



# Arizona State University

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## 1999–2000 Graduate Catalog

All colleges, schools, divisions, and departments establish certain academic requirements that must be met before a degree is granted. Advisors, directors, department chairs, and deans are available to help the student understand these requirements, but the student is responsible for fulfilling them. At the end of a student's course of study, if requirements for graduation have not been satisfied, the degree is not granted. For this reason, it is important for all students to acquaint themselves with all regulations, to be informed throughout their college careers, and to be responsible for completing requirements.

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**On the Cover** / Palm Walk takes bicyclists and pedestrians through the heart of the ASU Main campus, here passing by the Computing Commons. Tim Trumble photo

The *Graduate Catalog* is the official source of information for programs and requirements of ASU and its colleges, departments, and schools. Catalogs may be viewed on the Web at [www.asu.edu/aad/catalogs](http://www.asu.edu/aad/catalogs).

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President Lattie F. Coor Tim Trumble photo

Dear ASU Students and Prospective Students:

I am pleased to welcome you to Arizona State University, a Research I university in one of the nation's fastest-growing metropolitan areas.

I am proud of the fact that ASU continues to advance rapidly as a major national research university. This accomplishment is reflected by the talented and diverse students and faculty we have attracted, our ability to deliver quality education, achievements in research and creative activities, and the richness in our cultural diversity. We are committed to excellence in research, teaching, and professional and community service, which are all essential components of a great and engaging university.

Arizona State University is noted for its outstanding resources and environment and for faculty characterized by their creative and scholarly distinction and innovation. As well, we seek ways to create educational partnerships with the community to enrich its intellectual life and enhance the professional tenor of our programs.

We will continue to strive for excellence and to encourage creative individuals to be curious and to think critically and boldly. It is an honor to invite you to be a part of the vigorous academic community at ASU.

Sincerely,

A handwritten signature in black ink, appearing to read "Lattie F. Coor". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Lattie F. Coor  
President







Bianca L. Bernstein

Tim Trumble photo

I extend a warm welcome to new and continuing graduate students at Arizona State University. As we celebrate our 60th year of graduate education, we take pride in our national leadership in many professional and scholarly areas. We offer 48 doctoral and 91 master's degree programs, supported by 1,600 faculty members, whose teaching and research are recognized nationally and internationally.

The close collaboration of our programs with organizations in the private and public sectors fosters research and professional opportunities for our graduate students in the surrounding greater metropolitan area and beyond. As an integral part of our doctoral education, we emphasize professional development through our Preparing Future Faculty program, one of the first in the nation.

We are proud of our commitment to graduate education: to prepare our students to become scholarly and professional leaders in a new century in which technology will continue to transform the boundaries of knowledge. Our partnership with ASU students provides a nurturing environment to enhance their intellectual and personal growth. Please call on us if we may be of assistance.

I wish you success in the pursuit of your goals at Arizona State University.

Cordially,

A handwritten signature in cursive script that reads "Bianca L. Bernstein". The signature is written in dark ink on a white background.

Bianca L. Bernstein  
Dean of the Graduate College

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# Who to Contact at ASU Main

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Arizona is on mountain standard time all year and does not observe daylight saving time. Effective September 1, 1999, the area code is 480 for all numbers at ASU Main, ASU East, and Downtown Center but remains 602 for ASU West. For the "Academic Directory," see page 315. For the "ASU East Directory," see page 379. For the "ASU West Directory," see page 387.

ASU switchboard.....	965-9011
Admissions, Graduate College.....	965-6113
Advising Office, Graduate College.....	965-3521
Bookstore.....	965-3191
Computer Accounts.....	965-1211
Modem dial-in access.....	965-6900
Computing Commons.....	965-5968
Disabled Student Resources.....	965-1234
Employment	
Off-Campus.....	965-6318
On-Campus.....	965-5186
Format Evaluation.....	965-3521
Gammage Box Office.....	965-3434
Graduate College.....	965-3521
Graduate Student Association.....	965-1263
Graduation Office.....	965-6980
Health Services.....	965-3346
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Intramural Sports information.....	965-8900
Intercollegiate Athletics (ticket information).....	965-2381
Library	
Hayden (arts, business, humanities, information, social sciences).....	965-6164
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Scholarships.....	965-4845
Student Financial Assistance Office.....	965-3355
Student I.D.....	965-3124
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Testing Services, University.....	965-7146
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Tuition Payment.....	965-4347

# ASU Main Academic Administration

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For more information, see “Administrative Personnel,” page 369, “ASU East Administrative Personnel,” page 383, and “ASU West Administrative Personnel,” page 394.

Lattie F. Coor, *President*

Ben R. Forsyth, *Senior Executive Assistant to the President*

Ruth Jones, *Executive Assistant for University Programs*

Peterson Zah, *Special Advisor to the President on American Indian Affairs*

Milton D. Glick, *Senior Vice President and Provost*

Christine K. Wilkinson, *Vice President for Student Affairs*

Allan Price, *Vice President for Institutional Advancement*

Mernoy Harrison, *Vice Provost for Administrative Services*

Jonathan Fink, *Vice Provost for Research*

Charles R. Bantz, *Vice Provost*

Kathleen Church, *Vice Provost*

Walter Harris Jr., *Vice Provost*

William E. Lewis, *Vice Provost for Information Technology*

Louis Olivas, *Assistant Vice President for Academic Affairs*

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Deborah N. Losse, *Associate Dean for Academic Programs*

Sarah B. Lindquist, *Assistant Dean*

Sandra L. Luehrsen, *Assistant Dean*

Kent D. Blaylock, *Senior Manager*

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Larry E. Penley, *Dean, College of Business*

David C. Berliner, *Dean, College of Education*

Peter E. Crouch, *Dean, College of Engineering and Applied Sciences*

Bette F. DeGraw, *Dean, College of Extended Education*

J. Robert Wills, *Dean, College of Fine Arts*

Bianca L. Bernstein, *Dean, Graduate College*

Patricia D. White, *Dean, College of Law*

Gary S. Krahenbuhl, *Dean, College of Liberal Arts and Sciences*

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Ted Humphrey, *Dean, University Honors College*

Sherrie Schmidt, *Dean, University Libraries*

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Gerald Farin, *Computer Science*

Anne Feldhaus, *Religious Studies*

Dale Furnish, *Law*

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Ann Nichols, *Social Work*

Michael Ormiston, *Economics*

Joseph Palais, *Electrical Engineering*

Bradley Rogers, *Manufacturing Technology, ASU East*

Janet Taylor, *Art*

# Course Prefix Index

The course descriptions in this catalog refer to ASU Main and ASU East courses. For ASU West course descriptions, see the *ASU West Catalog*. For ASU Main and ASU East courses for undergraduates, see the *General Catalog*.

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HPS	History and Philosophy of Science <sup>1</sup>		NOR	Norwegian <sup>1</sup>	
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MUS	Music <sup>1</sup>		WST	Women's Studies <sup>1</sup>	

<sup>1</sup> See the *General Catalog*.

<sup>2</sup> See the *ASU West Catalog*.





# ASU Graduate Degrees

Graduate degrees, majors, and concentrations offered at ASU Main, ASU East, and ASU West are shown in the “ASU Graduate Degrees” table below, which points to the primary page where more information can be found. The table shows only officially approved concentrations; other informal areas of study may be available.

## ASU Graduate Degrees

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Environmental Planning	Urban planning	Main	195
<b>Master of Fine Arts</b>			
Art	Ceramics, drawing, fibers, intermedia, metals, painting, photographic studies, photography, printmaking, sculpture, wood	Main	117
Creative Writing		Main	158
Dance		Main	167
Theatre	Performance, scenography, theatre for youth	Main	306
<b>Master of Health Services Administration</b>			
Health Services Administration		Main	212
<b>Master of Mass Communication</b>			
Mass Communication		Main	239
<b>Master of Music</b>			
Composition		Main	252
Music Education	Choral music, general music, instrumental music, jazz studies	Main	252
Performance	Music theatre musical direction, music theatre performance, performance pedagogy, piano accompanying, solo performance (instrumental, keyboard, voice)	Main	252
<b>Master of Natural Science</b>			
Natural Science	Biology, chemistry, geology, mathematics, microbiology, physics, plant biology	Main	257
<b>Master of Physical Education</b>			
Physical Education		Main	261

<sup>1</sup> This major is offered toward more than one degree at the same level.

<sup>2</sup> Applications are not being accepted at this time.

<sup>3</sup> This major has formalized concentration(s); other areas of study are available.

<sup>4</sup> This collaborative program is offered by the three state universities.

<sup>5</sup> This program is administered jointly by the College of Education and the Graduate College.

<sup>6</sup> This major is jointly offered with the University of Arizona.

<sup>7</sup> Students apply to this degree program through the College of Law, not the Graduate College.

## ASU Graduate Degrees (continued)

Degree/Major	Concentration	Campus	Page
<b>Master of Public Administration</b>			
Public Administration	Public information management, public management, public policy analysis and evaluation, urban management and planning	Main	274
<b>Master of Public Health</b>			
Public Health <sup>4</sup>	Health administration and policy	Main	212
<b>Master of Science</b>			
Aerospace Engineering <sup>1</sup>		Main	104
Agribusiness	Agribusiness management and marketing, food quality assurance	East	106
Bioengineering		Main	122
Biology <sup>3</sup>	Ecology	Main	124
Building Design	Computer-aided design, energy performance and climate-responsive architecture, facilities development and management	Main	127
Chemical Engineering <sup>1</sup>	Biomedical and clinical engineering, chemical process engineering, chemical reactor engineering, energy and materials conversion, environmental control, solid-state processing, transport phenomenon	Main	136
Chemistry	Analytical chemistry, biochemistry, geochemistry, inorganic chemistry, organic chemistry, physical chemistry, solid-state chemistry	Main	140
Civil Engineering <sup>1</sup>		Main	142
Communication Disorders		Main	149
Computer Science <sup>1</sup>		Main	151
Construction	Construction science, facilities, management	Main	154
Economics		Main	172
Electrical Engineering <sup>1</sup>		Main	182
Engineering Science <sup>1</sup>		Main	182
Environmental Resources		Main	197
Exercise Science/Physical Education		Main	200
Family Resources and Human Development	Family studies, general family resources and human development	Main	203
Geology		Main	209
Industrial Engineering <sup>1</sup>		Main	222
Information Management		Main	225
Justice Studies		Main	227
Mechanical Engineering <sup>1</sup>		Main	245
Microbiology		Main	249
Molecular and Cellular Biology		Main	251
Nursing	Adult health nursing, community health nursing, community mental health/psychiatric nursing, family health nursing, nursing administration, parent-child nursing, women's health	Main	258
Physics		Main	262
Plant Biology <sup>3</sup>	Ecology, photosynthesis	Main	266
Recreation	Outdoor recreation, recreation administration, social/psychological aspects of leisure, tourism and commercial recreation	Main	277
Statistics		Main	294
<b>Master of Science in Design</b>			
Design	Graphic design, industrial design, interior design	Main	168
<b>Master of Science in Engineering</b>			
Aerospace Engineering <sup>1</sup>		Main	104
Chemical Engineering <sup>1</sup>	Biomedical and clinical engineering, chemical process engineering, chemical reactor engineering, energy and materials conversion, environmental control, solid-state processing, transport phenomena	Main	137

## ASU Graduate Degrees (continued)

Degree/Major	Concentration	Campus	Page
<b>Master of Science in Engineering (continued)</b>			
Civil Engineering <sup>1</sup>		Main	142
Electrical Engineering <sup>1</sup>		Main	182
Engineering Science <sup>1</sup>		Main	187
Industrial Engineering <sup>1</sup>		Main	222
Mechanical Engineering <sup>1</sup>		Main	245
<b>Master of Science in Technology</b>			
Technology	Contact the College of Technology and Applied Sciences for available concentrations.	East	296
<b>Master of Social Work</b>			
Social Work		Main	284
<b>Master of Taxation</b>			
Taxation		Main	295
<b>Master of Teaching English as a Second Language</b>			
Teaching English as a Second Language		Main	296
<b>Doctor of Education</b>			
Curriculum and Instruction <sup>1</sup>	Bilingual education, communication arts, curriculum studies, early childhood education, elementary education, English as a second language, Indian education, mathematics education, multicultural education, <sup>2</sup> reading education, science education, secondary education, social studies education	Main	161
Educational Administration and Supervision		Main	176
Higher and Postsecondary Education	Higher education	Main	215
<b>Doctor of Musical Arts</b>			
Music	Choral conducting, music composition, music education, solo performance (instrumental, keyboard, voice)	Main	253
<b>Doctor of Philosophy</b>			
Aerospace Engineering		Main	105
Anthropology	Archaeology, physical anthropology, social-cultural anthropology	Main	109
Bioengineering		Main	122
Biology <sup>3</sup>	Ecology	Main	124
Business Administration	Accountancy, finance, health services research, <sup>2</sup> information management, management, marketing, supply chain management	Main	129
Chemical Engineering	Biomedical and clinical engineering, chemical process engineering, chemical reactor engineering, energy and materials conversion, environmental control, solid-state processing, transport phenomena	Main	137
Chemistry	Analytical chemistry, biochemistry, geochemistry, inorganic chemistry, organic chemistry, physical chemistry, solid-state chemistry	Main	140
Civil Engineering		Main	142
Communication	Communicative development, intercultural communication, organizational communication	Main	145
Computer Science		Main	151
Counseling Psychology		Main	156

<sup>1</sup> This major is offered toward more than one degree at the same level.

<sup>2</sup> Applications are not being accepted at this time.

<sup>3</sup> This major has formalized concentration(s); other areas of study are available.

<sup>4</sup> This collaborative program is offered by the three state universities.

<sup>5</sup> This program is administered jointly by the College of Education and the Graduate College.

<sup>6</sup> This major is jointly offered with the University of Arizona.

<sup>7</sup> Students apply to this degree program through the College of Law, not the Graduate College.

## ASU Graduate Degrees (continued)

Degree/Major	Concentration	Campus	Page
Curriculum and Instruction <sup>1, 5</sup>	Curriculum studies, early childhood education, educational media and computers, <sup>2</sup> elementary education, English education, exercise and wellness education, music education, physical education, reading education, science education, special education	Main	164
Economics		Main	172
Educational Leadership and Policy Studies		Main	178
Educational Psychology	Lifespan developmental psychology; measurement, statistics, and methodological studies; school psychology	Main	181
Electrical Engineering		Main	182
Engineering Science		Main	187
English	Literature, rhetoric/composition and linguistics	Main	189
Environmental Design and Planning	Design; history, theory, and criticism; planning	Main	192
Exercise Science	Biomechanics, motor behavior/sport psychology, physiology of exercise	Main	199
Family Science <sup>3</sup>	Marriage and family therapy	Main	205
Geography		Main	207
Geology		Main	209
History	Asian history, British history, European history, Latin American history, U.S. history	Main	217
History and Theory of Art <sup>6</sup>		Main	219
Industrial Engineering		Main	222
Justice Studies	Criminal and juvenile justice; dispute resolution; law, justice, and minority populations; law, policy, and evaluation; women, law, and justice	Main	229
Learning and Instructional Technology <sup>1</sup>	Instructional technology, learning	Main	238
Mathematics		Main	241
Mechanical Engineering		Main	245
Microbiology		Main	249
Molecular and Cellular Biology		Main	251
Philosophy		Main	260
Physics		Main	263
Plant Biology <sup>3</sup>	Ecology, photosynthesis	Main	267
Political Science	American politics, comparative politics, international relations, political theory	Main	269
Psychology	Behavioral neuroscience, clinical psychology, cognitive/behavioral systems, developmental psychology, environmental psychology, quantitative research methods, social psychology	Main	272
Science and Engineering of Materials	High-resolution nanostructure analysis, solid-state device materials design	Main	281
Social Work		Main	286
Sociology		Main	289
Spanish	Cultural studies, literature	Main	290
Speech and Hearing Science	Developmental neurolinguistic disorders, neuroauditory processes, neurogerontologic communication disorders	Main	293
Theatre	Theatre for youth	Main	307
<b>Doctor of Public Administration</b>			
Public Administration		Main	276
<b>Juris Doctor<sup>7</sup></b>		Main	78

<sup>1</sup> This major is offered toward more than one degree at the same level.

<sup>2</sup> Applications are not being accepted at this time.

<sup>3</sup> This major has formalized concentration(s); other areas of study are available.

<sup>4</sup> This collaborative program is offered by the three state universities.

<sup>5</sup> This program is administered jointly by the College of Education and the Graduate College.

<sup>6</sup> This major is jointly offered with the University of Arizona.

<sup>7</sup> Students apply to this degree program through the College of Law, not the Graduate College.

**Concurrent and Dual Degrees Offered at ASU Main**

Concurrent or Dual Degrees	Administered by	Page(s)
Juris Doctor/Master of Health Services Administration	College of Law/School of Health Administration and Policy	78, 212
Juris Doctor/Master of Science in Economics*	College of Law/Department of Economics	78, 172
Juris Doctor/Doctor of Philosophy in Justice Studies	College of Law/Committee on Law and Social Sciences	78, 230
Master of Business Administration/Juris Doctor	College of Business/College of Law	63, 78, 128
Master of Business Administration/Master of Accountancy and Information Systems	College of Business	63, 103, 128
Master of Business Administration/Master of Architecture	College of Business/School of Architecture	63, 114, 128
Master of Business Administration/Master of Health Services Administration	College of Business	63, 128, 213
Master of Business Administration/Master of International Management	College of Business/American Graduate School of International Management (Thunderbird) or Groupe Ecole Supérieure de Commerce Toulouse, France, or Universidad Carlos III de Madrid, Spain	63, 128
Master of Business Administration/Master of Science in Economics	College of Business	63, 128, 172
Master of Business Administration/Master of Science in Information Management	College of Business	63, 128, 225
Master of Business Administration/Master of Taxation	College of Business	63, 128, 295
Master of Science in Engineering (Industrial Engineering)/Master of International Management of Technology	Department of Industrial and Management Systems Engineering/ American Graduate School of International Management (Thunderbird)	222
Master of Science in Justice Studies/Master of Arts in Anthropology	School of Justice Studies/Department of Anthropology	108, 227
Master of Science in Nursing/Master of Health Services Administration	College of Nursing/School of Health Administration and Policy	213, 257

\* Applications for this program are not being accepted at this time.

**Certificate Programs Offered at ASU Main, East, and West**

Certificate Program	Administered by	Page(s)
Artist Diploma (graduate certificate)	School of Music	251
Certificate in Gerontology	ASU Main and ASU West	212, 385
Certificate in Hazardous Materials and Waste Management	ASU East	<i>See the General Catalog.</i>
Certificate in Medieval Studies	Arizona Center for Medieval and Renaissance Studies	248
Certificate in Museum Studies	Department of Anthropology	108
Certificate in Renaissance Studies	Arizona Center for Medieval and Renaissance Studies	280
Certificate in Scholarly Publishing	Department of History	280
Certificate in Translation	Department of Languages and Literatures	<i>See the General Catalog.</i>
Certificate in Transportation Systems	Committee on Transportation Systems	310

# Graduate College Calendar

## April 1999

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

## May 1999

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

## June 1999

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

## July 1999

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

## August 1999

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

## 1999

Check the 1999 *Summer Sessions Bulletin* for details and to confirm these dates.

Mon., Feb. 1–  
Wed., June 2  
Mon., Feb. 1–  
Wed., July 7  
Tues., Apr. 27

Mon., May 31  
Tues., June 1  
Tues., June 8  
Tues., June 8  
Fri., June 18  
Fri., June 25  
Fri., July 2

Fri., July 2  
Mon., July 5  
Tues., July 6  
Tues., July 13  
Fri., July 16  
Fri., July 23  
Fri., July 23  
Fri., July 30

Thurs., Aug. 5  
Fri., Aug. 6

## 1999

Check the fall 1999 *Schedule of Classes* for details and to confirm these dates.

Wed., Apr. 28–  
Fri., Aug. 27

Mon., Aug. 2  
Tues., Aug. 3

Mon., Aug. 16–  
Tues., Aug. 17  
Mon., Aug. 16–  
Sat., Aug. 21

Tues., Aug. 17

Thurs., Aug. 19

Thurs., Aug. 19

Mon., Aug. 23

## Summer Sessions

Registration and drop/add for first five-week session and eight-week session

Registration and drop/add for second five-week session

Final tuition payment deadline for all summer sessions  
(For students who register after April 27, fees are due daily.)

Classes are excused for Memorial Day

Instruction begins for first five-week session and eight-week session

Unrestricted withdrawal deadline for first five-week session

Unrestricted withdrawal deadline for eight-week session

Restricted course withdrawal for first five-week session and eight-week session

Restricted complete withdrawal deadline for first five-week session

August graduation filing deadline (must be met to have name appear in commencement program)

First five-week session ends

Classes are excused for Independence Day

Instruction begins for second five-week session

Unrestricted withdrawal deadline for second five-week session

Restricted complete withdrawal deadline for eight-week session

Eight-week session ends

Restricted course withdrawal deadline for second five-week session

Restricted complete withdrawal deadline for second five-week session

Second five-week session ends

Commencement

## Fall Semester

Registration

Early Teaching Assistant Orientation (8 A.M.–5 P.M.)

Final tuition payment deadline for fall 1999  
(For students who register after Aug. 3, fees are due daily.)

New Teaching Assistant Orientation and activities  
(8 A.M.–5 P.M.)

International Student Orientation and activities

Welcoming orientation for all new graduate students, Memorial Union, Arizona Room (7–9 P.M. Tuesday, 10 A.M.–Noon Wednesday)

Workshops for new graduate students, Memorial Union, Arizona Room (8 A.M.–5 P.M.)

New Faculty and Academic Professional Orientation and Reception

Instruction begins



**September 1999**

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

**October 1999**

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

**November 1999**

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

**December 1999**

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

**January 2000**

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

**February 2000**

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29			

Mon., Sept. 6

Classes are excused for Labor Day

Fri., Sept. 17

Unrestricted withdrawal deadline

Fri., Oct. 15

December graduation filing deadline (must be met to have name appear in commencement program)

Tues., Oct. 19

Thesis/Dissertation Workshop, Memorial Union, Ventana Room (3–5 P.M.)

Fri., Oct. 29

Restricted course withdrawal deadline

Thurs., Nov. 11

Classes are excused for Veterans Day

Wed., Nov. 24

Last day to submit materials for thesis and dissertation format review and oral defense

Thurs., Nov. 25–

Classes are excused for Thanksgiving recess

Fri., Nov. 26

Thurs., Dec. 2

Restricted complete withdrawal deadline

Wed., Dec. 8

Instruction ends

Thurs., Dec. 9

Reading day

Fri., Dec. 10

Last day to hold oral examination in defense of a thesis or dissertation

Fri., Dec. 10–

Final examinations

Sat., Dec. 11;

Mon., Dec. 13–

Thurs., Dec. 16

Tues., Dec. 14

Last day to obtain signature of the Graduate College dean for thesis and dissertation approval

Tues., Dec. 14

Last day to submit to ASU Bookstore binding for thesis and dissertation (due by 3 P.M.)

Fri., Dec. 17

Commencement

Tues., Dec. 28

Winter session (CEE) instruction begins

**2000**

**Spring Semester**

Check the spring 2000 *Schedule of Classes* for details and to confirm these dates.

Wed., Nov. 17, 1999–

Registration

Fri., Jan. 21, 2000

Mon., Dec. 20, 1999

Final tuition payment deadline for spring 2000 (For students who register after Dec. 20, fees are due daily.)

Fri., Dec. 31, 1999

Winter session classes are excused for New Year's Day

Mon., Jan. 10

New Teaching Assistant Orientation

Mon., Jan. 10–

International Student Orientation and activities

Sat., Jan. 15

Tues., Jan. 11

New Graduate Student Orientation begins

Fri., Jan. 14

Winter session (CEE) instruction ends

Mon., Jan. 17

Classes are excused for Martin Luther King Jr. Day

Tues., Jan. 18

Instruction begins

Fri., Feb. 11

Unrestricted withdrawal deadline

Tues., Feb. 15

Thesis/Dissertation Workshop, Memorial Union, Ventana Room (3–5 P.M.)

Sun., Mar. 12–

Classes are excused for spring recess

Sun., Mar. 19

Fri., Mar. 31

May graduation filing deadline (must be met to have name appear in commencement program)

Fri., Mar. 31

Mid-semester scholarship reports due in Office of Registrar

Fri., Mar. 31

Restricted course withdrawal deadline

**March 2000**

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

**April 2000**

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

**May 2000**

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

**June 2000**

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

**July 2000**

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

**August 2000**

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Fri., Apr. 21

Last day to submit materials for thesis and dissertation format review and oral defense

Thurs., Apr. 27

Restricted complete withdrawal deadline

Wed., May 3

Instruction ends

Thurs., May 4

Reading day

Fri., May 5

Last day to hold oral examination in defense of a thesis or dissertation

Fri., May 5–

Final examinations

Sat., May 6;

Mon., May 8–

Thurs., May 11

Tues., May 9

Last day to obtain signature of the Graduate College dean for thesis and dissertation approval

Last day to submit to ASU Bookstore binding for thesis and dissertation (due by 3 P.M.)

Fri., May 12

Commencement

**2000****Summer Sessions**Check the 2000 *Summer Sessions Bulletin* for details and to confirm these dates.

Mon., Jan. 31–

Registration and drop/add for first five-week session and eight-week session

Wed., May 31

Mon., Jan. 31–

Registration and drop/add for second five-week session

Wed., July 5

Tues., Apr. 25

Final tuition payment deadline for all summer sessions (For students who register after April 25, fees are due daily.)

Mon., May 29

Classes are excused for Memorial Day

Tues., May 30

Instruction begins for first five-week session and eight-week session

Tues., June 6

Unrestricted withdrawal deadline for first five-week and eight-week sessions

Fri., June 16

Restricted course withdrawal deadline for first five-week session and eight-week session

Fri., June 23

Restricted complete withdrawal deadline for first five-week session

Fri., June 30

First five-week session ends

Mon., July 3

Instruction begins for second five-week session

Tues., July 4

Classes are excused for Independence Day

Fri., July 7

August graduation filing deadline (must be met to have name appear in commencement program)

Mon., July 10

Unrestricted withdrawal deadline for second five-week session

Fri., July 14

Last day to submit materials for thesis and dissertation format review and oral defense

Fri., July 14

Restricted complete withdrawal deadline for eight-week session

Fri., July 21

Eight-week session ends

Fri., July 21

Restricted course withdrawal deadline for second five-week session

Fri., July 28

Last day to hold oral examination in defense of a thesis or dissertation

Fri., July 28

Restricted complete withdrawal deadline for second five-week session

Tues., Aug. 1

Last day to obtain signature of the Graduate College dean for thesis and dissertation approval

Tues., Aug. 1

Last day to submit to ASU Bookstore binding for thesis and dissertation (due by 3 P.M.)

Thurs., Aug. 3

Second five-week session ends

Fri., Aug. 4

Commencement

# Accreditation and Affiliation

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Arizona State University Main is accredited by the North Central Association (NCA) of Colleges and Secondary Schools. Arizona State University East is recognized by the NCA as a full-service campus and is accredited under the ASU Main umbrella. Programs in the various colleges, schools, divisions, and departments are accredited by, affiliated with, or members of national bodies as described in the “Academic Accreditation,” “Academic Affiliation,” and “Academic Membership” tables. Some programs in the College of Education are approved by the State Board of Education (Arizona) and the National Association of School Psychologists.

**ASU West.** ASU West is separately accredited by the Commission on Institutions of Higher Education of the North Central Association of Colleges and Schools. Professional programs in the various academic areas are accredited by national bodies as described in the “Academic Accreditation at ASU West” table, page 25.

## Academic Accreditation at ASU Main and East

Unit or Program	Accredited by
<b>College of Architecture and Environmental Design</b> B.S.D., Interior Design B.S.L.A. M.Arch. M.E.P.	Foundation for Interior Design Education Research Landscape Architectural Accreditation Board National Architectural Accrediting Board Planning Accreditation Board
<b>College of Business</b> all programs School of Accountancy and Information Management School of Health Administration and Policy	American Assembly of Collegiate Schools of Business American Assembly of Collegiate Schools of Business Accrediting Commission on Education for Health Services Administration
<b>College of Education</b> M.C., Counseling  Ph.D., Counseling Psychology; Ph.D., Educational Psychology with a concentration in school psychology	Council for Accreditation of Counseling and Related Educational Programs American Psychological Association
<b>College of Engineering and Applied Sciences</b> B.S.E., Aerospace Engineering; B.S.E., Bioengineering; B.S.E., Chemical Engineering; B.S.E., Civil Engineering; B.S.E., Computer Systems Engineering; B.S.E., Electrical Engineering; B.S.E., Industrial Engineering; B.S.E., Materials Science and Engineering; B.S.E., Mechanical Engineering B.S., Computer Science  B.S., Construction	Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.  Computer Science Accreditation Commission of the Computing Sciences Accreditation Board American Council for Construction Education
<b>College of Fine Arts</b> Department of Theatre School of Music	National Association of Schools of Theatre National Association of Schools of Music
<b>College of Law</b> J.D.	American Bar Association and Association of American Law Schools
<b>College of Liberal Arts and Sciences</b> B.A., B.S., Family Resources and Human Development with a concentration in human nutrition—dietetics; M.S., Family Resources and Human Development with a concentration in general family resources and human development (human nutrition and foods area) B.S., Clinical Laboratory Sciences	American Dietetic Association  National Accrediting Agency for Clinical Laboratory Sciences

**Academic Accreditation at ASU Main and East (continued)**

<b>Unit or Program</b>	<b>Accredited by</b>
<b>College of Liberal Arts and Sciences (continued)</b>	
M.S., Communication Disorders	American Speech-Language-Hearing Association
Ph.D., Psychology with a concentration in clinical psychology	American Psychological Association
<b>College of Nursing</b>	
B.S.N., M.S., Nursing	Arizona Nurses Association (American Nurses Credentialing Center's Commission on Accreditation) Arizona State Board of Nursing National League for Nursing Commission on Collegiate Nursing Education (approved)
<b>College of Public Programs</b>	
B.S., Recreation	Council on Accreditation of the National Recreation and Park Association
B.S.W., M.S.W.	Council on Social Work Education
Master of Public Administration	National Association of Schools of Public Affairs and Administration
Walter Cronkite School of Journalism and Telecommunication	Accrediting Council on Education in Journalism and Mass Communications
<b>College of Technology and Applied Sciences</b>	
B.S., Aeronautical Engineering Technology; B.S., Electronics Engineering Technology; B.S., Manufacturing Engineering Technology	Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.

**Academic Affiliation**

<b>Unit or Program</b>	<b>Affiliated with</b>
<b>College of Architecture and Environmental Design</b>	
School of Architecture	American Institute of Architects, Central Arizona and Rio Salado Chapters Architectural Research Centers Consortium Association for Computer-Aided Design in Architecture
School of Design	Association of Collegiate Schools of Architecture American Society of Interior Designers Human Factors and Ergonomics Society Industrial Designers Society of America Interior Design Educators Council International Interior Design Association Society of Environmental Graphic Designers
School of Planning and Landscape Architecture	American Planning Association American Society of Landscape Architects Association of Collegiate Schools of Planning Council of Educators in Landscape Architecture Society for Range Management Soil and Water Conservation Society Wildlife Society
<b>College of Education</b>	
	American Association of Colleges for Teacher Education American Educational Research Association University Council for Educational Administration

## Academic Membership

Unit or Program	Membership with
<b>College of Education</b>	American Association of Colleges for Teacher Education University Council for Educational Administration Association of American Law Schools
<b>College of Law</b>	
<b>College of Liberal Arts and Sciences</b>	
Department of Anthropology	American Anthropological Association Council for Museum Anthropology
Department of Biology	American Institute of Biological Sciences American Society of Naturalists American Society of Zoologists Animal Behaviorists' Society Sigma Psi
Department of Chemistry and Biochemistry	American Association for Advancement of Science American Chemical Society
Department of Exercise Science and Physical Education	American Society for Advancement of Science American Alliance for Health, Physical Education, Recreation and Dance American College of Sports Medicine American Physical Society Arizona Society of Medical Technology Committee on Allied Health Education National Association for Physical Education in Higher Education North American Society for Sports History North American Society for Sports Psychology and Physical Activity
Department of Family Resources and Human	American Dietetic Association Development
Department of Geography	Association of American Geographers
Department of Geology	American Association of Petroleum Geologists American Geophysical Union American Institute of Professional Geologists Geological Society of America Mineralogical Society of America Society of Economic Paleontologists and Mineralogists
Department of History	American Association for State and Local History American Association of Museums American Historical Association Institute of Historical Research
Department of Languages and Literatures	American Council on Teaching Foreign Language International Studies Association Modern Language Association
Department of Mathematics	American Mathematical Society Mathematical Association of America Rocky Mountain Mathematics Consortium Society for Industrial and Applied Mathematics
Department of Microbiology	American Society of Microbiology
Department of Military Science	Association of U.S. Army
M.S., Ph.D., Molecular and Cellular Biology	American Society of Medical Technology
Department of Philosophy	American Philosophical Association
Department of Physics and Astronomy	Acoustical Society of America American Association of Physicists in Medicine American Association of Physics Teachers American Astronomical Society American Crystallographic Association American Physical Society American Vacuum Society International Astronomical Union Materials Research Society Optical Society of America

**Academic Membership (continued)**

<b>Unit or Program</b>	<b>Membership with</b>
Department of Plant Biology	American Institute of Biological Sciences American Society of Cell Biology American Society of Horticultural Science American Society of Photobiology American Society of Plant Physiologists American Society of Plant Taxonomy Arizona-Nevada Academy of Science Botanical Society of America Botanical Society of Japan California Botanical Society Ecological Society of America International Association of Landscape Ecology International Association of Plant Taxonomy International Association for Study of Plant Succulents International Association of Wood Anatomists International Organization of Paleobotany International Photosynthesis Society International Society of Arboriculture International Society of Ecological Modeling International Society of Plant Molecular Biology International Society of Plant Producers International Union of Woody Plant Physiologists Microscopy Society of America Phycological Society of America Phytochemical Society of North America Sigma Xi Soil Science Society of America
Department of Political Science	American Political Science Association Inter-University Consortium for Political and Social Research
Department of Psychology	American Society of Clinical Psychologists
Department of Sociology	American Sociological Association
Women's Studies Program	Association for Women in Science National Women's Studies Association
<b>College of Nursing</b>	American Association of Colleges of Nursing Western Institute of Nursing
<b>College of Public Programs</b>	
Department of Communication	Speech Communication Association Western States Communication Association
Department of Recreation Management and Tourism	American Humanics, Inc. Arizona American Indian Tourism Association Arizona Heritage Alliance Arizona Park and Recreation Association Arizona State Therapeutic Association National Park and Recreation Association Travel Tourism Research Association
School of Justice Studies	Arizona Justice Educators Association of Criminal Justice Doctoral Programs National Academic Advising Onati International Institute for the Sociology of Law
School of Public Affairs	National Association of Schools of Public Affairs and Administration
Walter Cronkite School of Journalism and Telecommunication	Association of Schools of Journalism and Mass Communication Broadcast Education Association
<b>Graduate College</b>	Council of Graduate Schools
<b>University Honors College</b>	National Collegiate Honors Council

Academic Accreditation at ASU West

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Unit or Program	Accredited by
<b>College of Human Services</b> Department of Recreation and Tourism Management  Department of Social Work	National Recreation and Park Association/American Association for Leisure and Recreation Council on Social Work Education
<b>School of Management</b> all programs	American Assembly of Collegiate Schools of Business

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Gammage Auditorium

Tim Trumble photo

# Frequently Asked Questions

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## Admission Information?

Requests for applications or information regarding the progress of your file during the admission process should be directed to Graduate Admissions at 480/965-6113 or [asugrad@asu.edu](mailto:asugrad@asu.edu). For more information, visit [www.asu.edu/graduate/admission](http://www.asu.edu/graduate/admission) on the Web.

## Advising?

The Graduate College Advising Office is open to prospective and admitted graduate students. For an appointment, call 480/965-3521 or stop by the center lobby, Wilson Hall. Students admitted to degree programs should first seek advising within their programs.

## Application Fee Waiver?

ASU cannot waive, defer, or refund the fee. Your application is processed and sent to the academic unit to which you are applying only after you have paid the fee.

## Campus Map?

The Graduate College (Wilson Hall, center lobby) distributes maps of the campus and parking facilities. Maps are also available at the ASU Bookstore, 480/965-3191.

## Catalog?

Once admitted, you will receive a free copy. This copy is mailed to you if your address is in the United States, or you may present your letter of admission at the Graduate College to receive your free copy. Catalogs are also available in the ASU Bookstore, 480/965-3191, for a fee of \$4.

## Corresponding with ASU?

Address letters to: Department or Office Name (if known), Arizona State University, Tempe, AZ 85287. If you are not sure how to address your letter, send it to Graduate Admissions, and the staff will forward it to the proper office.

## Degree Programs and Departments?

For specific information about faculty, programs, application requirements, and deadlines, contact the academic unit directly, by mail or by phone. Unsure? Contact the Graduate College Advising Office, 480/965-3521 or [asugrad@asu.edu](mailto:asugrad@asu.edu).

## Employment on Campus?

The Student Financial Assistance Office, 480/965-5186, maintains and posts up-to-date employment information for jobs on campus.

## Financial Assistance? Loans? Assistantships? Scholarships?

**First:** Your best source of information is the academic unit to which you are applying; its director of graduate study can provide information, guidance, and application forms for scholarships, assistantships, and fellowships specific to that program. Most units set early deadlines and require special forms or procedures.

**Second:** Information about loans, scholarships, grants, work-study and employment opportunities is available through the Graduate College Financial Assistance Office, Wilson Hall, 480/965-3521, or e-mail [asugrad@asu.edu](mailto:asugrad@asu.edu). For more information, visit [www.asu.edu/graduate/gradaid](http://www.asu.edu/graduate/gradaid) on the Web.

**Third:** At a college or public library, ask a reference librarian for publications to help you find scholarships and fellowships.

**Fourth:** If you now attend school, ask your advisor for guidance in finding information on financial assistance in your discipline.

## Financial Guarantee?

International applicants must provide explicit verification from their banks that funds equal to the amount specified on the Financial Guarantee Form are available to them. (A general assurance of good credit is not accepted.) For more information, visit [www.asu.edu/graduate/admission](http://www.asu.edu/graduate/admission) on the Web.

## Housing?

**On Campus:** Cholla Apartments house graduate students and should be specifically requested for campus housing on applications instead of other facilities; contact Residential Life, 480/965-3515, or [reslife@asuvm.inre.asu.edu](mailto:reslife@asuvm.inre.asu.edu). University housing is available for married students or families only at ASU East campus. For more information visit [www.asu.edu/reslife](http://www.asu.edu/reslife) on the Web.

**Off Campus:** Information is available from the ASASU Tenants/Commuter Students Association, 480/965-6246. Tempe, Mesa, Scottsdale, and Phoenix newspapers advertise many rentals.

## I-20/IAP-66 Forms?

ASU issues visa forms permitting attendance at ASU only. ASU issues the I-20 or IAP-66 only after receiving an acceptable Financial Guarantee Form and admitting the student.

## Immunization?

Students born after December 31, 1956, must receive a measles immunization or offer proof of measles immunity. Direct questions to Student Health Center, 480/965-1358. For more information, visit [reslife@asuvm.inre.asu.edu](mailto:reslife@asuvm.inre.asu.edu) on the Web.

## International Student Association?

Contact the International Student Office, 480/965-7451, after arriving on campus. For more information visit [www.asu.edu/vpsa/studentlife/iso/iso.html](http://www.asu.edu/vpsa/studentlife/iso/iso.html) on the Web.

## Internet Information?

ASU Web: [www.asu.edu](http://www.asu.edu); ASU Graduate College: [www.asu.edu/graduate/](http://www.asu.edu/graduate/); e-mail: [asugrad@asu.edu](mailto:asugrad@asu.edu).

## Letters of Recommendation?

Send these letters to the director of graduate study in the academic unit to which you are applying.

## Phone Numbers?

Call the campus operator Monday through Friday, 8 A.M. to 5 P.M. at 480/965-9011. Unsure about who to call? Contact a Graduate College advisor, 480/965-3521.

## Registration?

Contact the Office of the Registrar, 480/965-3171, or the academic unit to which you are applying.

## Release of Information to Friends?

By law, staff members can give personal information only to the applicant. If you want us to release information to another person, you must authorize us to do so. Send a letter to Graduate Admissions naming the person who may represent you. Please sign the letter with your name as it appears on your application form.

## Research and Support Facilities?

The academic unit to which you are applying is your best source of information about library resources, computing facilities, and research laboratories in your field. Contact the program's director of graduate study.

## Teacher Certification?

Students who select nondegree and degree graduate programs at ASU are eligible for Arizona teacher's certification. Contact the Office of Student Affairs, College of Education at 480/965-3877.

## TOEFL Scores?

ASU accepts score reports from *only* the Educational Testing Service, Princeton, New Jersey, or from a sponsor organization such as LASPAU or the Institute of International Education.

## Transcripts?

For a full description of the ASU policy on transcripts, see "Transcripts," page 42.



# General Information

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## MISSION

Arizona State University has emerged as a leading national and international research and teaching institution with a primary focus on Maricopa County, Arizona's dominant population center. This rapidly growing, multicampus public research university offers programs from the baccalaureate through the doctorate for approximately 49,000 full-time and part-time students through ASU Main in Tempe; ASU West in northwest Phoenix; a major educational center in downtown Phoenix; ASU East, located at the Williams Campus (formerly Williams Air Force Base) in southwest Mesa; and other instructional, research, and public service sites throughout Maricopa County. ASU is a modern university that applies its research capabilities to the rapidly evolving needs of Maricopa County and the state.

Arizona State University's goal is to become a world-class university in a multicampus setting, one of the very best public universities in the nation. Its mission is to provide outstanding programs in instruction, research, and creative activity, to promote and support economic development, and to provide service appropriate for the nation, the state of Arizona, and the state's major metropolitan area. To fulfill its mission, ASU places special emphasis on the core disciplines and offers a full range of degree programs—baccalaureate through doctorate. To become competitive with the very best public universities, ASU recognizes that it must offer quality programs at all degree levels in a broad range of fundamental fields of inquiry. ASU will continue to dedicate itself to superior instruction; to excellent student performance; to original research, creative endeavor, and scholarly achievement; and to outstanding public service and economic development activities. As a result of this dedication, ASU was awarded the prestigious Research I university status in 1994, recognizing ASU as a premier research institution.

## ORGANIZATION

Arizona State University is part of a university system governed by the Arizona Board of Regents, a body with perpetual succession under the constitution and laws of Arizona. The board consists of eight citizens appointed by the governor of the state for terms of eight years, and one student regent serving for one year with the elected governor and state superintendent of public instruction as members ex officio.

The regents select and appoint the president of the university, who is the liaison between the Arizona Board of Regents and the institution. The president is aided in the administrative work of the institution by the senior vice president and provost, other provosts, vice presidents, deans, directors, department chairs, faculty, and other officers. Refer to "ASU Main Academic Administration," page 9, and "Administrative Personnel," page 369.

The academic units develop and implement the teaching, research, and service programs of the university, aided by the university libraries, museums, and other services.

The faculty and students of the university play an important role in educational policy, with an Academic Senate,

joint university committees and boards, and the Associated Students serving the needs of a large institution.

## EQUAL OPPORTUNITY AND AFFIRMATIVE ACTION

It is the policy of ASU to provide equal opportunity through affirmative action in employment and educational programs and activities. Discrimination is prohibited on the basis of race, color, religion, national origin, citizenship, sex, sexual orientation, age, disability, special disabled veteran or Vietnam-era veteran status. Equal employment opportunity includes but is not limited to recruitment, hiring, promotion, termination, compensation, benefits, transfers, university-sponsored training, education, tuition assistance, and social and recreational programs.

ASU is committed to taking affirmative action in increasing opportunities at all levels of employment and to increasing participation in programs and activities by all faculty, staff, and students. Affirmative action is directed toward minority persons, women, special disabled veterans, Vietnam-era veterans, and persons with disabilities.

## University Policy Prohibiting Discriminatory Harassment

**Harassment Prohibited.** Subject to the limiting provisions of "Freedom of Speech and Academic Freedom" specified below, it is a violation of university policy for any university employee or student to subject any person to harassment on university property or at a university-sponsored activity.

**Harassment Defined.** Actions constitute harassment if (1) they substantially interfere with another's educational or employment opportunities, peaceful enjoyment of residence, physical security, and (2) they are taken with a general intent to engage in the actions and with the knowledge that the actions are likely to substantially interfere with a protected interest identified above. Such intent and knowledge may be inferred from all the circumstances.

**Freedom of Speech and Academic Freedom.** Neither this nor any other university policy is violated by actions that amount to expression protected by the state or federal constitutions or by related principles of academic freedom. This limitation is further described in the ASU First Amendment Guidelines, the current version of which supplements this policy and is available in the Office of the General Counsel.

**Relationship to the Work of the Campus Environment Team.** If harassment is discriminatory, it falls within the education, monitoring, reporting, and referral functions of the Campus Environment Team. Harassment is discriminatory if taken with the purpose or effect of differentiating on the basis of another person's race, sex, color, national origin, religion, age, sexual orientation, disability, or Vietnam-era veteran status.

## INTERGROUP RELATIONS CENTER

The Intergroup Relations Center provides opportunities for students, faculty, and staff to get involved in programs,

workshops, activities, and events designed to educate about and improve relations among many different groups at ASU. The center is well-known for presenting programs and workshops that are innovative, nondefensive, and educational and that are inclusive of many groups.

The center sponsors the Voices of Discovery Program, which consists of more than 10 small intergroup dialogues between different student groups. Examples of the different groups include a Latino/white dialogue group; an African American/white group; a female/male group; an American Indian/white group; a heterosexual/gay, lesbian, bisexual group; a Jewish/Christian dialogue group; an Asian/white group; and a persons with disabilities/able-bodied group. Each group meets for two hours per week for six weeks to have discussions about race, ethnicity, class, gender, sexual orientation, and other intergroup issues all designed to increase understanding and relations between groups. Students receive credit through courses for participating in the program.

The center also sponsors Leadership 2000, a four-day training retreat that takes place once a year and involves about 80 ASU students from many backgrounds. Leadership 2000 takes place in the mountains near Prescott, Arizona, and trains students to understand and address issues of leadership, culture, cross-cultural communication, stereotyping, intergroup cooperation and friendship, identity development, prejudice, and discrimination.

## HISTORY OF ARIZONA STATE UNIVERSITY

On February 26, 1885, House Bill 164, “An Act to Establish a Normal School in the Territory of Arizona,” was introduced in the 13th Legislative Assembly of Arizona Territory by John Samuel Armstrong. The bill, strongly supported by Charles Trumbull Hayden of Tempe, passed the House on March 6 and the Council on March 11 and was signed by Governor F.A. Tritle on March 12, 1885, thereby founding the institution known today as Arizona State University. Under the supervision of Principal Hiram Bradford Farmer, instruction was instituted on February 8, 1886, when 33 students met in a single room on land donated by George and Martha Wilson of Tempe.

The institution began with the broad obligation to provide “instruction of persons...in the art of teaching and in all the various branches that pertain to good common school education; also, to give instruction in the mechanical arts and in husbandry and agricultural chemistry, the fundamental law of the United States, and in what regards the rights and duties of citizens.”

With the growth of the state, especially the surrounding Phoenix metropolitan area, the school has carried forward this charter, accompanied by successive changes in scope, name, and governance.

**The Early Years.** For the first 14 years, the school was governed by six principals. At the turn of the century and with another new name, Normal School of Arizona, President Arthur John Matthews brought a 30-year tenure of progress to the school.

He assisted in changing the school to an all-college student status; the Normal School had enlisted high school students who had no other secondary educational facilities in Arizona. He embarked on a building schedule that included the state’s first dormitories. Of the 18 buildings constructed while Matthews was president, six are still in use. His leg-

acy of an “evergreen campus,” with the import of many shrubs and trees and the planting of Palm Walk, continues to this day: the main campus is a nationally recognized arboretum.

Matthews also saw to it that the Normal School was accredited outside the state. His service on national education organization boards was conducive to this recognition. The school remained a teacher’s college in fact and theory during Matthews’ tenure, although the struggle to attain status as a university was ongoing.

An extraordinary event occurred March 20, 1911, when former President Theodore Roosevelt visited the Tempe school and spoke from the steps of Old Main. He had dedicated the Roosevelt Dam the day before and was impressed with Arizona. He noted that construction of the dam would benefit central Arizona’s growth and that of the Normal School. It would be another year before the territory became a state.

During the Great Depression, Ralph W. Swetman was hired as president for a three-year term. This was a time of uncertainty for educational institutions. Although enrollment increased due to the depression, many faculty were terminated and faculty salaries were cut. The North Central Association became the accrediting agency for Arizona State Teachers College.

**The Gammage Years.** In 1933, Grady Gammage, then president of Arizona State Teachers College at Flagstaff, became president of Arizona State Teachers College at Tempe, a tenure that would last for nearly 28 years.

The Graduate Division was created in 1937 and the first master’s program was established the same year.

On March 8, 1945, the three state institutions of higher learning came under the authority of one Arizona Board of Regents, which oversees ASU today.

The phenomenal growth of the college began after the end of World War II. Dr. Gammage had foreseen that the G.I. Bill of Rights would flood campuses everywhere with returning veterans. Many of the veterans who had received military training in Arizona had fallen in love with the state and vowed to return after the war. The numbers within one year were staggering: in the fall semester of 1945, 553 students were enrolled; over the weekend semester break in January 1946, enrollment increased 110 percent to 1,163 students. Successive semesters saw continuing increased enrollment.

Like his predecessor, Dr. Gammage oversaw the construction of a number of buildings. His greatest dream, that of a great auditorium, came five years after his death. He laid the groundwork for it with Frank Lloyd Wright, who designed what is now the university’s hallmark building, Grady Gammage Memorial Auditorium, built in 1964.

**Years of Growth and Stature.** During the 1960s, with the presidency of Dr. G. Homer Durham, Arizona State University began its academic rise with the establishment of several new colleges (the College of Fine Arts, the College of Law, the College of Nursing, and the School of Social Work) and the reorganization of what became the College of Liberal Arts and Sciences and the College of Engineering and Applied Sciences. Perhaps most important, the university gained the authority to award the Doctor of Philosophy and other doctoral degrees.

The next three presidents—Harry K. Newburn, 1969–71, John W. Schwada, 1971–81, and J. Russell Nelson, 1981–

89—and Interim President Richard Peck, 1989, led the university to increased academic stature, expansion of the campuses, and rising enrollment. With approximately 49,000 students, ASU is the fourth largest university in the nation.

On January 1, 1990, Dr. Lattie F. Coor, a native Arizonan, became 15th in the institution's succession of principals and presidents. He has highlighted undergraduate education, research, cultural diversity, and economic development as the "four pillars" of the university's agenda. He has taken steps in these areas by further defining the role of ASU West and by initiating the establishment of ASU East.

In 1996, "The University for the Next Century" initiative, involving campus and community members, developed a set of general goals to guide the university at the turn of the millennium. By making selective investments in people, programs, and new practices, ASU will be a prototype of the major metropolitan research university of the future that is technologically sophisticated in linking its students, faculty, staff, and alumni to the larger issues of society.

**Research I Status.** ASU was named a Research I university by the Carnegie Foundation for the Advancement of Teaching in early 1994. Nationally, 88 universities have been granted this status, indicating successful garnering of support for research projects and educating future scientists.

### Athletics

The original nickname for the Normal School of Arizona athletic teams was the Owls. Athletics other than Sunday hikes and lawn tennis were not part of the early curriculum.

During President Matthews' tenure, some team competition began. The Tempe Bulldogs saw some interesting and rough competition with the University of Arizona Wildcats. In the 1940s, the college's teams became the Sun Devils.

In 1979, the university joined the Pacific-10 Conference. In 1987, ASU became the first Arizona football team to play in the Rose Bowl, defeating the University of Michigan Wolverines 22-15. ASU made its second appearance in 1997 against Ohio State.

In 1998 ASU finished 12th nationally in the Sears Directors' Cup, which recognizes the top athletic programs in the country. The women's golf team won its fifth NCAA championship in six years in 1998. Also in 1998, the ASU baseball team reached the College World Series Championship Game for the 10th time in its history.

### Graduate College

Graduate education at ASU began with the creation of the Graduate Division in 1937 and the establishment of the first master's program the same year. For the first 20 years, graduate education focused exclusively on professional programs in education. During the 1950s as the campus grew and broadened its mission, a number of new degree programs appeared, significantly enhancing the role of graduate studies on the campus. By the early 1960s, graduate programs were established in many disciplines; humanities, social science, and science fields were well represented, as were professional programs in business, engineering, fine arts, and public administration. With this expansion of the mission of the campus came new facilities and the development of a wider range of research interests and activities.

Major changes in the nature and role of graduate education came in the early 1960s when the first Ph.D. programs were established in chemistry, education, engineering, English, physics, and psychology. The research focus of

campus programs grew at a rapid pace. Master's programs matured as doctoral programs were added. From the late 1960s to the present, campus facilities for instruction, research, and advanced study significantly expanded to support university programs with the construction of new laboratories, classroom structures, and two large libraries—including a new main library and a separate science and engineering library.

### UNIVERSITY CAMPUSES AND SITES

**ASU Main.** ASU Main is located near the heart of metropolitan Phoenix in the city of Tempe (population 160,000). Nearby are the municipalities that make up the fast-growing Valley of the Sun: Chandler, Gilbert, Glendale, Mesa, Scottsdale, and other communities.

ASU Main comprises more than 700 acres and offers outstanding physical facilities to support the university's educational programs. Buildings are modern and attractively designed.

Broad pedestrian malls laid out in an easy-to-follow grid plan, bicycle lanes connecting all parts of the university, and spacious lawns and subtropical landscaping characterize a campus serving the physical, aesthetic, and educational needs of students, faculty, and staff.

**ASU East.** The university's third campus, ASU East, opened at the Williams Campus in the fall of 1996. Approximately 1,100 students are enrolled in degree programs offered by the College of Technology and Applied Sciences and Morrison School of Agribusiness and Resource Management, programs offered at no other Arizona campus. In 1997, East College was created to provide support courses for existing programs and to generate new degree programs at ASU East.

ASU East has joined with Chandler-Gilbert Community College (CGCC) in the New Partnership in Baccalaureate Education that allows students to graduate in four years with an ASU baccalaureate degree earned entirely at the Williams Campus, at some savings in tuition.

The campus includes excellent educational facilities and unique residential opportunities, including a choice of traditional residence halls or two- to five-bedroom homes.

ASU East is a student-centered campus that offers many of the features of a small college in a rural area while providing access to the resources of a major research university and the amenities of a large metropolitan area. A shuttle service provides transportation between ASU East and ASU Main. The 600-acre ASU East campus is easily accessible via major interstate routes. For more information, see "ASU East," page 375.

**ASU West.** ASU West is a campus of Arizona State University that offers upper-division undergraduate and graduate programs in the arts and sciences and in selected professional fields. It is located in northwest Phoenix to serve the higher educational needs of residents of western Maricopa County. As a comprehensive campus, the institution is developing a broad spectrum of professional and academic programs that share a liberal arts foundation and an interdisciplinary emphasis.

The campus is located between 43rd and 51st Avenues on West Thunderbird Road in Phoenix. Immediately west of the campus is the city of Glendale. The core campus was completed in March 1991 and includes the Fletcher Library,

the Sands Classroom Building, the Laboratory/Computer Classroom Building, the Faculty and Administration Building, Kiva Lecture Hall, and the University Center Building.

For more information, see "ASU West," page 384. For complete information and course listings, see the *ASU West 1999–2000 Catalog*.

**ASU Extended Campus.** The ASU Extended Campus ([www.asu.edu/xed](http://www.asu.edu/xed)) goes beyond the boundaries of the university's three physical campuses to provide access to academic credit and degree programs for working adults through flexible schedules; a vast network of off-campus sites; classes scheduled days, evenings, and weekends; plus innovative delivery technologies, including television, the Internet, and independent learning. The Extended Campus offers programs in partnership with the campuses and colleges of ASU, including a variety of professional continuing education programs. The ASU Downtown Center is the anchor location of the Extended Campus. Lifelong learning opportunities are offered to students of all ages throughout Maricopa County and the state of Arizona through the Extended Campus.

*ASU Downtown Center.* Located in downtown Phoenix, 502 E. Monroe, the ASU Downtown Center offers a variety of daytime and evening courses of interest to employees in private businesses and government agencies and to individuals seeking personal growth and enrichment. These courses are scheduled at a variety of convenient times and offered through various modes of delivery. In addition, computer technology classes are taught during daytime, evening, and weekend hours, and computer certificates are offered. Professional continuing education, certificate programs and lecture series are also available. Access to ASU library information and resources, the ASU mainframe, and the Internet is available through the center's computer lab.

**ASU Research Park.** The mission of the ASU Research Park ([www.asu.edu/researchpark](http://www.asu.edu/researchpark)) is to enhance Arizona's high value research-based economic development and to build the university's capacity to educate and advance knowledge. To this end, the Research Park serves to attract to Arizona new corporate and regional headquarters and research and development firms that broaden the base for potential research among ASU departments, interact with graduate students, consult with university faculty, cosponsor seminars on research topics, and provide employment opportunities for graduates of ASU.

The Research Park has major tenants, including ASM Lithography, CytecFiberite, Iridium North America, Motorola Flat Panel Display, Motorola University, National Association of Purchasing Management, PKS Information Services, VLSI, and Walgreens Healthcare Plus. There is also a 50,000-square-foot multitenant building developed by Transamerica Corporation, and the Lakeside Technology Center, a 44,000-square-foot multitenant building developed by Price-Elliott Research Park, Inc. The Research Park contributes to ASU's standing as a major research university.

**Camp Tontozona.** Located in the famed Mogollon Rim country near Kohl's Ranch, northeast of Payson, this continuing education facility of the university serves the needs of academic departments conducting teaching and research in mountain terrain. The camp is also available to faculty, staff, graduate students, and alumni for family use. For more information, call 480/965-6851.

**Deer Valley Rock Art Center.** Deer Valley Rock Art Center, located two miles west of the Black Canyon Freeway on Deer Valley Road, is operated by the ASU Department of Anthropology in consultation with the Hopi, Yavapai, and Gila River Indian tribes. It includes more than 1,500 petroglyphs that cover the eastern slope of Hedgpath Hills. For more information, call 480/582-8007.

**The Arboretum.** The Arboretum at Arizona State University is a flourishing oasis of plants from around the world. Dedicated on November 20, 1990, this virtual outdoor classroom includes 162 species/varieties of trees and 172 species/varieties of other woody ornamental and herbaceous plants from diverse geographic regions as well as the Sonoran Desert. It contains one of the best collections of palms and conifers in the desert Southwest and a growing collection of native Southwestern plants.

The Arboretum actually began with Arthur J. Matthews. By the time Matthews' 30-year reign as president was finished, nearly 1,500 trees of 57 varieties and more than 5,700 feet of hedges were planted. One of his most enduring landscape projects was the planting of Palm Walk in 1916, which extends from University Drive south to Orange Mall.

Several Arboretum walking tours are designated on campus, including the historic north campus tour, the green trail tour, and the red trail tour.

## UNIVERSITY LIBRARIES AND COLLECTIONS

The collections of the university's libraries comprise more than 3 million volumes, approximately 6.8 million microform units, and more than 36,000 periodical and serial subscriptions. Computer access to commercially and locally produced databases and the ability to borrow research materials from other libraries enhance local resources. ASU is a member of the Association of Research Libraries and the Center for Research Libraries.

For telephone numbers, see "Who to Contact at ASU Main," page 8.

**Charles Trumbull Hayden Library.** The Charles Trumbull Hayden Library, designed by Weaver and Drower in 1966, houses the largest multidisciplinary collection. In addition to the open stack areas, separate collections and service areas include Current Periodicals and Microforms; Government Documents; Interlibrary Loan and Document Delivery Services; Labriola National American Indian Data Center; Library Instruction, Systems, and Technology (L.I.S.T.); Reference; Reserve; Special Collections; and Archives and Manuscripts, which includes the Arizona Collection, the Chicano Research Collection, and the Visual Literacy Collection.

Specialized collections include comprehensive holdings of the Pre-Raphaelite period, a 14th-century manuscript on algebra, the child drama collection, the Thomas Mosher collection, the William S. Burroughs collection, and the papers of several major Arizona political figures.

**Architecture and Environmental Design Library.** The Architecture and Environmental Design Library, located in the College of Architecture and Environmental Design/ North building, contains books and periodicals pertinent to areas of study within the college. See "College Facilities," page 61, for more information.

**Arizona Historical Foundation Library.** Under a cooperative agreement with ASU, the Arizona Historical Foundation houses a library of several thousand volumes, manuscript collections, maps, and photographs, and a large collection of audio/visual materials. Housed in the Charles Trumbull Hayden Library, the collection's focus is on the history of Arizona and the Southwest.

**Fletcher Library.** Located at the ASU West campus, Fletcher Library utilizes a range of electronic systems, from compact discs to telecommunications networks, to provide access to resources and delivery of materials. Its holdings include more than 310,000 volumes, 3,000 serial subscriptions, and 1.4 million microfilms selected to complement ASU West course offerings.

**Law Library.** The John J. Ross-William C. Blakley Law Library is located on McAllister Avenue. See "Organization," page 60, for more information.

**Music Library.** A large collection of music scores, recordings, books, music reference materials, and listening facilities for individuals and groups are located on the third floor of the Music Building, West Wing.

**Daniel E. Noble Science and Engineering Library.** The Daniel E. Noble Science and Engineering Library houses books, journals, and microforms in the sciences and engineering, the Map Collection, and the U.S. Patent and Trademark Depository.

**University Archives.** The University Archives collection (1885–present) of university theses and dissertations, administrative records of the university, historical photographs and personal papers of faculty, staff, and alumni as well as student, faculty, and official university publications are available for use at the Luhrs Reading Room in Hayden Library. The historic University Archives Building on Tyler Mall is the home of the 1907 Gallery, which hosts exhibits of historical photographs from the collections of the Department of Archives and Manuscripts.

## PERFORMING AND FINE ARTS FACILITIES

**ASU Art Museum.** The ASU Art Museum serves students and scholars within and beyond the university and as a cultural resource for the Phoenix Metropolitan area. Additionally, the museum serves a public beyond the immediate area through traveling exhibitions and publications that not only document the exhibitions but also offer critical insight into the museum's areas of concentration.

Exhibitions, education programs, and publications are both interdisciplinary and educational and designed to engage viewers with art that is relevant to their lives. New technologies in the content of art and in the approaches to reaching new audiences are eagerly and openly adopted.

Collections and exhibitions focus on contemporary art, particularly new media and new methods of presentation; art by Latin American artists; art from the Southwest; prints, both historic and contemporary; and crafts, emphasizing American ceramics. The museum was founded by a gift of historic American paintings, which are on continuous display, including works by Gilbert Stuart, Albert Pinkham Ryder, Winslow Homer, Georgia O'Keeffe and Romare Bearden. The contemporary art holdings include works by Nam June Paik, Lorna Simpson, Vernon Fisher, Sue Coe,

and Enrique Chagoya. Exhibitions and collections are housed in galleries and study rooms in two facilities: the international award-winning Nelson Fine Arts Center and Matthews Center in the middle of campus.

Educational programs include artist residencies and dialogs with classes, student docent program, internships and research assistanceships, lectures and symposia, in-gallery materials, special curricula-based school programs, school and public tours. For information on upcoming exhibitions and programs, call 480/965-2787.

**Computing Commons Gallery.** One of the unique features of the Computing Commons building is an art gallery, located off the main lobby in the northwest corner of the building. The gallery has design features that are unique for showcasing technology-based artwork and displays. The Computing Commons gallery can support display of national online computer art networks (e.g., via Internet) and holographic displays, as well as more traditional two-dimensional graphic presentations. This is an exciting decade for the arts as new technology-based tools and techniques open new avenues for creativity, as demonstrated by the exhibits in the Computing Commons Gallery.

**Dance Studio Theatre.** Located in the Physical Education Building East, the Dance Studio Theatre is a 6,000-square-foot dance studio that also serves as a proscenium-style performance space. The 300-seat theatre is devoted to informal and formal showcases of student and faculty choreographic work.

**Drama City.** Housed in a 50-year-old former church, Drama City is the primary performance venue for the Institute for Studies in the Arts. The space is a black box, 60 by 30 feet with fixed lighting positions and flexible control stations. The area can seat up to 100 and is equipped for performance or installation pieces. The facility also houses a wide range of technology for performance and presentation including video projection, automated luminaires, and a unique computerized control system for integrated media usage.

**Gallery of Design.** Housed in the College of Architecture and Environmental Design, the Gallery of Design features traveling exhibitions on design and urban issues.

**Paul V. Galvin Playhouse.** Built to stage the largest productions of the ASU Theatre, the Paul V. Galvin Playhouse is a 496-seat proscenium-stage theatre set at the east end of the Nelson Fine Arts Center. The Department of Theatre's annual season of 12 to 15 plays also includes productions in the Lyceum and Prism theatres and the Fine Arts Center Studios.

**Grady Gammage Memorial Auditorium.** A versatile center for the performing arts designed by Frank Lloyd Wright and named for the late President Grady Gammage, Grady Gammage Memorial Auditorium seats 3,000 and has won wide acclaim for its design and acoustics. In addition to the great hall and related facilities—including the Aeolian-Skinner organ contributed by Hugh W. and Barbara V. Long—the building contains classrooms and workshops for the College of Fine Arts.

**The Intelligent Stage.** The Intelligent Stage is a production and performance facility designed to explore the possibilities of interactive stage performance. The facility includes a

sprung floor; 30 dimmers and a four channel sound system; a composer workstation; workstations for designing interactive MIDI performances; and a movement sensing, image-processing workstation. All are networked together for multi-machine performance and production. Resident artists and technologists provide design and logistical support for projects in the facility.

**Katzin Concert Hall.** Located in the new music building expansion, the Katzin Concert Hall seats 350 people. Primarily used for solo and chamber music recitals, the hall houses a nine-foot Hamburg concert Steinway piano. The acoustics are enhanced by the maple-paneled stage and the multifaceted walls and ceiling.

**Louise Lincoln Kerr Cultural Center.** Located in Scottsdale, the Louise Lincoln Kerr Cultural Center offers cultural events, especially in the performing arts, to the community.

**Lyceum Theatre.** A small but technically sophisticated 164-seat proscenium-theatre, the Lyceum Theatre is a theatre laboratory devoted to the work of student playwrights, directors, and actors.

**Music Theatre.** As part of the music complex, the Music Theatre, modeled after the Wagnerian Theatre in Bayreuth, Germany, rises five stories and seats an audience of 500. This theatre is the home of many opera and musical productions.

**J. Russell and Bonita Nelson Fine Arts Center.** Designed by Albuquerque architect Antoine Predock, the J. Russell and Bonita Nelson Fine Arts Center is a spectacular, 119,000-square-foot village-like aggregate of buildings that includes five galleries of the ASU Art Museum, the Paul V. Galvin Playhouse, the University Dance Laboratory, seven specialized theatre and dance studios, a video studio, and a variety of scenic outdoor features, including courtyards, fountains, pools, and a 50-by-100-foot projection wall designed for outdoor video.

**Northlight Gallery.** The Northlight Gallery is dedicated to museum-quality exhibitions of historical and contemporary photography. Located in Matthews Hall, it is open during the academic year.

**Organ Hall.** Located in the new music building expansion, the Organ Hall houses the Fritts Organ. This tracker-action pipe organ is designed to capture the qualities of baroque European organs. The hall is designed to complement the organ with a barrel-vaulted ceiling and wooden benches to seat 175 persons.

**Prism Theatre.** The Prism Theatre is an alternative black box space devoted to multiethnic, experimental works and second stage productions.

**Recital Hall.** Located on the fifth floor of the music building, the Recital Hall is an intimate 125-seat facility that opens onto a rooftop courtyard.

**Sundome Center for the Performing Arts.** As America's largest single-level theatre, the Sundome Center for the Performing Arts in Sun City West has 7,169 seats. The theatre is equipped with sophisticated and state-of-the-art lighting systems, and a single-span roof affords each seat a clear view. As one of Arizona's premier entertainment venues, the

Sundome provides a varied array of top entertainment from Las Vegas concerts to classical ballets to celebrity lectures.

**Television Station KAET.** KAET, Channel 8, is the university's PBS station. Studios of the award-winning station are located in the Stauffer Communication Arts Building. To operate 24 hours a day, KAET employs more than 50 ASU students and interns. To learn more about KAET-TV, visit its Web site at [www.kaet.asu.edu](http://www.kaet.asu.edu) or call 480/965-3506.

**University Dance Laboratory.** A flexible performance space within the Nelson Fine Arts Center, the University Dance Laboratory is designed specifically for experimental dance productions. Along with the Dance Studio Theatre in the Physical Education Building East, the University Dance Laboratory is used by the Department of Dance for experimental performances.

**Harry Wood Gallery.** Housed in the Art Building (ART 120), the Harry Wood Gallery provides temporary exhibitions of the visual arts during the academic year.

## COMPUTING FACILITIES AND SERVICES

Computers are fundamental tools for research, instruction, and learning in every college and department at ASU. The Information Technology (IT) department provides a variety of computing equipment and services available for use by students, faculty, and staff.

IT also provides programming, statistical, graphics, and other applications for microcomputers and mainframe computing systems. University-wide electronic mail and the library's online catalog are accessible through a high-speed communications network from many campus sites and offices, and off campus via a telephone connection. Communication with other research facilities is possible through the Internet.

A wide range of information on campus activities and related topics is available online. Faculty, staff, and students can access the ASU Web site at [www.asu.edu](http://www.asu.edu). This site contains information from various colleges, departments, and organizations; currently approved courses; the *Schedule of Classes*; the general and graduate catalogs; a phone and electronic mail directory; the athletic calendar of events; application forms; financial aid information; and much more.

IT provides several service centers, described below, for the ASU academic community.

**Computing Commons.** The Computing Commons building (CPCOM) opened at the beginning of the 1993 fall semester. Designed in 1990, the Computing Commons provides a "technology hub" that draws together students, faculty, and staff from all disciplines on campus in an environment which fosters maximum interaction. The building and its facilities have drawn national recognition and acclaim as a model facility for the support of instruction and research in a technology-based environment. The Computing Commons houses a 225-workstation computing site, nine electronic classrooms, a Visualization Center, the Customer Assistance Center, a computer store, and a technology-based art gallery.

**Computing Sites.** In addition to the Computing Commons computer site, there are four additional sites located on the ASU Main Campus. These sites are available for ASU faculty, staff, and students with an ASURITE user ID. Site con-

figurations and hours of operation vary. Refer to [www.asu.edu/it/fyi/student/compsite.html](http://www.asu.edu/it/fyi/student/compsite.html) for current information.

**Computer Accounts.** The Computer Accounts Office, located on the first floor of the Computing Commons in room 105, offers access to a wide variety of computer services. These services are available to all students, faculty and staff who need to use the computing systems for academic or administrative purposes. To use these services, you need a user ID and password. For information about obtaining a computer account refer to [www.asu.edu/it/fyi/start/accounts.html](http://www.asu.edu/it/fyi/start/accounts.html).

**Customer Assistance Center.** The Customer Assistance Center, located on the second floor of the Computing Commons in room 202, offers a library of reference manuals, computing periodicals, and other information concerning computing systems and software. Self-paced training is available for various software applications running DOS, Windows, Macintosh, Unix, or mainframe operating systems. The Customer Assistance Center also distributes communication, virus protection, and other site-license software as well as site-specific documentation in a “print on demand” environment. Print on demand is also available at [www.asu.edu/it/fyi/document](http://www.asu.edu/it/fyi/document).

**Help Desk/Consulting.** The Information Technology Help Desk provides ASU customers with centralized systems information and first-level assistance in resolving computing problems. Services are available through 480/965-6500, [www.asu.edu/helpdesk](http://www.asu.edu/helpdesk), and walk-in consulting at the Customer Assistance Center, CPCOM 202. The Help Desk assists with data recovery/repair, Web page AFS permissions and file/directories, communication, e-mail, and virus protection software, computing and equipment problem referral.

**Instructional Support.** Instruction Support ([is.asu.edu](http://is.asu.edu)) serves as a development center for the design and delivery of instruction utilizing technology. The Instruction Support Group is composed of interrelated units under which a wide range of talent and expertise is centrally available. Students, faculty, and researchers skilled in the areas of system design, graphics, interactive software, networked delivery, and digital video staff Instruction Support. The group facilitates the development of instruction within the realm of currently available technology and extends the potential to drive innovation and development. From this perspective, Instruction Support takes on the flavors of a research and development unit, a production group, a training facility, and an incubator for technological innovation.

The Instruction Support Group works in collaboration with faculty in the coordination of cross-disciplinary research and production projects relating to the integration of technology with education. Through partnerships with faculty and groups outside ASU, grant writing teams are able to leverage support that may not otherwise be attainable by a single academic unit or faculty member. Central to effective support service is the establishment of a partnership among the various support units within the university. Instruction Support coordinates the efforts of groups, which include the College of Extended Education, University Libraries, Disability Resources for Students, and the Office

of Research and Creative Activities, to provide faculty with a wide array of support services.

Instruction Support offers consultation sessions tailored toward enhancing the instructional use of technology by the university teaching community. Sessions range from an introduction to technology in education through advanced and customized approaches for instructors in specific programs.

**Instruction Support (IS) Lab.** The IS Lab provides an environment in which faculty may seek and receive one-on-one, guided or independent support for course development and delivery. Expert staff work closely with faculty to refine and develop their skill and confidence in the design and delivery of instruction through a variety of technology supported means, including synchronous and asynchronous learning. Located on the second floor of the Computing Commons, the IS Lab provides faculty, university professionals, and graduate students with a unique opportunity to integrate technology with instruction. The IS Lab sponsors workshops and demonstrations, and serves as a dynamic clearinghouse of information and referrals for effective integration of technology with education.

**Research Support.** Research Support ([www.asu.edu/it/irs/rs](http://www.asu.edu/it/irs/rs)) provides assistance to faculty, staff, and student researchers in both scientific and creative endeavors. Research Support encompasses both processing and operations. Processing involves consulting in the use of software tools and program coding directly related to projects or specific research. Operational activities support overall workflow of university computing facilities. Activities include consulting for computation, statistics, visualization, and geographical information system platforms in conjunction with software package installation/use, media conversion, and product evaluation.

A variety of computation facilities are provided in support of research and creative endeavors within the ASU community. Computing facilities range from individual workstations to SMP/MPP servers and mainframes. Extended computer capabilities are available through access to national computing centers.

**Geographic Information Systems (GIS) Lab and Visualization Center.** The GIS Lab and Visualization Center both seek to establish partnerships with faculty, staff, and students to acquire, create, and enhance research and creative endeavors through the effective use of Visualization and GIS technologies.

The Visualization Center is located on the second floor of the Computing Commons in room 235. The center offers faculty, staff, and graduate students hardware and application software resources and services for high-level graphics and visualization used in research. Researchers can receive assistance ranging from interactive viewing of scientific data to visualization from both the Liberal and the Performing Arts and other visually related endeavors. The Visualization Center serves as a focal point for developing technologies in software, hardware, and communications.

The GIS Lab staff assists researchers with hardware and software and data to facilitate the creation of geographic information systems for spatial analysis, query, and display. The lab supports research from various disciplines and provides additional resources to students who are enrolled in classes for GIS instruction. The GIS Lab, also located in

Computing Commons 235, serves as a focal point for GIS users to meet and share information and technical expertise.

## ALUMNI ASSOCIATION

Founded in 1894, the Alumni Association is a volunteer-led organization committed to serve and unite alumni for the purpose of advancing the interests of Arizona State University and its alumni. The association provides a variety of services for ASU alumni as well as a series of events scheduled around the country.

With more than 200,000 alumni living in every state and throughout the world, the association plays an important role as the university's primary support organization. Comprising more than 40 groups, the campus, college, club, and chapter organizations (4Cs) of the association provide opportunities for all alumni to stay involved with the part of ASU that interests them most.

Members of the ASU Alumni Association Board of Directors are elected each spring.

The association's professional staff is led by Executive Director Susan Clouse Dolbert.

For information about the association or its board of directors, call 1-800-ALUMNUS or 480/965-ALUM (2586).

## RESEARCH CENTERS, INSTITUTES, AND LABORATORIES

These units serve the university's mission in research. They are overseen by eight of the colleges, the vice provost for Research, and ASU East.

### College of Architecture and Environmental Design

**Herberger Center for Design Excellence.** The Herberger Center for Design Excellence serves the Phoenix area through research, publications, and symposia regarding urban design and environmental planning issues. For more information, call 480/965-6693.

### College of Business

**L. William Seidman Research Institute.** The mission of the L. William Seidman Research Institute is to encourage and support business research by serving as a public access point to the College of Business. Specific goals include transferring new knowledge to the public; supporting faculty and student research; encouraging the development of educational programs grounded in business research; and conducting high-quality, applied business research.

The institute encourages research activity by providing research support services to the faculty, staff, and students of the college. This includes facilitating grant preparation and assistance in grant administration. Its research centers act as the focal point for involving faculty and students in applied research on important issues identified by the business community.

The institute also serves an important role in the broader educational mission of the College of Business by disseminating the findings of research conducted by the faculty, students, and research center staff, as well as the results of business research from other sources around the world. This is accomplished through a variety of mechanisms: newsletters and research reports; seminars and conferences; internet Web pages; media interviews and press releases; and by

responding to inquiries from businesses, public officials, and the community.

For more information, contact the director, L. William Seidman Research Institute, BA 319, 480/965-5362. The institute's Web site is [www.cob.asu.edu/seid](http://www.cob.asu.edu/seid).

**Arizona Real Estate Center.** The Arizona Real Estate Center, established in 1980, serves a multifunction research and educational role to foster better understanding of the real estate sector of the Arizona economy. Housing, commercial real estate, and construction activity data for Arizona and Maricopa County are collected by the center and are utilized for a variety of ongoing projects, including the calculation of affordability indexes and the computation of housing appreciation figures for the metropolitan Phoenix area. The center's annual outlook series provides a public forum for prominent members of the real estate industry to present their perceptions of market conditions.

For more information, contact the director, Arizona Real Estate Center, BA 319, 480/965-5440. The center's Web site is [www.cob.asu.edu/seid/arec](http://www.cob.asu.edu/seid/arec).

**Bank One Economic Outlook Center.** The Bank One Economic Outlook Center (EOC), established in 1985, specializes in economic forecasts of Arizona and the Western states. The center publishes the *Bank One Arizona Blue Chip Economic Forecast* (monthly), *Greater Phoenix Blue Chip Economic Forecast* (quarterly), *Western Blue Chip Economic Forecast* (10 issues per year), and *Blue Chip Job Growth Update* (monthly), an update of current job growth in the United States. The center also publishes *Mexico Consensus Economic Forecast* (quarterly), a forecast and historical data on the Mexican economy.

For more information, contact the director, Bank One Economic Outlook Center, BA 319, 480/965-5543. The center's Web site is [www.cob.asu.edu/seid/eoc](http://www.cob.asu.edu/seid/eoc).

**Center for the Advancement of Small Business.** The Center for the Advancement of Small Business (CASB) is the 21st-century leader in business education, practice, and research that provides high-quality, relevant programs, and information services focused on small business since 1994. The center enables students and existing small and medium-sized businesses to participate, contribute, and compete in the global economy.

The center provides students from all disciplines with programs and resources that prepare them for positions of leadership in small and medium-size businesses, and aids small and medium-size businesses in the continuous improvement of their human resources and business practices. CASB also engages in applied research on entrepreneurship and the emerging changes and trends in small business.

For more information, contact the director, Center for the Advancement of Small Business, BAC 111, 480/965-3962. The center's Web site is [www.cob.asu.edu/seid/casb](http://www.cob.asu.edu/seid/casb).

**Center for Advanced Purchasing Studies.** The Center for Advanced Purchasing Studies (CAPS) was established in November 1986 by a national affiliation agreement between the ASU College of Business and the National Association of Purchasing Management (NAPM). It is the first and only program of its kind in the nation and is located in the Arizona State University Research Park, about eight miles south of the main ASU campus. CAPS conducts in-depth



research into the problems facing the purchasing profession today and, through its studies, seeks to improve purchasing effectiveness and efficiency and the overall state of purchasing readiness.

For more information, call 480/752-2277, or contact

DIRECTOR, CENTER FOR ADVANCED  
PURCHASING STUDIES  
ASU RESEARCH PARK  
2055 E CENTENNIAL CIRCLE  
PO BOX 22160  
TEMPE AZ 85285-2160

**Center for Business Research.** The Center for Business Research (CBR) has been a consistent source of information on the Arizona and metropolitan Phoenix economies since 1951. Both the business community and the public have had access to the economic indicators produced by the ongoing projects of the center, including quarterly net migration estimates for Arizona and Maricopa County, and the Metropolitan Phoenix Consumer Price Index. The center also conducts projects under the sponsorship of private and public agencies. Recent examples include: the economic impact of Super Bowl XXX, a study of seasonal migration to Arizona, and an analysis of the state's hospital industry. A monthly publication of the center, *AZB/Arizona Business*, plays a major role in disseminating to the public the economic information compiled by the research centers of the Seidman Institute. The staff within the center is available to respond to inquiries and to provide available data.

For more information, contact the director, Center for Business Research, BA 319, 480/965-3961. The center's Web site is [www.cob.asu.edu/seid/cbr](http://www.cob.asu.edu/seid/cbr).

**Center for Services Marketing and Management.** The Center for Services Marketing and Management (SMM Center) is a leading university-based hub devoted to the study of services marketing and management since 1985. The SMM Center addresses how any company can improve internal service processes and use service and customer satisfaction as a competitive advantage. The center is cross-industry in nature, encouraging firms to share the best ideas and practices for adaptation across industries. Though grounded in marketing, the center's work is also cross-functional, integrating concepts and techniques from marketing, operations, human resources, and management.

The center's areas of expertise include customer retention and loyalty; service quality; service delivery; professional services such as healthcare, accounting and consulting services; customer satisfaction; services strategy; service culture; and service recovery. A leader in the business and academic communities, the SMM Center's work advances the knowledge base in the field and provides applicable frameworks, concepts, and tools.

The center offers its partner firms top flight executive education in services through the annual "Activating Your Firm's Service Culture" symposium, the annual "Services Marketing and Management" institute, and the annual "Information Technology Services Marketing" course, and provides customized executive education programs and research projects which are tailored to and conducted for charter member firms.

The center also actively supports the College of Business' M.B.A. program that offers a certification in Services Marketing and Management. The services track infuses strong

company-based experience and encourages summer internships.

For more information, contact the director, Center for Services Marketing and Management, BAC 440, 480/965-6201.

**Center for the Study of Finance.** The Center for the Study of Finance (CSF), established in 1986, serves the national financial, policy-making, and academic communities through research, publications, conferences, and educational programs. The focus of such activities is on the changing nature of the domestic and international financial system with such specific areas as the interaction between financial markets, deposit insurance reform, the deregulation of financial institutions, the financing of mergers and acquisitions, and the effect of government policy on financial markets receiving recent attention.

For more information, contact the director, Center for the Study of Finance, BAC 519, 480/965-5229.

**Joan and David Lincoln Center for Applied Ethics.** The Joan and David Lincoln Center for Applied Ethics (LCAE) has provided training and sponsored research in applied ethics for organizations since 1980. The center's research focuses on the connection between valued-based businesses and their financial performance. Its study of companies with 100 years of consistent dividend payments has been reported in *The Wall Street Journal* and numerous academic and professional journals.

The center sponsors an annual conference on organizational ethics as well as on ethics for lawyers beyond the profession's code and model rules. Examples of topics covered in the center's published research reports include lawyers and ethics, ethics and international labor practices, the rogue employee and ethics in organizations, and ethics and cultural variances in international business.

Each year the center recognizes an outstanding business leader for exemplary ethical standards. Recipients of the Lincoln Center award in the past have been Lewis W. Lehr of 3M, the center's first recipient; Sir Adrian Cadbury of Cadbury Schweppes; Robert W. Galvin of Motorola; James Houghton of Corning Glass Works; R. William Taylor of the American Society of Association Executives; Jerry Junkins of Texas Instruments; Bowen McCoy of Buzz McCoy Associates, Inc.; and Aaron Feuerstein of Malden Mills Industries, Inc.

For more information, contact the director, Joan and David Lincoln Center for Applied Ethics, BA 352B, 480/965-2710.

**Manufacturing Institute.** See "Manufacturing Institute," page 37, for information about this joint venture of the College of Business and the College of Engineering and Applied Sciences.

### College of Education

**Center for Bilingual Education and Research.** The Center for Bilingual Education and Research (CBER) was created in 1980 to conduct policy-relevant research in bilingual and dual-language education. The center's scope of work is driven by a need to merge several related topics into a single articulated conversation: English/Spanish biliteracy; promoting the role of public education to strengthen communities; and enabling binational collaboration among educators on both sides of the U.S.-Mexico border. The long-term

vision is to help develop a new pedagogy tailored to the needs of the bicultural region the center serves. The integration of these themes shapes the scope of work for CBER in these areas:

1. Within the broad scope of educational policy research, CBER focuses on scholarly inquiry that contributes to informed and enlightened discourse on language policy for schools and society, especially on the harmonious coexistence of English, the national language; and Spanish, the second most used language in our society.
2. Life in the American Southwest is bicultural and increasingly binational. In this Pan-American context, bilingualism will gain in importance. Equally important will be the collective ability of residents on both sides of the border to work harmoniously in pursuit of a common destiny that will be ever more intertwined. Schools must help children and youth develop skills and predispositions to face this challenge.
3. Mexico and the U.S. are becoming more interdependent. In this context, Mexican educators should have opportunities to contribute to improving education for Mexican immigrant children in U.S. schools. To enable this, schools must create pilot projects and a collaborative infrastructure for collaboration among institutions and individuals on both sides of the U.S.-Mexico border.

For more information, contact the director, Center for Bilingual Education and Research, ED 414, 480/965-7134.

**Center for Indian Education.** The Center for Indian Education is an interdisciplinary research and service center established in 1959. It promotes studies in American Indian policy and administration that contribute to scholarship and effective practices in education, professional training, and tribal capacity building. It is structured to foster relations between the university and sovereign tribes, and to provide training and technical assistance for community programs. The center publishes the *Journal of American Indian Education* and sponsors workshops and colloquia that bring together scholars and tribal community leaders.

The center provides leadership through a group of American Indian faculty and is organized on the basis of scholarly expertise of the faculty. In addition to College of Education faculty, responsibilities are shared by faculty from the School of Social Work, the School of Justice Studies, the College of Liberal Arts and Sciences, and the College of Law. Areas currently studied include administrative leadership, policy analysis, bilingual education, health and welfare policy, justice studies, and program development in professional studies.

For more information, contact the director, Center for Indian Education, ED 415, 480/965-6292.

### College of Engineering and Applied Sciences

**Center for Innovation in Engineering Education (CIEE).** This center, established in September 1994, promotes and encourages visionary approaches to educating engineering students. The center seeks support for the research, development, and assessment of new educational paradigms, unique curricula, improved courses, and new delivery systems that embrace a range of learning models,

alternative classroom management strategies, improved pedagogies, and advanced educational technologies. The center also develops and offers workshops and seminars to encourage wide-scale implementation of those approaches that are shown to be effective in developing the attributes that will be needed by graduates.

The vision of the center is that its programs will (1) create and continuously improve educational systems that will develop in graduates the skills, knowledge, and attitudes required for them to quickly and effectively become world-class engineers; and (2) develop an expanding team of scholars that desires to actively explore new and improved educational theories, methods, and technologies to improve teaching and learning.

For more information, contact the CIEE director, ECG 205, 480/965-5350, or access the center's Web site at [www.eas.asu.edu/~asufc/ciee](http://www.eas.asu.edu/~asufc/ciee).

**Center for Research in Engineering and Applied Sciences.** The Center for Research in Engineering and Applied Sciences supports the faculty and students in the knowledge creation and discovery mission of the university. The center provides research support services for all research in the college as well as interfacing with the research offices of the university and other colleges. The center area also supports the contribution of the college to the state's economic development through collaborative research partnerships with and technology transfer to industry. Specialized and interdisciplinary efforts are currently in place in such areas as acoustics, air pollution, alternative energy, applied mechanics, artificial intelligence, automated manufacturing, bioengineering, communications, computational microelectronics, computer-aided design and manufacturing (CAD/CAM), computer-integrated manufacturing (CIM), computer science, control systems, data and information systems, electrical characterization, environmental resources and control, expert systems, fluid mechanics, fuels and combustion, materials, mass transfer, metallurgy, nuclear radiation, photovoltaics, plasma, plastics, power systems, analyses, robotics, semiconductor materials and fabrication, semiconductor processing, signal processing, soil mechanics, solar thermal energy, solid-state electronics and systems design and analysis, telecommunications, thermodynamics, transportation systems, turbines, very-large-scale integrated (VLSI) circuits, waste management, and water resources.

For more information, contact the director, Center for Research in Engineering and Applied Sciences, ECG 136, 480/965-1725, or access the center's Web site at [www.eas.asu.edu/research](http://www.eas.asu.edu/research).

**Center for Low Power Electronics.** The technical areas of focus include

1. basic materials, alternative materials, and their fabrication;
2. device design optimization;
3. design of digital, analog, and hybrid low power circuits; and
4. power-based physical design for single- and multi-chip VLSI systems.

For more information, contact the director, Center for Low Power Electronics, ENGR 115, 480/965-3708.

**Center for Solid-State Electronics Research.** CSSER focuses on research in the areas of semiconductors crystal

growth, both by bulk and epitaxial techniques; device characterization and modeling; defect behavior in semiconductor material characterization; processing; fine line lithography; surface analysis; and transport. Major programs address semiconductor device modeling, transport theory, optoelectronics, ferroelectrics, semiconductor processing, microwave devices, and ultra-submicron devices. New programs address synthetic neural systems and their impact on VLSI design. Research in the specially designed facilities includes various aspects of submicron dimension devices.

For more information, contact the director, Center for Solid-State Electronics Research, ENGR 115, 480/965-3708 or access the center's Web site at [ceaspub.eas.asu.edu/csser](http://ceaspub.eas.asu.edu/csser).

**Manufacturing Institute.** The Manufacturing Institute is a joint venture of the College of Business and the College of Engineering and Applied Sciences, established to enhance manufacturing research and industrial collaboration at the interface between the two colleges. The mission of the institute involves integrating aspects of manufacturing in both the business and engineering areas, helping to fulfill the university's goal of becoming one of the leading educational and research institutions in both manufacturing enterprise and manufacturing process technology issues. The institute has two academic codirectors, one each from the College of Business and the College of Engineering and Applied Sciences, and has active industry involvement.

For more information, contact one of the directors, Manufacturing Institute, GWC 402, 480/965-3709, or access the institute's Web site at [mi.asu.edu/mi](http://mi.asu.edu/mi).

**Center for System Science and Engineering Research.** The Center for System Science and Engineering Research has established four focus areas: nonlinear dynamical systems, control theory and its applications, mathematical neuroscience, and scientific computing and interdisciplinary systems engineering. The center is jointly sponsored by the College of Engineering and Applied Sciences and the College of Liberal Arts and Sciences. Its main goals are the creation and enhancement of interdisciplinary and cooperative research, graduate education, and public service programs in the areas of systems science, applied mathematics and computation.

For more information, contact the SSERC director, GWC 606, 480/965-8382, or visit the center's Web site at [www.eas.asu.edu/sserc](http://www.eas.asu.edu/sserc).

**Telecommunications Research Center.** Telecommunications play a vital role in home, commercial, entertainment, educational, scientific, and military systems. The Telecommunications Research Center focuses its interests and activities in research and educational programs. The approach is to conduct basic and applied research, develop technologies, and provide education programs in all major areas of telecommunications, from signal generation to reception. The targeted areas of excellence are antennas, propagation, and scattering; microwave circuits, devices, and measurements; optical communications; signal processing; broadband switching; and communication systems. Ultramodern laboratories and computational facilities are associated with the center.

For more information, contact the director, Telecommunications Research Center, GWC 411, 480/965-5311.

## College of Fine Arts

**Institute for Studies in the Arts.** As the research center for the College of Fine Arts, the Institute for Studies in the Arts (ISA) serves as a laboratory for the research and development of new art forms, new ideas and concepts, and innovative technologies for artistic expression; a network for communication among creative scholars both within and outside the arts; and a resource base for the documentation, evaluation, and dissemination of research in the arts. ISA addresses the needs of a variety of populations through technical and monetary support and sponsorship of research projects, performances, exhibitions, and symposia.

ISA facilities include an experimental performance studio at Drama City and a state-of-the-art video production and post-production laboratory in Matthews Center. ISA maintains a database of interdisciplinary scholarship in the arts and actively seeks to communicate with researchers from diverse backgrounds in the ASU community and worldwide.

ISA is open to a wide range of research proposals from both faculty and graduate students, provided such proposals address the ISA mission of experimentation and innovation in the arts.

For information, contact the director, Institute for Studies in the Arts, MCENT 224, 480/965-9438, or visit ISA's Web site at [researchnet.vprc.asu.edu/isa](http://researchnet.vprc.asu.edu/isa).

## College of Law

**Center for the Study of Law, Science, and Technology.** Located in the College of Law, the center conducts research, edits *Jurimetrics: The Journal of Law, Science and Technology* in cooperation with the American Bar Association Section on Science and Technology, and sponsors seminars, workshops, and conferences. Through these activities, the center seeks to contribute to the formulation and improvement of law and public policy affecting science and technology and to the wise application of science and technology in the legal system. Current areas of research include communications and telecommunications law, computer-related law, forensic science and statistics, legal issues and biotechnology, law and medicine, and law and social science.

For more information, contact the director, Center for the Study of Law, Science, and Technology, LAW 102, 480/965-2124.

## College of Liberal Arts and Sciences

**Arizona Center for Medieval and Renaissance Studies (ACMRS).** The Arizona Center is a research unit serving affiliate scholars from ASU, Northern Arizona University, and the University of Arizona. It represents a variety of disciplines including history, literature, philosophy, religion, language, music, art, and science. ACMRS enriches academic offerings in medieval and renaissance studies by sponsoring one or two visiting professors each year. Graduate research assistantships are also available through the center.

Significant opportunities for the study of the Middle Ages and the Renaissance exist at ASU. Hayden Library has an extensive microfilm collection and many rare books in medieval and renaissance studies. ACMRS also sponsors a lecture series each semester covering a variety of topics.

Other programs include an annual conference, a public symposium, a summer study abroad program at University of Cambridge (United Kingdom), and student exchange

programs with the University of Copenhagen (Denmark) and the University of Kalmar (Sweden).

Since 1996, ACMRS has published *Medieval & Renaissance Texts & Studies (MRTS)*, a major series of editions, translations, and reference works. In collaboration with the University of Massachusetts at Dartmouth and the Medieval and Renaissance Committee of the University of Michigan, ACMRS sponsors and coedits *Mediterranean Studies*, an annual interdisciplinary journal publishing articles on all aspects of the Mediterranean region. ACMRS also sponsors a book series titled "Arizona Studies in the Middle Ages and the Renaissance," published by Brepols (Belgium).

ACMRS also partners with the Renaissance Society of America and the University of Toronto in "Iter," a massive, retrospective, online medieval and renaissance bibliography covering all languages and disciplines, and is the official site of the Medieval Academy of America's online data project offering information on medieval centers, programs, committees, and regional associations in North America.

For more information, contact the director, Arizona Center for Medieval and Renaissance Studies, SS 224, 480/965-5900, or access the Web site at [www.asu.edu/clas/acmrs](http://www.asu.edu/clas/acmrs).

**Cancer Research Institute.** Significant advances in the treatment of human cancer and other serious medical problems depend upon scientists well trained in organic chemistry, biochemistry, and biology. The Cancer Research Institute provides graduate students with the specialized training necessary for research in the discovery and development of effective anticancer drugs. Among various activities, laboratory personnel are pursuing a unique program concerned with isolation, structural identification, and synthesis of naturally occurring anticancer agents from marine animals, plants, and marine microorganisms.

For more information, contact the director, Cancer Research Institute, CRI 209, 480/965-3351.

**Center for Asian Studies.** Through its East Asian and Southeast Asian studies programs, the center serves as research coordinator for Asian studies' faculty and graduate students in a variety of disciplines. The center sponsors colloquia and research conferences. It also publishes two scholarly *Monograph Series* and a newsletter on Southeast Asian studies, *Suvannabhumi*, which have an international readership. Graduate students may apply for research assistantships in the center and its program.

The center administers student exchange programs with a number of universities in Asia. The center also sponsors a graduate student colloquium and film series on Asian topics. A reading room is located in the center office suite offering a variety of Asian and English language publications and newspapers from and about Asia.

For more information, contact the director, Center for Asian Studies, WHALL 105, 480/965-7184.

**Center for Meteorite Studies.** One of the nation's largest collections of extraterrestrial materials is available for research in the Center for Meteorite Studies. Teaching and research on meteorites, meteorite craters, and related areas of space and planetary science are accomplished through the regular academic units in cooperation with the center.

For more information, contact the director, Center for Meteorite Studies, PS C151, 480/965-6511.

**Center for Solid-State Science.** The Center for Solid-State Science is a research unit within the College of Liberal Arts and Sciences.

The membership comprises faculty and academic professional researchers and research support personnel, most of whom hold simultaneous appointments in affiliated academic units. The Center for Solid-State Science is the ASU focal point for interdisciplinary research on the properties and structures of condensed phases of matter at the interfaces between solid-state chemistry and physics, earth and planetary science, and materials science and engineering. It also supports interdisciplinary approaches to science and engineering educational outreach activities.

The center provides an administrative home for large, multidisciplinary, block-funded research projects. These include the NSF-supported Materials Research Science and Engineering Center (MRSEC) and the Interactive Nano-Visualization for Science and Engineering Education (IN-VSEE) project. To support these activities, members of the center operate modern and sophisticated research facilities and organize regular research colloquia and symposia.

Principal topical areas of research in the center include studies of structure and reactivity of surfaces and interfaces, electronic materials, advanced ceramics and glasses, synthesis of new materials, high pressure research, development of techniques in high resolution electron microscopy and micro-structural and chemical analysis, development of visualization techniques at different scales of magnification for science education and community outreach.

The research facilities of the center include

- A. **The Center for High Resolution Electron Microscopy (CHREM)**, which operates several ultra high resolution and ultra high vacuum electron microscopes and supports microscopy methods, and instrumentation development, including holography, position- and time-resolved nano-spectroscopy and energy-filtered imaging and diffraction. The center provides high-resolution capability for a large external group from other universities and industry.
- B. **The Goldwater Materials Science Laboratories (GMSL)**. These facilities include
  1. the Materials Preparation Facility (MPF), which provides a wide range of synthesis and processing capabilities for preparation of specimen materials. MPF also provides thermal analysis for study of solid-state reactions and Auger and X-ray photoelectron spectroscopy for analysis of surface compositions and electronic structure of surfaces;
  2. the Materials Science Electron Microscopy Laboratory (MSEML), which provides state-of-the-art electron microscopes for analysis of microstructures, including imaging and diffraction, and high spatial resolution chemical analysis using energy dispersive X-ray and electron energy loss microspectroscopy;
  3. the Ion Beam Analysis of Materials (IBeAM) facility, which provides compositional and structural determination of the surface and near-surface regions (0–2mm) of solids by ion beam analysis where elemental composition and depth distribution information are needed. Channeling experiments

- are used to determine crystal perfection and site occupancy;
4. the Secondary Ion Mass Spectrometry (SIMS) laboratory, which provides depth profile and point composition analysis with very high chemical sensitivity, on the order of one part per billion, including isotopic analysis for many materials. SIMS is also used as a chemical microscope, to image elemental distributions on specimen surfaces;
  5. the Scanning Probe Microscopy Laboratory (SPM), which provides facilities for nanoscale viewing of solid surfaces using scanning tunneling microscopy (STM), atomic force microscopy (AFM) and related techniques. The SPM laboratory serves as a focus for undergraduate research training programs, and educational and outreach activities;
  6. the High Pressure Laboratory (HiPLAB), which provides facilities for synthesis of new materials and for geochemistry/geophysics studies at up to 25 Gpa (250,000 atmospheres) and temperatures greater than 2000° C. These facilities are complemented by diamond anvil cells capable of in situ studies at up to one million atmospheres. This laboratory provides a focus for core research projects within the MRSEC;
  7. the Visualization Facility (VF), which consists of a battery of linked workstations for remote operation of instruments and data collection, capture of images in real time, and advanced computing and simulation of materials. The VF is used in research and in undergraduate and graduate education, as well as in educational and community outreach; and
  8. other specialized laboratories under development include high resolution X-ray diffraction for thin film characterization, optical spectroscopy, and nuclear magnetic resonance spectroscopy for solid-state studies and research on materials under extreme conditions.

These facilities provide the primary teaching and research resources used by students in the Science and Engineering of Materials interdisciplinary Ph.D. program and the undergraduate option for Materials Synthesis and Processing. They are also used extensively by students in disciplinary programs from affiliated departments.

For more information, contact the Director, Center for Solid-State Science, PS A213, 480/965-4544.

**Center for the Study of Early Events in Photosynthesis.** This center, located in the College of Liberal Arts and Sciences, was established at ASU in 1988 as part of the USDA/DOE/NSF Plant Science Centers Program. The center serves as an infrastructure supporting ASU scientists who study photosynthesis using a variety of methods and approaches, ranging from molecular biology and biochemistry to organic chemistry, ultrafast laser spectroscopy, X-ray crystallography, and theoretical chemistry. It is designed to enhance undergraduate, graduate, and postdoctoral education through multidisciplinary cooperative research projects.

The ultimate objective of the research is the elucidation of the basic principles governing the biochemical and biophysical processes of photosynthetic energy storage. This

goal is being realized via investigation of the early events of photosynthesis, including: light absorption and excitation transfer in photosynthetic antennas; the mechanism of primary photochemistry in plant and bacterial systems; secondary electron transfer processes; structure and assembly of photosynthetic antennas, reaction centers, and electron transfer proteins; pigment-protein interactions; artificial and biomimetic photosynthetic solar energy conversion systems; and mechanisms of biological electron transfer reactions.

The center is equipped with state-of-the-art instrumentation which allows students to do frontier research in a broad range of disciplines. Equipment includes a variety of pulsed lasers for measurements with time resolution ranging from sub-picoseconds to seconds; a 500 MHz NMR instrument; an EPR spectrometer; a protein X-ray facility; spectrophotometers; fluorometers; a protein sequencer; and an amino acid analyzer.

The center sponsors a weekly Photosynthesis Seminar Series and brings in visiting scientists from around the world to carry out collaborative research. Undergraduate, graduate and postdoctoral training programs in the Department of Chemistry and Biochemistry and the Department of Plant Biology are central components of the activities of the center.

For more information, contact the director, Center for the Study of Early Events in Photosynthesis, PS D207, 480/965-1963.

**Exercise and Sport Research Institute.** The Exercise and Sport Research Institute (ESRI) is an interdisciplinary research unit located in the Department of Exercise Science and Physical Education and serves, in part, as a research facility for the interdisciplinary doctoral program in exercise science.

The major research areas can be described as follows. *Biomechanics* applies the laws of physics to the study of human movement. It examines internal and external forces applied to the human body and the effects these forces have on the body. *Exercise physiology* studies the acute responses of the body to exercise and its chronic adaptations to training. It also studies the interrelationships among physical activity, performance, and health. *Exercise biochemistry* studies the provision and regulation of energy transfer during and after exercise. *Exercise endocrinology* studies interrelationships of exercise and training with stress, hormones, neurotransmitters, and the immune system. *Motor behavior and sport psychology* study human behavior in motor activity and sport settings. *Motor behavior* includes the subdomains of *motor learning, control, and development*. Motor learning focuses on skill acquisition, motor control studies how movement is regulated and controlled via the nervous system in normal and pathological populations, and motor development studies how growth and maturation affect performance and learning across the lifespan. Within the context of sport and exercise, *sport psychology* examines the influence of psychological variables on performance or health and the influence of participation on psychological phenomena.

The ESRI is affiliated with a number of medical institutions in the Phoenix area.

Faculty and graduate students at the ESRI are investigating a wide range of topics concerning human physical activity, including different ages, levels of health, levels of ability and fitness, and environments; and levels and types of train-

ing, body composition, nutrition, and physical and emotional stresses. Where applicable, these aspects are studied using an interdisciplinary approach.

For more information, contact the director, Exercise and Sport Research Institute, PEBE 159, 480/965-7473.

**Hispanic Research Center.** The Hispanic Research Center (HRC) at ASU is an interdisciplinary unit, dedicated to research and creative activities, that is university-wide but administered through the College of Liberal Arts and Sciences. The HRC performs basic and applied research on a broad range of topics related to Hispanic populations, disseminates research findings to the academic community and the public, engages in creative activities and makes them available generally, and provides public service in areas of importance to Hispanics.

Faculty, staff, and advanced graduate students organize into working groups to develop a broad range of specific projects and lines of inquiry within the general categories of Hispanic entrepreneurship, science and technology, information and data compilation and dissemination, the Hispanic polity, and the arts. Ongoing activities of the HRC, primarily funded by external grants, include the Arizona Hispanic Business Survey, the *Bilingual Review Press*, the Coalition to Increase Minority Degrees, the Community Art and Research Outreach (CARO), *Compañeros en la Salud*, Project 1000, and the Western Alliance to Expand Student Opportunities.

CARO sponsors creative activities and action research in collaboration with community-based organizations and ASU faculty.

For more information, contact the director, Hispanic Research Center, CFS 104, 480/965-3990.

**Institute of Human Origins.** The Institute of Human Origins (IHO), founded in 1981 by Donald Johanson, became part of the College of Liberal Arts and Sciences in 1997. IHO is a multidisciplinary research organization dedicated to the recovery and analysis of the fossil evidence for human evolution and the establishment of a chronological framework for human evolutionary events. IHO's scientists carry out field research at sites in Africa, the Middle East, and Asia. IHO houses the largest collection of *Australopithecus afarensis* casts (including "Lucy," a 3.2 million-year-old human ancestor) in the world as well as an extensive collection of other fossil hominid casts. IHO's library contains more than 3,000 volumes, numerous journals, videotapes, audiotapes, and slides related to human evolution and fossil sites. IHO produces periodic newsletters, offers lecture series, conducts tours and workshops, and supports numerous informal science education outreach projects.

For more information, visit the Institute of Human Origins, SS 103, or call 480/727-6580 or access the Web site at [www.asu.edu/clas/iho](http://www.asu.edu/clas/iho).

**Latin American Studies Center.** Arizona maintains an ever-growing interest in Latin America that draws upon an extensive experience of historical and geographical ties. The Latin American Studies Center is the focal point for these interests at ASU. Through its program, the center serves the university community and maintains strong ties with various Latin American organizations in the state and the nation. Principal activities are coordinating Latin American studies at the undergraduate and graduate levels; sponsoring student exchange programs, organizing events featuring

Latin American arts and culture, numerous seminars, and research conferences; publishing a wide range of professional materials; and undertaking and facilitating research about the region.

The center administers student exchange programs with the Catholic University of Bolivia and three Mexican universities—the Autonomous University of Guadalajara, the Autonomous University of Nuevo Leon, and the University of Sonora. Each spring several ASU students are selected to attend courses at the Latin American universities while Bolivian and Mexican students attend ASU.

The center is a member of the American Modern Language Association, Consortium of U.S. Research Programs for Mexico, Consortium for Latin American Studies Association, Pacific Coast Council on Latin American Studies, Rocky Mountain Council for Latin American Studies, Consortium of Latin American Studies Programs, and Conference on Latin American History.

The center directly encourages research, not only through its research conferences, but also through close coordination with the Latin American collection of Hayden Library and networking with Latin American universities.

For more information, contact the director, Latin American Studies Center, SS 213, 480/965-5127.

## College of Public Programs

**Morrison Institute for Public Policy.** Established in 1981 by the Morrison family of Gilbert, Arizona, as a unit within the School of Public Affairs, the Institute conducts research on public policy matters, informs policy makers and the public about issues of importance, and advises leaders on choices and actions. Morrison Institute offers a variety of services to public and private sector clients and pursues its own research agenda. Services include policy research, program evaluation, and public outreach. The institute's interests, research, and publications span such areas as education, urban growth, human services, workforce development, economic development, and arts and culture.

For more information, call 480/965-4525, visit the Web site at [www.asu.edu/copp/morrison](http://www.asu.edu/copp/morrison), or write

MORRISON INSTITUTE FOR PUBLIC POLICY  
ARIZONA STATE UNIVERSITY  
PO BOX 874405  
TEMPE AZ 85287-4405

## Vice Provost for Research

**Center for Environmental Studies.** Established in 1974, the primary mission of the center is to facilitate collaborations among faculty researchers and to aid decision making about environmental issues. Through its collaborations, both with ASU faculty and partners from government, business, and the educational community, the center advances the identification of key local and global environmental issues and collects reliable information to be used by scholars, policy makers, and the general public.

The center is also home to the Central Arizona–Phoenix Long-Term Ecological Research (CAP LTER) project, only one of two urban sites in the NSF-funded LTER network. The CAP LTER project focuses on an arid-land ecosystem profoundly influenced, even defined, by the presence and activities of humans, and involves over 50 associated faculty from biology, ecology, engineering, geography, geology, sociology, urban planning, and anthropology.

The center also facilitates applied environmental research projects undertaken by the Southwest Center for Environmental Research and Policy (SCERP), a consortium of five U.S. and four Mexican universities. SCERP develops a research agenda for the study of air and water quality, hazardous waste problems, environmental health issues and growth management questions in the border region.

The center manages the Sierra Ancha Research Station, located at an elevation of 5,000 feet in the desert-pine forest transition. The station offers research potential in biology, geology, anthropology, physical geography, and resource management. Research space and living accommodations are also available for academic, research, and community organizations. For more information, contact the director, Center for Environmental Studies, Tempe Center (Univer-

sity and Mill), 480/965-2975 or visit the center's Web site at [www.asu.edu/ces](http://www.asu.edu/ces).

### ASU East

**Center for Agribusiness Policy Studies.** The Center for Agribusiness Policy Studies carries out research and development relating to agribusiness, rural development, multiple use of scarce resources, and public policy. The center addresses regional, national, and international development in the context of global and competitive markets for agricultural products and inputs. For more information, contact the director of the Center for Agribusiness Policy Studies at 480/727-1583.



Noble Science and Engineering Library

Dave Tevis photo

# Fees, Deposits, and Other Charges

The Arizona Board of Regents reserves the right to change fees and charges without notice. The current semester *Schedule of Classes* generally reflects up-to-date fee amounts.

The following fees apply to both credit and noncredit (audit) registrations and are subject to change.

## DEFINITIONS

*Resident tuition* refers to the charge assessed to all resident students who register for classes at ASU. *Nonresident tuition* refers to the charge assessed to nonresident students, as established in Arizona Board of Regents' Policy 4-102.

## ACADEMIC YEAR TUITION

The resident and nonresident tuition for fall and spring semesters is shown in the "1999–2000 Resident and Nonresident Tuition" table on this page. The amounts listed are per semester hour each academic term. For more information on classification for fee status, see "Residency Classification Procedures and Policies," page 45.

Students registered for seven or more hours are considered full-time for tuition payment purposes. See "Enrollment Verification Guidelines," page 92.

*Note:* The rate for one hour is charged if the student is registered for only a zero-hour class.

**Graduate College Differential Fees.** Certain graduate programs assess an additional differential fee. These fees differ according to college and/or program. Contact your program advisor for details on these fees.

**Summer Sessions Fees.** The 1999 registration fee per semester hour is \$115 except for law students. The registration fee per semester hour for law students is \$259. For more information, see "Summer Sessions," page 96, and the *Summer Sessions Bulletin*.

## OTHER FEES, DEPOSITS, AND CHARGES

**Special Class Fees and Deposits.** Certain university classes require payment of fees or deposits for materials, breakage, and rentals. These fees and deposits are listed in the *Schedule of Classes* for each semester. See the "Special Class Fees and Deposits for ASU Main and ASU East" table, page 46.

**Student Recreation Complex Fee.** All students (except university employees) who take at least one class at ASU Main must pay a mandatory Student Recreation Complex fee. Full-time (seven or more hours) students are charged \$25 per semester. Part-time students pay \$12 per semester, and summer students pay \$2 per semester hour. See the current semester *Schedule of Classes* for more information.

**Financial Aid Trust Fee.** All students must pay a financial aid trust fee. Full-time (seven or more hours) students are charged no more than one percent of the current tuition. The fee for students enrolled six or fewer hours is half that charged full-time students. The total summer sessions fee does not exceed the amount for a full-time student. Fees collected from students are matched by the State of Arizona

## 1999–2000 Resident and Nonresident Tuition

Hours	Resident*	Nonresident*
1	\$ 115.00	\$ 389.00
2	230.00	778.00
3	345.00	1,167.00
4	460.00	1,556.00
5	575.00	1,945.00
6	690.00	2,334.00
7	1,094.00	2,723.00
8	1,094.00	3,112.00
9	1,094.00	3,501.00
10	1,094.00	3,890.00
11	1,094.00	4,279.00
12 or more	1,094.00	4,670.00

\* In addition to tuition, students are charged other fees (e.g., the Student Recreation Complex fee and financial aid trust fee).

and used to create a Financial Aid Trust Fund, from which student grants are awarded under the usual financial aid eligibility criteria available at the ASU Student Financial Assistance office in the Student Services Building.

**Arizona Students' Association (ASA) Fee.** The ASA is a nonprofit lobbying organization that represents Arizona's public university students to the Arizona Board of Regents, State Legislature, and U.S. Congress. During 1997, students at the state universities voted to change the mechanism for funding the ASA. A \$1 fee is charged to each student each semester. Any refunds for this fee are provided through the ASA Central Office at 480/966-6358.

**Late Registration.** The fee assessed on registrations on or after the first day of each session is \$35. A \$35 late fee is also assessed on registration payments received after the fee payment deadline but processed before the class enrollment purge.

**Admission Application.** The nonrefundable fee for degree applications is \$45. The nonrefundable fee for nondegree or readmission applications \$15.

**Transcripts.** The Office of the Registrar releases official transcripts *only upon the written request of the student*. The request must include the following information:

1. the student's name and former name(s);
2. the student ID number;
3. the date of birth; and
4. the dates of attendance.

The request for official transcript form is available online at [www.asu.edu/registrar/forms](http://www.asu.edu/registrar/forms).

The Office of the Registrar does not issue a transcript if the student has a financial records hold. The student must supply a specific address if the transcript is to be mailed. The fee for an official transcript for a student not enrolled is \$5 for the first copy. Additional copies ordered at the same



time are \$1 each. The fee is \$1 per copy for a student enrolled for a current or future semester.

Unofficial transcripts may be requested in person at the Office of the Registrar, any registrar site, or by mail or fax (480/965-2295) if a signed release is enclosed. There is no charge for an unofficial transcript.

**Private Music Instruction.** The fee for one-half hour of instruction weekly is \$40. The fee for one hour of instruction weekly is \$60. The fee for more than one hour of instruction weekly—for music majors only—is \$60.

**Musical Instrument Rental Charge.** The charge for use of university-owned musical instruments is \$25. Consult the School of Music for specific information.

**Binding and Microfilm Fees.** The binding fee for a thesis or dissertation is \$17 per copy. This fee is subject to change. Additional charges may be required depending on the size and nature of the document. The dissertation microfilming fee is \$50, and is subject to change.

**Sun Card/ID Card.** The replacement fee is \$10.

**Parking Decals.** A parking decal must be purchased, in person or by using the Park Smart touch-tone telephone system 480/921-PARK (7275), for motor vehicles parked on campus except in areas where metered parking or visitor lots are available. Photo identification is required. Annual decals range from \$50 to \$129 for controlled access parking. Decals are sold on a first come, first served basis. For more decal sales information, call 480/965-6124 or visit the Web site at [www.asu.edu/dps/pts](http://www.asu.edu/dps/pts).

Each vehicle registered at ASU Parking and Transit Services must comply with Arizona emission standards (A.R.S. § 15-1627G) during the entire registration period. The fee for this emission inspection is \$25 to \$35 per vehicle.

Everyone is encouraged to support travel reduction measures by using mass transit, the university shuttle bus, carpooling, bicycling, or walking whenever possible. See “Transportation,” this page, for more information.

**Parking Violations.** Due to a high demand for parking, regulations are strictly enforced. Fines range from \$10 to \$100. Appeals to parking citations may be filed within 14 calendar days to Parking and Transit Services and, after payment, may be further appealed to the Parking Citation Appeals Board. Unpaid parking citations are delinquent financial obligations subject to the provisions of the “Delinquent Financial Obligations,” page 44. The vehicle of any person owing three or more unpaid parking citations or \$100 in unpaid parking citations is subject to impoundment. An \$85 minimum fee is assessed if impoundment is required. For more information, call 480/965-4527.

**Returned Checks.** Checks returned by a bank are assessed a \$15 service charge with repayment needed within five business days of notification. A second \$15 service charge is made if the returned check is not repaid within this five-day period. Repayment of a returned check must typically be in cash.

The university may have arrangements with its bank to redeposit automatically for a second time checks for which there are insufficient funds. No service charge is assessed by ASU until a check is returned to ASU; however, the payer may be assessed a service charge by the payer’s financial institution.

Students paying registration fees and tuition with a check that is subsequently not honored by a financial institution are subject to involuntary withdrawal from the university if repayment is not made. All students involuntarily withdrawn are charged tuition and/or registration fees according to the standard refund schedule as of the involuntary withdrawal date, as determined by the university.

**On-Campus Housing.** The cost of ASU Main housing varies. In 1998–99 the most typical cost was \$2,780 per academic year. Meal plans are purchased separately. For more information, see “Residential Life” in the *General Catalog*, or call 480/965-3515.

## TRANSPORTATION

To reduce air pollution and traffic congestion, students are encouraged to travel to and from campus by means other than automobile. Nearby on-campus parking is limited and tightly controlled.

Alternative transportation modes are used by thousands of ASU students. ASU is served by a Phoenix-area regional bus service; monthly and reduced-fare semester passes are available on campus. In addition, an inexpensive express shuttle runs between ASU Main in Tempe and ASU West in northwest Phoenix; another shuttle runs among ASU Main, Mesa Community College, and ASU East in Mesa; and a Free Local Area Shuttle (FLASH) is available around the periphery of ASU Main.

Bicycle ridership at ASU is estimated to be more than 15,000 students daily. Ample racks in many locations enable the parking and securing of bicycles. Bicycle use is restricted only in those areas of campus where pedestrian traffic is sufficiently heavy to make such use a hazard. The Bike Co-op Repair Service provides assistance with bicycle maintenance.

Also, careful class scheduling, when possible, can reduce a student’s transportation needs. For more information on commute alternatives, call 480/965-1072.

## PAYMENT METHODS AND DEADLINES

**InTouch.** The InTouch system, at 480/350-1500, allows students to register for classes, to drop/add, and to make fee payment from any touch-tone phone. Students paying fees with available financial aid, debit cards, Visa, or MasterCard must use the InTouch system. Refer to the *Schedule of Classes* for available dates and times and more information about the InTouch system.

**Debit/Credit Cards.** ASU accepts debit cards, Visa, and MasterCard. Debit/credit card payments through InTouch are processed online with the bank. See the *Schedule of Classes* for information about using debit/credit cards by mail or campus payment boxes.

**Check.** Checks payable for the exact amount of charges and without a restrictive endorsement are generally acceptable, except for students on check use suspension due to a previously returned check.

**Financial Aid.** Students receiving financial aid may use their expected aid to pay university charges, including tuition and fees. Students who wish to do so must follow specified procedures. See the current semester *Schedule of Classes* for more information.

**Veterans Deferred Payment.** The Veterans Readjustment Assistance Act allows veterans to apply for deferred payment of registration fees, books, materials and supplies required for courses. To assist eligible students, a Veteran Promissory Note may be issued deferring payment during their first semester of benefits. Contact the Veterans Services Section at SSV 148 or call 480/965-7723 for information on meeting the necessary requirements. The university may deny this privilege with previous delinquent obligations.

**Payment Deadlines.** Fees must be paid by the deadline dates and times indicated or the registration is voided. A fee payment deadline is printed on all Schedule/Billing Statements and in the *Schedule of Classes*.

## REFUNDS

**Academic Year Resident and Nonresident Tuition.** Students withdrawing from school or individual classes receive a refund as described in the “Fall and Spring Withdrawal Refunds” table:

### Fall and Spring Withdrawal Refunds

Withdrawal Date	Refund
Before first day of the semester	100%*
One through 7 calendar days	80%
8 through 14 calendar days	60%
15 through 21 calendar days	40%
22 through 28 calendar days	20%
After the 28th calendar day	No refund

\* A \$35 processing fee is subtracted per session.

The university provides a prorated refund for first-time students receiving financial aid; therefore, the refund schedule is the minimum amount refundable to these students.

Withdrawal occurs on the calendar day that withdrawal is requested, either in person at a registrar site or by phone using InTouch, the ASU touch-tone telephone system for registration and fee payment. Students withdrawing for medical or other extenuating circumstances must contact their college for refunds that may be available under these circumstances.

**Summer Sessions Fees.** Students withdrawing from any summer session or individual classes receive a refund as described in the “Summer Sessions Withdrawal Refunds” table. *Refunds are based on the session days and not the class meeting dates for any particular class.*

### Summer Sessions Withdrawal Refunds

Withdrawal Dates	Refunds
Before first day of session	100%*
First and second days of session	80%
Third day of session	60%
Fourth day of session	40%
Fifth day of session	20%
After fifth day of session	No refund

\* A \$35 processing fee is subtracted per session.

**Special Class Fees and Deposits.** After the first week of classes, refunds, if any, are determined only by the department or school offering the course. Refund determination is

based on withdrawal date, type of activity, and costs already assessed by the department or school.

**Private Music Instruction.** If a student must drop a music course because of illness or other emergency beyond the student’s control, not more than half of the instruction charge may be refunded, as determined by the School of Music.

**Late Registration.** This fee is not refundable.

**Student Recreation Complex Fee.** This fee is refundable only upon complete withdrawal in percentage increments per the refund schedule.

**Financial Aid Trust Fee.** This fee is not refundable.

**Official Transcripts.** Overpayments by mail of \$5 or less are only refunded by specific request.

**Graduation Fee.** Overpayments by mail of \$5 or less are refunded only by specific request.

**Residence Halls.** Refunds to students departing from ASU Main residence halls before the end of the academic year are computed on the following basis.

**Charges and Deposits.** Housing payments and deposits are refunded as prescribed by the Residential Life License Agreement that students sign when they apply for residence hall accommodations. Students should refer to this document and the Schedule of Charges and Deadlines for specific information on refunds.

**Other University Charges.** Other university charges are normally not refundable, except for individual circumstances.

**Payment of Refunds.** Refunds require student identification and are made payable only to the student for the net amounts due the university. When the last day of a refund period falls on a weekend or holiday, a withdrawal form must be submitted to one of the registrar sites during operating hours on the workday preceding the weekend or holiday. Refunds are normally paid by check, payable to the student, and are mailed to the student’s local address.

**Parking Decals.** Prorated refunds are available through the last business day in April.

**Forfeiture of Refunds.** Refunds are subject to forfeiture unless obtained within 90 days of the last class day of the semester for which the fees were originally paid.

## DELINQUENT FINANCIAL OBLIGATIONS

Arizona Board of Regents’ Policy 4-103B, which applies to ASU, states the following:

1. Each university shall establish procedures to collect outstanding obligations owed by students and former students.
2. Each university shall maintain a system to record all delinquent financial obligations owed to that university by students and former students.
3. Students with delinquent obligations shall not be allowed to register for classes, purchase parking decals, receive cash refunds, or obtain transcripts, diplomas, or certificates of program completion. The university may allow students to register for

classes, obtain transcripts, diplomas, or certificates of program completion if the delinquent obligation is \$25 or less.

4. Unpaid obligations shall remain a matter of record until students and former students satisfy their financial obligations or until satisfactory arrangements for repayment are made with the university.
5. The university may write off delinquent financial obligations of students according to accepted accounting principles and after appropriate collection efforts. No such write-off shall operate to relieve the student of liability for the obligation nor shall such write-off entitle the student to release of any transcripts, diplomas, certificates of program completion, or to register for further university classes until such obligation is actually paid.
6. Each university shall include this policy in its bulletin or catalog.

A late charge of \$10 is made for any balances due the university not paid within 30 days of the initial due date, with a second \$10 late charge being made if these amounts are not paid within 30 days of the first late charge. Procedures to be followed for disputed charges are available from the Accounts Receivable Section of the Business Services Office, located in ADM A109.

### RESIDENCY CLASSIFICATION PROCEDURES AND POLICIES

The Arizona Board of Regents is required by law to establish uniform guidelines and criteria for classifying students' residency to determine those students who must pay nonresident tuition. The following is a summary of the general guidelines used to determine residency for tuition purposes. All of the evidence is weighed under the presumption that a nonresident student's presence in Arizona is primarily for the purpose of education and not to establish domicile and that decisions of an individual about the intent to establish domicile are generally made after the completion of an education and not before.

To obtain resident status for tuition purposes, independent students must establish their residence in Arizona at least one year immediately before the last day of regular registration for the semester in which they propose to attend ASU. Arizona residence is generally established when individuals are physically present in the state with the intention of making Arizona their permanent home.

Mere physical presence in Arizona for one year does not automatically establish residency for tuition purposes. Adult students and emancipated minors must combine physical presence in Arizona for one year with objective evidence of their intent to make Arizona their permanent home. If these steps are delayed, the one-year period is extended until both presence and intent have been demonstrated for one full year. In addition to physical presence and intent, the student must demonstrate financial independence for the two tax years immediately preceding the request for resident classification. The student must demonstrate objective evidence of self-support and that he or she was not claimed as an income tax deduction by his or her parents or any other individual for two years. An adult student is defined as being at least 18 years of age at the beginning of the domicile year. For a complete definition of an emancipated minor, refer to the Arizona Board of Regents' residency classification poli-

cies, available in the Residency Classification Section, SSV B115.

No person is considered to have gained or lost resident status merely by attending an out-of-state educational institution.

**Aliens.** Students who are aliens are subject to the same requirements for resident status as are U.S. citizens. In establishing domicile, aliens must not hold a visa that prohibits establishing domicile in Arizona.

**Refugees.** Refugees may qualify as resident students by virtue of having been granted refugee status in accordance with all applicable laws of the United States and having met all other requirements for residence in Arizona.

### Exceptions to the General Residency Rule

Students may be eligible for resident status for tuition purposes if they can meet one of the following criteria on or before the last day of regular registration.

**Legal Dependents.** If a student and his or her parents are domiciled in Arizona and have not met the one-year residency requirement but the parents are entitled to claim the student as a dependent for federal and state tax purposes, the student may be eligible for resident status for tuition purposes.

**Transferred Employees.** If students are domiciled in Arizona and have not met the one-year residency requirement but are employees or spouses of employees who have been transferred to Arizona by their employers for employment purposes, the students may be eligible for resident status for tuition purposes.

**Members of the Military.** If students are not domiciled in Arizona but are members of the U.S. Armed Forces stationed in Arizona or are the spouses or dependent children of a member (as defined in A.R.S. § 43-1001), the students may be eligible for resident status for tuition purposes. If military service is concluded while they are enrolled, students do not lose resident status while they are continuously enrolled in a degree program. If individuals are domiciled in Arizona immediately before becoming members of the U.S. Armed Forces, they do not lose resident status because of their absence while on active duty with the military as long as they maintain Arizona affiliations and file Arizona state tax.

**Native Americans.** Students who are members of a Native American tribe whose reservation lies both in Arizona and an adjacent state and who are residents of that reservation may be eligible for resident status for tuition purposes.

### Procedures for Establishing Residency Status

All students are responsible for obtaining residency classification for tuition purposes before registering and paying their fees. This procedure requires students to complete and file a domicile affidavit form. This form is required of all new and returning students as part of the admission or readmission process. Students classified as nonresidents who believe they may qualify for resident status must file a petition with the Residency Classification Section. This petition must be filed by the last day of regular registration. A student seeking resident status must also file supporting documentation necessary to provide a basis for resident classification (source[s] of support, driver's license, voter's

registration, vehicle registration, etc.). Students whose residency petitions are in process at the fee payment deadline are responsible for paying nonresident tuition and fees. However, an appropriate refund is issued if residency is later granted for that semester.

Any student found to have made a false or misleading statement concerning residency or tuition status is subject to dismissal from the university.

Failure to file a timely written petition for reclassification of residency status for tuition purposes constitutes a waiver of the student's right to apply for the given semester. Peti-

tion deadlines are published each semester in the *Schedule of Classes*. Extensions to the deadlines are not permitted.

Residency classification is an extremely complex issue. The information presented here is a summary and does not address each individual's situation; therefore, students are encouraged to make a personal visit to the Residency Classification Section to discuss their individual circumstances as soon as possible. Guidelines for determination of residency for tuition purposes are subject to review and change without notice. For more information, call the Residency Classification Section at 480/965-7712 or refer to [www.asu.edu/registrar/residency](http://www.asu.edu/registrar/residency) on the Web.

### Special Class Fees and Deposits for ASU Main and ASU East

#### Special Fees<sup>1</sup>

ADE 510 Foundation Architectural Studio.....	175.00
ADE 511 Core Architectural Studio I.....	175.00
ADE 512 Core Architectural Studio II.....	175.00
ADE 521 Advanced Architectural Studio I.....	175.00
ADE 522 Advanced Architectural Studio II.....	175.00
ADE 621 Advanced Architectural Studio III.....	175.00
ADE 622 Advanced Architectural Studio IV.....	175.00
ART 401 Nonsilver Photography.....	30.00
ART 403 Senior Photographic Projects.....	25.00
ART 404 Portraiture Photography.....	25.00
ART 405 Advanced Color Photography.....	35.00
ART 407 View Camera.....	25.00
ART 414 Advanced Life Drawing.....	25.00
ART 415 Art Anatomy.....	20.00
ART 425 Advanced Figure Painting.....	25.00
ART 427 Advanced Watercolor.....	45.00
ART 431 Special Problems in Sculpture.....	40.00
ART 432 Neon Sculpture.....	45.00
ART 436 Architectural Sculpture.....	40.00
ART 437 Film Animation.....	25.00
ART 438 Experimental Systems in Sculpture.....	40.00
ART 446 Computer Art II.....	35.00
ART 452 Advanced Lithography.....	40.00
ART 454 Advanced Screen Printing.....	35.00
ART 455 Advanced Photo Processes for Printmaking.....	30.00
ART 456 Fine Printing and Bookmaking I.....	30.00
ART 457 Fine Printing and Bookmaking II.....	30.00
ART 458 Papermaking.....	20.00
ART 459 Monoprinting.....	20.00
ART 460 Ceramic Clay.....	25.00
ART 463 Ceramic Glaze.....	25.00
ART 466 Special Problems in Ceramics.....	25.00
ART 472 Advanced Jewelry.....	15.00
ART 473 Advanced Metalworking.....	15.00
ART 474 Advanced Wood.....	25.00
ART 476 Fibers: Multiple Harness Weaving.....	25.00
ART 477 Printed Textiles.....	30.00
ART 494 ST: Advanced Sculpture.....	20.00
ART 494 ST: Carving.....	25.00
ART 494 ST: Experimental Paper.....	25.00
ART 494 ST: Experimental Printmaking.....	30.00
ART 494 ST: Fibers and Surface.....	25.00
ART 494 ST: Foundry Casting Methods.....	40.00
ART 494 ST: Print Textiles.....	25.00
ART 494 ST: Relief Printmaking.....	35.00
ART 494 ST: Turning.....	25.00
ART 494 ST: Vapor Glazes.....	15.00
ART 498 PS: Landscape Photography: Theory.....	25.00
ART 551 Intaglio Projects.....	40.00
ART 594 ST: Turning.....	25.00

#### Special Fees<sup>1</sup>

ART 598 ST: Advanced Color Photography.....	35.00
ART 598 ST: Advanced Screen Printing.....	35.00
ART 598 ST: Advanced Sculpture.....	20.00
ART 598 ST: Architectural Sculpture.....	40.00
ART 598 ST: Art Anatomy.....	20.00
ART 598 ST: Ceramic Clay.....	25.00
ART 598 ST: Ceramic Glaze.....	25.00
ART 598 ST: Dimensional Animation.....	25.00
ART 598 ST: Experimental Paper.....	25.00
ART 598 ST: Experimental Printmaking.....	30.00
ART 598 ST: Experimental Systems in Sculpture.....	40.00
ART 598 ST: Fibers and Surface.....	25.00
ART 598 ST: Figure Painting.....	25.00
ART 598 ST: Fine Printing and Bookmaking I.....	30.00
ART 598 ST: Fine Printing and Bookmaking II.....	30.00
ART 598 ST: Foundry Casting Methods.....	40.00
ART 598 ST: Jewelry Metalworking.....	15.00
ART 598 ST: Life Drawing.....	20.00
ART 598 ST: Lithography.....	40.00
ART 598 ST: Monoprinting.....	20.00
ART 598 ST: Neon Sculpture.....	45.00
ART 598 ST: Nonsilver Photography.....	30.00
ART 598 ST: Papermaking.....	20.00
ART 598 ST: Photo Processes for Printmaking I.....	25.00
ART 598 ST: Portraiture Photography.....	25.00
ART 598 ST: Print Textiles.....	25.00
ART 598 ST: Printed Textiles.....	30.00
ART 598 ST: Relief Printmaking.....	35.00
ART 598 ST: Screen Printing.....	35.00
ART 598 ST: Special Problems in Ceramics.....	25.00
ART 598 ST: Special Problems in Sculpture.....	40.00
ART 598 ST: View Camera.....	35.00
ART 598 ST: Watercolor.....	45.00
ART 598 ST: Wood.....	25.00
ART 621 Studio Problems: Ceramics.....	25.00
ART 621 Studio Problems: Jewelry Metalworking.....	15.00
ART 621 Studio Problems: Printmaking.....	25.00
BIO 410 Techniques in Wildlife Conservation Biology.....	45.00
BIO 426 Limnology.....	20.00
BIO 453 Animal Histology.....	5.00
BIO 471 Ornithology.....	15.00
BIO 472 Mammalogy.....	15.00
BIO 473 Ichthyology.....	15.00
BIO 474 Herpetology.....	15.00
BIO 502 Transmission Electron Microscopy.....	20.00
BIO 505 Scanning Electron Microscopy.....	20.00
BUS 502 Managerial Communication.....	8.00
CHM 424 Separation Science <sup>2</sup> .....	25.00
CHM 431 Qualitative Organic Analysis <sup>2</sup> .....	25.00
CHM 452 Inorganic Chemistry Laboratory <sup>2</sup> .....	25.00
CHM 467 General Biochemistry Laboratory <sup>2</sup> .....	25.00

Special Class Fees and Deposits for ASU Main and ASU East (continued)

**Special Fees<sup>1</sup>**

CHM 480	Methods of Teaching Chemistry <sup>2</sup> .....	25.00
CHM 593	Applied Project: Glass Blowing <sup>2</sup> .....	25.00
COM 584	Communication Internship.....	20.00
DSC 525	Design Methodologies.....	175.00
EDP 560	Individual Intellectual Assessment.....	12.50
EED 578	Student Teaching in the Elementary School.....	25.00
EED 598	ST: Using Math Manipulatives/ Elementary Schools.....	5.00
EED 598	ST: Using Math Manipulatives/Middle Schools.....	5.00
EPD 700	Interdisciplinary Research Methods.....	175.00
EPD 710	Current Research in Design.....	175.00
EPD 712	Current Research in Planning.....	175.00
EPD 714	Current Research in History, Theory, and Criticism.....	175.00
EPE 505	Applied Exercise Physiology Techniques.....	15.00
FON 442	Experimental Foods.....	15.00
FON 445	Quantity Food Production.....	15.00
FON 446	Human Nutrition Assessment Lecture/Laboratory.....	25.00
FON 598	ST: Research Methods in Nutrition.....	15.00
GLG 405	Geology of the Moon.....	10.00
GLG 406	Geology of Mars.....	10.00
GLG 420	Volcanology.....	35.00
GLG 424	Petrology.....	5.00
GLG 435	Sedimentology.....	15.00
GLG 436	Principles of Stratigraphy.....	20.00
GLG 441	Ore Deposits.....	20.00
GLG 455	Advanced Field Geology.....	35.00
GLG 456	Cordilleran Regional Geology.....	10.00
GLG 490	Topics in Geology: Clastic Sedimentology and Petrology.....	20.00
GLG 490	Topics in Geology: Moon.....	10.00
GLG 490	Topics in Geology: Pyroclastic Rocks.....	25.00
GLG 490	Topics in Geology: Remote Sensing.....	10.00
GLG 490	Topics in Geology: Volcano.....	25.00
GLG 510	Advanced Structural Geology.....	10.00
GLG 520	Advanced Physical Volcanology (fall only).....	35.00
GLG 524	Advanced Igneous Petrology.....	20.00
GLG 525	Advanced Metamorphic Petrology.....	5.00
GLG 591	Volcanology.....	35.00
GLG 598	ST: Advanced Field Geology.....	35.00
GLG 598	ST: Clastic Sedimentology and Petrology.....	20.00
GLG 598	ST: Cordilleran Regional Geology.....	10.00
GLG 598	ST: Geology of Mars.....	10.00
GLG 598	ST: Ore Deposits.....	20.00
GLG 598	ST: Petrology-Petrography.....	5.00
GLG 598	ST: Principles of Stratigraphy.....	20.00
GLG 598	ST: Sedimentology.....	15.00
GLG 598	ST: Volcanology.....	35.00
GPH 418	Landforms of the Western United States.....	20.00
GPH 491	Geographic Field Methods.....	20.00
GRA 481	Visual Communication V.....	175.00
GRA 482	Visual Communication VI.....	175.00
IEE 591	Seminar: Manufacturing Strategy.....	50.00
IEE 591	Seminar: Effects of Economics/ New Products Market.....	50.00
IEE 591	Seminar: Strategic Product Development.....	50.00
IEE 591	Seminar: New Product Strategic.....	50.00
IND 460	Design Project I.....	175.00
IND 461	Design Project II.....	175.00

**Special Fees<sup>1</sup>**

INT 466	Interior Design Studio V.....	175.00
INT 467	Interior Design Studio VI.....	175.00
JUS 584	Internship.....	20.00
MIC 421	Experimental Immunology.....	20.00
MIC 470	Bacterial Diversity and Systematics.....	25.00
MUP 511	Studio Instruction.....	60.00
MUP 521	Studio Instruction.....	40.00
MUP 527	Studio Instruction.....	60.00
MUP 727	Studio Instruction.....	60.00
NUR 559	Advanced Health Assessment.....	45.00
NUR 580	Advanced Nursing Practicum I, II.....	45.00
PLA 461	Landscape Architecture V.....	175.00
PLB 404	Phycology.....	25.00
PLB 420	Plant Ecology: Organisms and Populations.....	25.00
PLB 421	Plant Ecology: Communities and Ecosystems.....	25.00
PLB 472	Greenhouse/Nursery Management.....	25.00
PUP 572	Planning Studio I: Data Inventory and Analysis.....	175.00
PUP 574	Planning Studio II: Options and Implementation.....	175.00
SED 578	Student Teaching in the Secondary Schools.....	25.00
SED 598	ST: Using Math Manipulatives/Middle Schools.....	5.00
THP 440	Advanced Scene Design.....	5.00
THP 441	Scene Painting.....	20.00
THP 444	Drafting for the Stage.....	5.00
THP 445	Advanced Lighting Design.....	5.00
THP 506	Scenography.....	5.00
THP 512	Puppetry Workshop.....	10.00

**Deposits**

ADE 510	Foundation Architectural Studio.....	25.00
ADE 511	Core Architectural Studio I.....	25.00
ADE 512	Core Architectural Studio II.....	25.00
ADE 521	Advanced Architectural Studio I.....	25.00
ADE 522	Advanced Architectural Studio II.....	25.00
ADE 621	Advanced Architectural Studio III.....	25.00
ADE 622	Advanced Architectural Studio IV.....	25.00
CHM 424	Separation Science <sup>2</sup> .....	25.00
CHM 431	Qualitative Organic Analysis <sup>2</sup> .....	20.00
CHM 452	Inorganic Chemistry Laboratory <sup>2</sup> .....	20.00
CHM 525	Spectrochemical Methods of Analysis <sup>2</sup> .....	25.00
CHM 526	X-ray Methods of Analysis <sup>2</sup> .....	25.00
CHM 527	Electrical Methods of Chemical Analysis <sup>2</sup> .....	25.00
DSC 593	Applied Projects.....	25.00
DSC 599	Thesis.....	25.00
GRA 481	Visual Communication V.....	25.00
GRA 482	Visual Communication VI.....	25.00
GRA 485	Graphic Design Workshop.....	25.00
IND 460	Design Project I.....	25.00
IND 461	Design Project II.....	25.00
INT 466	Interior Design Studio V.....	25.00
INT 467	Interior Design Studio VI.....	25.00
PLA 461	Landscape Architecture V.....	25.00
PUP 572	Planning Studio I: Data Inventory and Analysis.....	25.00
PUP 574	Planning Studio II: Options and Implementation.....	25.00

**Class Fees Paid in Class or at Location Listed**

AMT 400	Flight Safety IV <sup>3</sup>	
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Financing Options Available

<sup>1</sup> For information on refunds, see "Refunds," page 44. For ASU West classes, see the *ASU West Catalog*.

<sup>2</sup> Chemistry classes may also carry a nonrefundable special class fee.

<sup>3</sup> Fees are variable and paid directly to contractor for rental of aircraft.

# Financing Graduate Studies

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Financial assistance for graduate study consists of scholarships, fellowships, assistantships, student loans, and work-study. Assistance can come from the university, private sources, and/or the federal government. The Graduate College Financial Assistance Office provides information and assistance to graduate and professional students. Students can also access the Web site for more information at [www.asu.edu/graduate/gradaid](http://www.asu.edu/graduate/gradaid) or send e-mail to [gradaid@asu.edu](mailto:gradaid@asu.edu). For more information, see "Assistantships and Associateships," page 96.

## UNIVERSITY SCHOLARSHIP AND FELLOWSHIP PROGRAMS

ASU offers several university-sponsored awards and scholarships for which both the Graduate College and the academic units conduct nominations and selections. To be considered for any of these award programs, students must apply directly to their academic department.

**Regents Graduate Academic Scholarships.** These scholarships are available on a competitive basis to graduate students with outstanding academic records. This scholarship covers the *resident tuition only (not nonresident tuition)* and is granted for the academic year or one semester only (not including summer sessions). Students must reapply to the academic unit every year.

Applicants must be regularly admitted to a graduate degree program; continuing students must also be in good standing (3.00 postbaccalaureate GPA at ASU). A graduate student may be nominated for this scholarship by the head of the student's academic unit. Application forms and further information may be obtained from each academic unit. Forms are also available from the Graduate College. Applications should be completed and returned to the academic unit. *The Graduate College does not accept direct applications. Applicants must meet deadlines established by the academic units and the Graduate College.*

**Regents Graduate Tuition Scholarships.** These scholarships are available on a competitive basis to nonresident graduate students with outstanding academic records. *This scholarship is granted for the academic year or one semester only (not including summer sessions).* Graduate students awarded with this scholarship pay the resident tuition. Applicants must be regularly admitted to a graduate degree program; continuing students must also be in good standing (3.00 postbaccalaureate GPA at ASU). Application forms and further information may be obtained from each academic unit. Forms are also available from the Graduate College. Applications should be completed and returned to the academic unit. *The Graduate College does not accept direct applications. Applicants must meet deadlines established by their academic unit and the Graduate College.*

**University Graduate Fellows Program.** This program offers competitive three-year merit packages that include scholarships ranging from \$1,000 to \$4,500, an annual stipend, plus waiver of resident and nonresident tuition. This fellowship program is for outstanding new graduate students with high credentials such as GRE scores, GPA, publi-

cations, and prestigious awards. Applicants should contact the academic unit for information.

**Herman E. DeMund Memorial Scholarship.** This scholarship is an annual award of \$2,000 for a deserving graduate student at ASU. Students who are regularly admitted to a graduate degree program are eligible to be nominated for this award. Nominations are made by the heads of the individual academic units to the Graduate College, and the recipient is chosen from these nominees. The selection for this award is made on the basis of scholastic ability.

**Phelps Dodge Scholarships.** Two graduate scholarships of \$5,000 are awarded to regularly admitted graduate students who are residents of Arizona and graduates of ASU. Awards for any academic year are limited to (1) a student chosen from the engineering student body for advanced study in mining, geology, metallurgy, or other fields allied with or pertaining to the mineral industry, or, if no suitable candidate is available for postgraduate study in these fields, for advanced study in any engineering field, and (2) a student chosen from the student body for advanced study in any field that the student may select and for which he or she may be qualified. Nominations are made by the head of the individual academic unit to the Graduate College and the recipients are chosen from those nominees. The selection for these awards is made on the basis of academic achievement.

**James J. Sweitzer Memorial Scholarship.** This scholarship provides a stipend of \$1,200 to \$1,500 to a graduate student in Agribusiness. Regularly admitted graduate students planning a career in agribusiness are eligible to apply as first- or second-year students. The selection committee considers financial needs but gives preference to high scholarship and potential in the field.

**Reiganji Graduate Scholarship Fund.** This scholarship fund offers \$1,400 annual scholarships plus waiver of resident and nonresident tuition to students majoring in East Asian history and philosophy.

**Travel and Research Grants.** The Graduate College collaborates with the Graduate Student Research Office to fund small grants to support graduate student research. These grants usually are made to defray expenses incurred by students completing their theses or dissertations. The Graduate College funds travel grants for doctoral students who wish to present their research results at regional and national conferences. Meeting scholars in their fields and participating with faculty in professional organizations presents opportunities for students to get involved in activities that will become central to their professional lives.

## PRIVATE FELLOWSHIPS AND AWARDS

ASU attracts a large number of graduate students who are honored with external sources of assistance such as national research fellowships and prestigious, private scholarships. In addition, the Graduate College assists in nominating graduate students for national competitions and provides support services to the recipients. These awards are targeted by academic discipline and/or student category.

**Achievement Rewards for College Scientists.** Scholarships are given to gifted and needy scholars in the natural sciences, medicine, and engineering to complete their career preparation. The annual award is \$6,000 in addition to resident and nonresident tuition waivers. Students must be nominated through their major department.

**Philanthropic Educational Organization National Scholarship Award.** This award is offered to outstanding women doctoral students. The successful applicant receives a cash stipend of \$7,000, matched by tuition remission. The award is renewable for a second year. Students must be nominated through their major department.

**Ford Foundation Predoctoral Fellowship.** This fellowship provides an annual stipend of \$14,000 for three years with tuition scholarships from ASU. The program supports fellows in research-based doctoral programs.

**Jacob K. Javits Fellowship Program.** This fellowship program offers an annual stipend of \$14,400 based on a fellow's need with tuition scholarships from ASU. This program is designed to assist students of superior ability to pursue studies leading to a doctoral or master's degree in fine arts.

**National Science Foundation Graduate Fellowships and Minority Graduate Fellowships.** These fellowships provide a stipend of \$14,400 for 12-month tenures. ASU provides additional tuition scholarships to fellows beginning their graduate study in science, mathematics, and engineering.

**National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM).** This fellowship program offers opportunities for underrepresented ethnic minority students to obtain master's degrees in engineering, through a program of paid summer internships and graduate financial assistance. Fellowships consist of a stipend of \$6,000 per academic year; when combined with the summer internship, the total value is between \$20,000 and \$40,000. ASU provides additional support to GEM fellows with tuition scholarships for both resident and nonresident tuition.

**Other Forms of Scholarship Support.** Students are encouraged to contact the academic unit in which they intend to study and the Graduate College Financial Assistance Office to determine if other sources of support are available.

The Graduate College publishes *Grad News* ([www.asu.edu/graduate/gradnews.htm](http://www.asu.edu/graduate/gradnews.htm)), a newsletter listing current grant and scholarship information. Reference books on national and regional scholarships for which students may be eligible are on reserve at Hayden Library. Announcements are available for review in the center lobby, Wilson Hall, and the Web at [www.asu.edu/graduate/gradnews.htm](http://www.asu.edu/graduate/gradnews.htm).

### NEED-BASED FINANCIAL AID

To be considered for need-based support, applicants must complete the Free Application for Federal Student Aid (FAFSA) or the Renewal FAFSA each year. U.S. citizens and permanent residents are eligible.

The FAFSA is available in a variety of formats.

1. The paper FAFSA is available after January 1 at any U.S. college or university, and the Graduate College Financial Assistance Office. The paper Renewal FAFSA is automatically mailed to the student from the federal processor if the student has applied for aid in the previous year. Both processes take about four to six weeks.
2. The electronic FAFSA is available through *FAFSA Express* and *FAFSA on the Web*. Both versions require that the student has access to a computer, modem and printer. A copy of the *FAFSA Express* software is available by calling 1-800-801-0576. *FAFSA on the Web* ([www.fafsa.ed.gov](http://www.fafsa.ed.gov)) allows the student to complete the application on the Web site. Both processes take approximately two weeks.

**Federal (College) Work-Study.** This federal, campus-based work program is administered by ASU. Awards for 1998–99 ranged from \$4,000 to \$5,000. All graduate students who apply for financial aid by the priority filing date of March 1 and demonstrate need are considered for this program. The student usually works 10 to 20 hours per week either on campus or for an off-campus, nonprofit agency to earn the award amount.

**Federal Perkins Loan.** This low-interest, long-term, federal, campus-based loan is administered by ASU. Awards for 1997–98 ranged from \$1,000 to \$3,000. Graduate students who apply by the March 1 priority filing date and demonstrate need are considered.

**William D. Ford Federal Direct Student Loans (Subsidized and Unsubsidized).** These long-term loans are available through the federal government. Students may borrow up to \$8,500 per academic year in a subsidized Federal Direct Loan. An additional unsubsidized Federal Direct Loan of up to \$10,000 per academic year may also be borrowed. Students applying for financial aid are automatically considered for this program.

### HIGHER EDUCATION TAX INCENTIVES

The Taxpayer Relief Act of 1997 provides assistance (Lifetime Learning Tax Credit) to graduate and professional students in meeting college expenses. For more information, visit the U.S. Department of Education Web site at [www.ed.gov](http://www.ed.gov).

### TAXABILITY OF FINANCIAL AID PROGRAMS

Scholarships, grants, fellowships, and stipends (but not loan funds) are taxable income to the recipient, except for the portion of these funds used for tuition and other university fees, or books, supplies, and equipment required for the courses being taken. Special tax regulations also apply to nonresident alien students and may require withholding of taxes at the time of aid disbursements to these individuals. Information on the taxability of scholarships can be obtained from the following Internal Revenue Service (IRS) publications and forms: *Publication 4—Student's Guide to Federal Income Tax*; *Publication 519—U.S. Tax Guide for Aliens*; *Publication 520—Scholarships and Fellowships*; Form 1040EZ and Instructions—Income Tax Return for Single and Joint Filers with no dependents; and Form 1040NR and Instructions—U.S. Nonresident Alien Income Tax Return.

These publications and forms can be obtained from the IRS at its toll-free number 1-800-829-FORM (3676). These publications and forms can also be accessed online at [www.irs.ustreas.gov/prod/forms\\_pubs](http://www.irs.ustreas.gov/prod/forms_pubs).

### **FINANCIAL AID FOR INTERNATIONAL STUDENTS**

International students are not eligible for Federal Financial Aid but can contact their academic department about Graduate Academic Scholarships and Graduate Tuition Scholarships. Each department or college has different deadline/eligibility requirements for these scholarships. Students may also contact their academic department about teaching, research, or graduate assistantships. Academic departments provide the appropriate forms to apply for these positions.

### **CAMPUS SERVICES AND ONLINE SERVICES**

Students can access personal information regarding financial aid by using FASTT Web at [www.asu.edu/fastt](http://www.asu.edu/fastt) or FASTT Phone at 480/968-4400. Students can check on

1. documents still needed to complete the financial aid file;
2. award information; and
3. financial aid forms in versions that can be printed and mailed or completed and sent across the Web.

For more information about financial assistance, visit the Graduate College Financial Assistance Office, located in the center lobby, Wilson Hall, or phone 480/965-3521.



Student Services Building at night

Tim Trumble photo



# Classification of Courses

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## COURSE INFORMATION

Information about all lower- and upper-division courses offered at ASU Main and East appears in the *General Catalog*, published every spring. Classes scheduled for the current or upcoming fall or spring semester are listed in the *Schedule of Classes*, published before the beginning of registration. Classes scheduled for the summer sessions are listed in the *Summer Sessions Bulletin*, published every spring. The *Schedule of Classes* and *Summer Sessions Bulletin* are also available online at [www.asu.edu/registrar/schedule](http://www.asu.edu/registrar/schedule). Information about courses that apply toward graduate programs also appears in the *Graduate Catalog*, published annually. Information about lower- and upper-division courses offered at ASU West appears in the *ASU West Catalog*, published annually.

See the “Course Prefix Index,” page 10, for the location of all ASU courses by prefix.

## COURSE NUMBERING SYSTEM

**100–299 (Lower-Division) Courses.** Lower-division courses are designed primarily for freshmen and sophomores. Certain classes are closed to freshmen who lack the designated prerequisites or whose majors are outside the unit offering the course. This information is available in the *General Catalog*, in the *Schedule of Classes*, or from the student’s academic advisor.

**300–499 (Upper-Division) Courses.** Upper-division courses are designed primarily for juniors, seniors, and other advanced students. Prerequisites and other restrictions should be noted before registration. Courses at the 400 level apply to graduate degree requirements for individual programs of graduate study when approved by the Graduate College. See “Reserving of Course Credit by Undergraduates,” page 94.

**500–799 (Graduate-Level) Courses.** Graduate-level courses are designed for graduate students. However, an upper-division undergraduate student may enroll in these courses with the approval of the student’s advisor, the course instructor, the department chair, and the dean of the college in which the course is offered. If the course does not meet an undergraduate graduation requirement, it may be eligible for use in a future graduate program on the same basis as work taken by a nondegree graduate student. See “Reserving of Course Credit by Undergraduates,” page 94.

**Continuing Registration.** Courses numbered 595, 695, and 795, Continuing Registration, carry one semester hour of credit; however, the student receives neither credit nor grade for the course.

**Omnibus Courses.** The omnibus numbers are used for courses offered on an experimental or tutorial basis or for courses in which the content is new or periodically changes. Academic units use their own prefixes before omnibus course numbers. The general nature of the work required for a particular omnibus course is consistent from unit to unit, but subject matter varies. Omnibus courses are often offered for a variable number of semester hours. See the appropriate

academic unit in the *General Catalog* or major in the *Graduate Catalog* for the omnibus course listing under a subject area.

## OMNIBUS GRADUATE COURSE DESCRIPTIONS

### **500, 600, 700 Research Methods.** (1–12)

Course on research methods in a specific discipline.

### **580, 680, 780 Practicum.** (1–12)

Structured practical experience in a professional program, supervised by a practitioner and/or faculty member with whom the student works closely.

### **583, 683, 783 Field Work.** (1–12)

Structured, supervised field experience in a field science or other discipline requiring experience in field techniques.

### **584, 684, 784 Internship.** (1–12)

Structured practical experience following a contract or plan, supervised by faculty and practitioners.

### **590, 690, 790 Reading and Conference.** (1–12)

Independent study in which a student meets regularly with a faculty member to discuss assignments. Course may include such assignments as intensive reading in a specialized area, writing synthesis of literature on a specified topic, writing literature review of a topic.

### **591, 691, 791 Seminar.** (1–12)

A small class emphasizing discussion, presentations by students, and written research papers.

### **592, 692 Research.** (1–12)

Independent study in which a student, under supervision of a faculty member, conducts research that is expected to lead to a specific project such as a thesis or dissertation, report, or publication. Assignments might include data collection, experimental work, data analysis, or preparation of a manuscript.

### **593, 693, 793 Applied Project.** (1–12)

Preparation of a supervised applied project that is a graduation requirement in some professional majors.

### **594 Conference and Workshop.** (1–12)

Topical instruction, usually in compressed format, leading to academic credit. Often offered off campus to groups of professionals.

### **595, 695, 795 Continuing Registration.** (1)

Used in situations where registration is necessary but where credit is not needed. Replaces arbitrary enrollment in reading and conference, research, thesis, dissertation, etc. Used by students when taking comprehensive examinations, defending thesis or dissertation, or fulfilling the continuous enrollment requirement in doctoral programs. Credit is not awarded, and no grade is assigned.

### **598 Special Topics.** (1–4)

Topical courses not offered in regular course rotation—e.g., new courses not in the catalog, courses by visiting faculty, courses on timely topics, highly specialized courses responding to unique student demand.

### **599 Thesis.** (1–12)

Supervised research focused on preparation of thesis, including literature review, research, data collection and analysis, and writing.

### **792 Research.** (1–15)

Independent study in which a student, under supervision of a faculty member, conducts research that is expected to lead to a specific project such as a dissertation, report, or publication. Assignments might include data collection, experimental work, data analysis, or preparation of a manuscript.

### **799 Dissertation.** (1–15)

Supervised research focused on preparation of dissertation, including literature review, research, data collection and analysis, and writing.

The preceding courses are described in announcements of the Graduate College and are also available in the respective departments. Under special circumstances, arrangements may be made at the dean’s request, through the approval of the senior vice president and provost, to increase the standard semester hours of credit.

**LAW 597, 697, and 797.** The numbers 597, 697, and 797 have been reserved for the Visiting Student Program in the College of Law.

**Prerequisites and Corequisites.** Some requirements, known as prerequisites, must be met *before* registering for a course. Other requirements, called corequisites, must be met *while* taking a course. A student registering for a course should be able to show that prerequisites have been met and that corequisites will be met as stated in the catalog or *Schedule of Classes* or must otherwise satisfy the instructor that equivalent preparation has been completed.

**International Program Courses.** Courses with the prefix IPO numbered 495 and 595 are reserved for International Programs study abroad and exchange programs. For most programs, participating students register for 18 semester hours. Following completion of an international program, undergraduate students receive credit for the study completed, with a minimum of 12 semester hours and a maximum of 18 semester hours, graduates with a minimum of six semester hours and a maximum of 12 semester hours.

IPO courses numbered 494 and 598 may be taken for one semester hour. Students register for these courses under the title "Study Abroad." At the conclusion of the program and

the transfer of overseas courses to the students' ASU records, a grade of "Y" is entered for the course.

For some special international programs, students register and receive credit for fewer semester hours.

#### Key to Course Listing Codes

Code	Definition
M	ASU Main and ASU East campus code*
W	ASU West campus code*
GLG	Example of a departmental prefix designation
410	Example of a course number
(3)	Example of course semester hours
F	Course offered fall only
S	Course offered spring only
SS	Course offered summer session only
F, S	Course offered both semesters
F 1999	Course offered every other year on semester indicated
A	Course offered once a year
N	Course not regularly offered

\* Campus codes are not used in the catalogs but appear in the *Schedule of Classes* and the *Summer Sessions Bulletin*.



Music Building

J. Cameron MacIsaac photo

# Graduate College

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**Bianca L. Bernstein, Ph.D.**

Dean

Through the faculty, Arizona State University's Graduate College offers programs to meet the educational needs of those who already hold baccalaureate and master's degrees. While many students prepare for careers in research, the professions, and the arts, others study for personal enrichment. Both part-time and full-time students are enrolled in 91 master's and 48 doctoral majors encompassing hundreds of concentrations and specialties. Other students explore new areas of interest or prepare for career advancements apart from formal degree programs.

The size, strength, and diversity of the graduate community reflect the university's commitment to high quality education. As a major center for graduate education, ASU supports cultural and intellectual activity as well as research in a broad range of arts and sciences and professional disciplines; in addition, the university conducts research addressing the social, cultural, and economic growth and development of Arizona and the Southwest.

One distinctive project that magnifies our dedication to graduate students is our Preparing Future Faculty program, funded by the Pew Charitable Trusts and ASU. The program is designed to educate students about faculty roles and prepare doctoral students specifically for faculty positions in our nation's colleges and universities.

This past year, about 2,000 ASU graduate students were awarded prestigious fellowships and scholarships, exceeding \$3.5 million. These awards were funded by the National Science Foundation, NASA, the Ford Foundation, Fulbright, and other public agencies and private foundations.

ASU assisted more than 2,800 outstanding graduate students through academic and tuition scholarship and other financial support programs—the total financial support amounted to \$15.5 million, exemplifying the university's commitment to enabling student success.

Our funded programs, together with our more than 30 research centers and institutes, provide assistantships and training for many of our graduate students; further, the centers coordinate conferences, colloquia, and special seminars to heighten the learning experience. The Office of the Vice Provost for Research provides seed money to enable our faculty and students to work at the frontiers of knowledge. Such activities continually encourage the creative embrace of change and experimentation.

ASU provides numerous choices in student life, for personal enrichment as well as cultural interaction. Many internationally known speakers present lectures here, bringing together faculty, graduate students, and the community to engage in stimulating dialogue.

**Intellectual Environment.** About 11,000 students from all 50 states and more than 100 nations are enrolled in graduate study at the university. The size and diversity contribute to a cosmopolitan setting that is ideal for intellectual discourse and stimulation. As a balance to this large grouping of students, individual graduate programs conduct small collo-

quia and seminars where students and faculty discuss their work in an intimate, intellectual environment supportive of student development. The result is a spirited, lively atmosphere in which students and faculty members get to know each other through collaborative research and intellectual exchange.

## GRADUATE PROGRAMS

### Degree Programs

Although graduate degree programs differ in many ways, they all share two important characteristics. First, in comparison to baccalaureate programs, they demand a deeper and broader understanding of a body of knowledge in a recognized discipline or profession. Second, in master's and especially in doctoral programs, graduate students prepare to make original contributions to their fields through research and other creative activities of a high order. In contrast, then, to the broad-based baccalaureate degree, graduate degrees are specialized. ASU offers several types and levels of postbaccalaureate degrees.

For admission information and procedures, access the Web site at [www.asu.edu/graduate/admission](http://www.asu.edu/graduate/admission) or refer to the *Application for Graduate Admission* booklet.

**Master's and Doctoral Work.** Many students pursue a master's degree to satisfy their own quest for learning. In some disciplines, such as dance or architecture, the master's degree is normally the terminal or final degree. In other fields, students enter master's programs as the first step toward more advanced work, such as doctoral studies, which prepare students for a lifetime of intellectual inquiry and creativity or for the application of knowledge to professional practice.

**Research Degrees.** Students at ASU may pursue research-oriented or practice-oriented degrees. Research-oriented degree programs—the Master of Arts (M.A.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.)—prepare students for careers of research and scholarship in governmental, business, and industrial organizations, or in university or college teaching. Students in these programs develop abilities to evaluate existing knowledge critically and extend it into fresh areas of inquiry and scholarship.

**Professional Degrees.** The professional or practice-oriented degree programs have slightly different names and distinct academic missions. The names of the degrees are commonly tied to the academic unit offering the program, for example, Master of Business Administration (M.B.A.), Master of Music (M.M.), Master of Social Work (M.S.W.), and Doctor of Public Administration (D.P.A.). With the objective of preparing students for professional practice, such programs require rigorous preparation in the fundamental literature and scholarship of the field. Some degrees require demonstrated expertise through an internship, an

### Interdisciplinary Graduate Degrees and Majors Overseen by the Graduate College

Major	Degree	Administered by
Creative Writing	M.F.A.	Creative Writing Committee
Curriculum and Instruction Concentrations: curriculum studies, early childhood education, educational media and computers, elementary education, English education, exercise and wellness education, math education, music education, physical education, reading education, science education, special education	Ph.D.	Interdisciplinary Committee on Curriculum and Instruction
Exercise Science Concentrations: biomechanics, motor behavior/sport psychology, physiology of exercise	Ph.D.	Committee on Exercise Science
Justice Studies Concentrations: criminal and juvenile justice; dispute resolution; law, justice and minority populations; law, policy, and evaluation; women, law, and justice	Ph.D.	Committee on Law and Social Sciences
Public Administration	D.P.A.	Committee on Public Administration
Science and Engineering of Materials Concentrations: high-resolution nanostructure analysis, solid-state device materials design	Ph.D.	Committee on the Science and Engineering of Materials
Speech and Hearing Science Concentrations: developmental neurolinguistic disorders, neuroauditory processes, neurogerontologic communication disorders	Ph.D.	Committee on Speech and Hearing Science
Statistics	M.S.	Committee on Statistics

exhibition (art), a performance (dance), or a recital (music). Examples of ASU fields in which academic units offer professional programs include architecture and design, business, education, engineering, health services administration, law, nursing, public administration, and social work.

#### Nondegree Graduate Study

Many serious students enter graduate studies not intending to obtain a new degree but rather to enhance personal knowledge. They may want to advance in their present career, acquire the background to make a career change, or make up academic deficiencies before entering a degree program. All graduate students, degree or nondegree, enjoy the benefits of cultural and intellectual activities at the university, such as colloquia, seminars, and conferences focusing on the latest scholarship in the field. By consulting with appropriate academic units, students can learn which courses are suitable to their needs.

For admission information and procedures, access the Web site at [www.asu.edu/graduate/admission](http://www.asu.edu/graduate/admission) or refer to the *Application for Graduate Admission* booklet.

**Student Services for Nondegree Students.** The Graduate College maintains an advising office open year-round. See “Graduate Student Support Services,” page 56, for more information.

#### Graduate Studies and University Environment

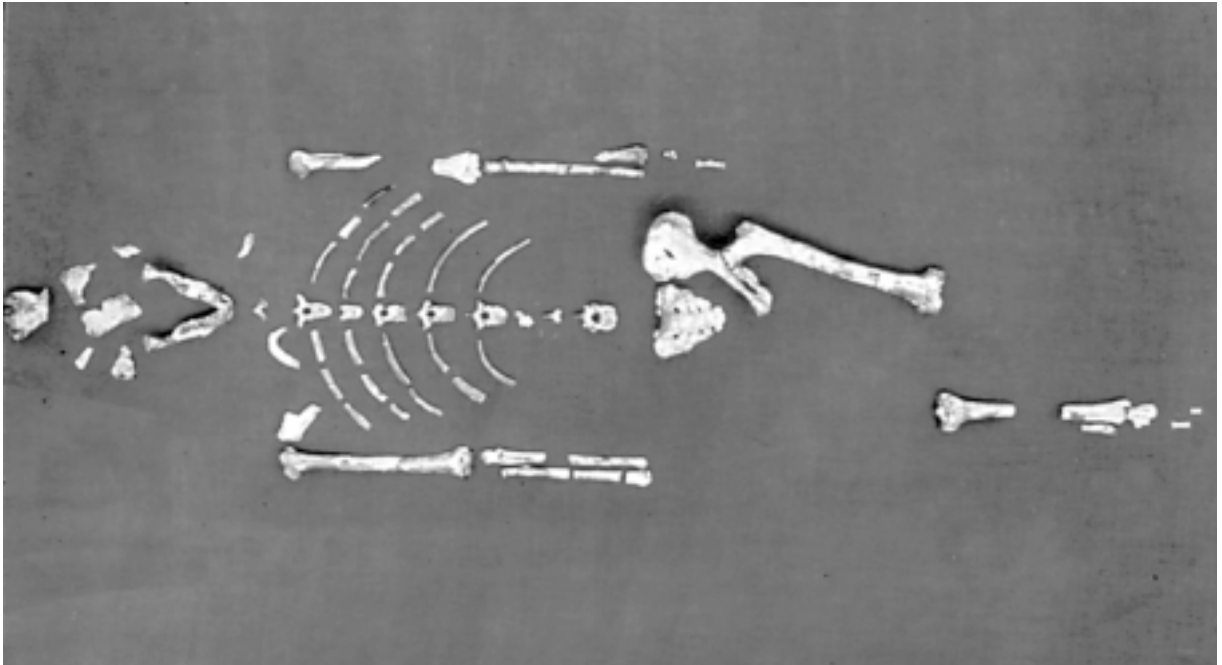
The Graduate College spans the university in supervising graduate studies and offering all postbaccalaureate degrees except the Juris Doctor, which is administered by the College of Law. Since more than 1,600 ASU faculty members teach graduate students in more than 115 instructional units,

the Graduate College works closely with the other colleges and academic units. In most cases, graduate instruction is offered by units that also provide related undergraduate programs.

**Interdisciplinary Study.** Although most graduate programs are offered by academic units, diverse interdisciplinary programs cross academic disciplines and come under the supervision of the Graduate College. Many majors are in fields that are still emerging as recognized academic disciplines and, therefore, do not customarily form the academic basis for departments. Other fields of study are inherently interdisciplinary and do not fit well with conventional disciplines around which departments are formed. Curricula must reflect intrinsically broad disciplinary affinities, and faculty must be drawn from more than one academic unit.

Currently, the Graduate College oversees nine interdisciplinary programs and has joint responsibility with the College of Education for another; several others are planned. Existing programs include the Gerontology Program (Certificate in Gerontology jointly offered by ASU Main and ASU West), Creative Writing (M.F.A.), Curriculum and Instruction (Ph.D.) (jointly administered with the College of Education), Exercise Science (Ph.D.), Justice Studies (Ph.D.), Public Administration (D.P.A.), Science and Engineering of Materials (Ph.D.), Speech and Hearing Science (Ph.D.), Statistics (M.S.), and Transportation Systems (Certificate in Transportation Systems).

Other interdisciplinary degree programs include Communication (Ph.D.) (administered by the College of Public Programs), History and Theory of Art (Ph.D.) (jointly offered



Replicas of the skeletal remains of "Lucy," human fossils dated to just less than 3.18 million years old, part of the collection at the ASU Institute of Human Origins IHO photo

with the University of Arizona (administered by the School of Art), Humanities (M.A.) (administered by the College of Liberal Arts and Sciences), and Molecular and Cellular Biology (M.S., Ph.D.) (administered by the College of Liberal Arts and Sciences).

Each of these programs utilizes resources and faculty from several disciplines. They promote cooperative research and instruction among faculty who share common interests but are housed in different academic units. They allow students to pursue degrees that are intellectually coherent but that bring together diverse strengths of the university. See the "Interdisciplinary Graduate Degrees and Majors Overseen by the Graduate College" table, page 54.

**Interdisciplinary Committee on Linguistics.** Linguistics at ASU is interdisciplinary in nature. The linguistics faculty come from the Departments of Anthropology, Communication, Computer Science and Engineering, English, Languages and Literatures, Philosophy, Psychology, and Speech and Hearing Science and from the College of Education.

The Interdisciplinary Committee on Linguistics coordinates linguistics courses and programs, provides advising, and hosts conferences and lectures.

Faculty from three departments (Anthropology, English, Languages and Literatures) offer programs with concentrations in linguistics: the M.A. in Anthropology, M.A. in English, M.A. in Spanish, and Master of Teaching English as a Second Language.

**Certificate Programs.** A number of certificate programs are offered by various academic units or programs on campus (see "Certificate Programs Offered at ASU Main, East, and West," page 17).

**Research Programs.** ASU continues to advance as a major research institution. The Office of the Vice Provost for Research provides leadership in obtaining external funding and in coordinating and administering sponsored projects. Many graduate students receive financial support and gain first-hand experience as they participate with faculty members in carrying out these research projects.

Much of this work is associated with campus research centers that help to develop proposals, coordinate activities, and bring together in colloquia and conferences students and faculty with common intellectual interests. Such centers include the Center for Solid-State Science, the Manufacturing Institute, the Institute of Human Origins, the Hispanic Research Center, and the Preventive Intervention Research Center. For more information, see "Research Centers, Institutes, and Laboratories," page 34.

**Research Facilities.** The university lends support to research in diverse ways, including extensive facilities for research and instructional programs. Recently built facilities include an architecture building, a fine arts complex, the Goldwater Center for Science and Engineering, an addition to the Life Sciences Center, and the Computing Commons. The Engineering Research Center, built as part of the Engineering Excellence Program, houses advanced facilities such as the Molecular Beam Epitaxy laboratory and a clean room for microelectronic device fabrication. Among other facilities supporting research on campus are the Institute for Studies in the Arts, in the College of Fine Arts; the Facility for High Resolution Electron Microscopy, in the College of Liberal Arts and Sciences; and the Southwest Archaeological Collection, in the Department of Anthropology.

**Library System.** The ASU library system is a major research facility (see "University Libraries and Collections," page 30). It contains more than 3 million volumes of books

and approximately 6.6 million pieces of microforms and subscribes to more than 36,000 journals and serials. Among the nation's research libraries, it is in the top quarter in annual volume acquisition. It is especially strong in amassing current monographs and serials to support graduate programs. Some of the most important research collections include manuscripts and rare photographs on Arizona and Southwest topics and an excellent collection of social science materials on Southwestern and border studies topics, including materials on northwestern Mexico. In the humanities, the main library has a fine collection of literary works and literary criticism from small and major presses in American and English literature. The collection on child drama is also outstanding. A growing rare book and manuscript collection supports the research interests of academic units. The Arthur Young Tax Library emphasizes accounting and law. The Noble Science and Engineering Library is a designated U.S. Patent Depository and as such is one of fewer than 30 U.S. academic libraries to receive copies of all new patents. The entire collection of U.S. patents in microfilm is housed in the Noble Library.

The libraries contain extensive U.S. and Arizona government documents and selected international documents.

Branch libraries provide important specialized collections. The Music Library contains scores and sound recordings. The Architecture and Environmental Design Library houses a nationally recognized set of materials on solar energy and research collections on the work of Frank Lloyd Wright and Paolo Soleri as well as other Arizona architects.

The libraries offer excellent support to researchers interested in electronic information sources. The online library system incorporates the usual catalog to ASU library holdings as well as several other important electronic reference databases and gateways. Bibliographic information on the library holdings can be accessed from any location in the world via a modem-equipped microcomputer.

The library system belongs to the Center for Research Libraries, permitting access to the center's vast collections of materials for extended loan periods.

### **Graduate Student Support Services**

Providing academic and professional development support to graduate students is an important part of the Graduate College mission. Services include advising, individual mentoring for disadvantaged students, and financial support, as well as orientation sessions, workshops, career seminars, and research conferences.

The Graduate College Student Programs/Services maintains a variety of programs specifically for graduate and nondegree students.

**Graduate College Financial Assistance Office.** The Graduate College Financial Assistance Office meets the needs of graduate and professional students. Students may receive financial services at Wilson Hall, without having to visit other offices on campus. Students are offered general information about graduate financial assistance at ASU, may turn in documents, or receive status information on their student loans. Students can also apply for emergency short-term loans or pick up forms to report special circumstances. Staff members are available to help students with financial assistance concerns. Refer to "Financing Graduate Studies," page 47, for a full description of graduate financial support

and services or visit the Web site at [www.asu.edu/graduate/gradaid](http://www.asu.edu/graduate/gradaid).

**Advising and Career/Professional Development.** Many graduate students have questions and concerns about which degree to pursue, how to combine their student roles with parenting, partnering and worker roles, and what to do with their degrees upon graduation. The Graduate College provides the following resources.

*Advising.* The Graduate College's Academic Advising Office supplies general information about policies, procedures, requirements, and support services. Appointments are available throughout the year.

Students with regular admission status should contact their academic unit for degree program advising and program of study planning.

*Career/Professional Development Seminars.* The Graduate College, in conjunction with Counseling & Consultation, offers seminars to groups of graduate students interested in exploring career-related subject matters. Examples of seminar topics are dual career issues, the impact of values on career decision making, and transferable skills.

*Career Planning Services for Graduate Students.* In conjunction with Career Services and Counseling & Consultation, the Graduate College provides a brochure listing numerous career planning services for graduate student needs. This publication is also available at [www.asu.edu/career](http://www.asu.edu/career).

**Diversity Programs.** The Graduate College's Diversity Programs are designed to increase the number of graduate students from groups underrepresented in their chosen field of study. Students interested in these programs must first go to their respective departments for nomination.

*Diversity Assistantship Program (DAP).* The purpose of this merit-based program is to support research and creative activities related to a student's field of study. Nominations are made by departments, and recipients are supervised by a faculty member.

*Academic Support Program (ASP).* The purpose of ASP is twofold: financial assistance and peer mentoring. ASP is available primarily to first-year students: However, departments are asked to provide a student's subsequent funding. The program is based on financial need and the nominations of students by departments. Financial support is provided in the form of a federal work-study to support field-related research that is supervised by a faculty member. For additional academic support, a student meets weekly with an assigned peer mentor who is two or more years advanced in the academic program.

*The Social and Academic Mentor Program.* The Graduate College Social and Academic Mentor (SAM) program is designed to recruit top graduate students from domestic, international, and underrepresented populations. Academic units submit applications to the Graduate College to nominate a first-year student (mentee) and peer mentor match. The mentor, two or more years advanced in the program, promotes the mentee's social and academic integration into graduate school using a structured format. The mentor meets weekly with the mentee and schedules regular monthly meetings with the faculty advisor to discuss the mentee's concerns, progress, accomplishments, or department-related matters.





Exercise Science and Physical Education Professors Charles Corbin, far right, and Robert Pangrazi are renowned experts for their research in the area of children and exercise.

Tim Trumble photo

**Orientations.** Each semester, the Graduate College hosts orientations for new graduate students and teaching assistants (TAs).

In addition to the general orientation, teaching assistants have the opportunity to enrich and enhance their teaching through seminars offered each semester. At least two seminars are mandatory for first-time TAs. Among other topics, TAs can attend sessions on teaching lab sciences, human diversity, critical thinking, classroom management, ethical issues, and multimedia applications in the classroom.

**Workshops for Undergraduate Students Considering Graduate Education.** The Graduate College holds workshops to address the issues that students contemplating graduate study should consider. The purpose of graduate study, the choices among research and professional degrees, the selection of schools to apply to, and the types and sources of financial support are among the topics discussed.

**Student Organizations.** The Graduate Student Council is part of the Associated Students of Arizona State University (ASASU), the student government for the university. The Graduate Research Support Office represents graduate student interests within ASASU and the Office of Student Life. It assists the Graduate College in planning orientations and other student-related activities and funds with the Graduate College small research grants to support graduate students' thesis and dissertation projects. In addition to the council, many other special interest organizations are open to graduate students.

**Format Office.** The thesis, dissertation, or equivalent is the culmination of an important stage of graduate studies. By researching and writing this final work, graduate students are able to show that they have acquired skills essential to a discipline. The Graduate College publishes a *Format Man-*

*ual* as a guide in preparing the master's or doctoral document. For more information, visit [www.asu.edu/graduate/formatmanual](http://www.asu.edu/graduate/formatmanual) on the Web.

**Publications Program.** The Graduate College publishes a number of brochures, fliers, and other items during the year.

#### **Graduate Council**

The Graduate Council establishes general policies for graduate programs and serves as an advisory board to the dean. As part of its duties, the council reviews proposals for new degree programs and concentrations, regularly conducts reviews of established academic programs, and sets policies and general standards for graduate admissions. Sixteen faculty members and one student serve on the council, representing a wide variety of degree programs, with at least one member representing each college in the university. An Academic Senate representative is also elected to serve. Council members are appointed by the president of the university.

#### **Offices of the Graduate College**

The general offices of the college, including those of the dean, admissions, advising, financial assistance, and operations are located on the first floor of Wilson Hall in the center of campus. College offices are open from 8:00 A.M. to 6:00 P.M. Monday through Thursday; 8:00 A.M. to 5:00 P.M. on Friday. The Graduate College may also be contacted by e-mail at [asugrad@asu.edu](mailto:asugrad@asu.edu) or telephone 480/965-3521. The Web address is [www.asu.edu/graduate](http://www.asu.edu/graduate).

# Celebrating 60 Years of Excellence and



*The first three members of the ASU Graduate College Hall of Fame pose with President Lattie Coor and Dean Bianca L. Bernstein. From left: Lorenzo Lisonbee, Jesse Jones, Bianca Bernstein, Lattie Coor, and Steadman Upham. Tim Trumble photo*

ARIZONA STATE UNIVERSITY observed 60 years of graduate education during a celebration titled “So Far, So Fast: 1938–1998.”

Highlights included the inaugural induction ceremony of Graduate College Hall of Fame members, performances and exhibits indicative of graduate education, and a time capsule burial and dedication ceremony.



*Mark Sunkett, African drummer and professor of music, contributed to the festivities of the celebration with his African drumming group. Tim Trumble photo*



*Assistant Professor Pamela Swan takes the pulse of a visitor at the Exercise/Wellness Fitness Monitoring booth. Tim Trumble photo*

*Spectators donned 3-D glasses for a panoramic view of the martian landscape. The photo was taken by Mars Pathfinder, and the image was generated by the ASU Space Photography Laboratory. Tim Trumble photo*





# Innovation in Graduate Education



Above, some of the items symbolic of graduate education in 1998 that were placed in the time capsule (shown right as it was buried). The capsule is to be unearthed in 2038, when ASU celebrates the 100-year anniversary of graduate education.  
Above: Tim Trumble photo  
Right: Dennis Durband photo



Above, Professor of Psychology in Education Robert Strom cuts the ribbon over the plaque at the time capsule dedication ceremony.  
Right, the plaque.  
Above: Tim Trumble photo  
Right: Dennis Durband photo

# College of Architecture and Environmental Design

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**John Meunier, M.Arch.**

Dean

## PURPOSE

The college provides graduate education for professional, research, and academic careers in architecture, design, environmental resource management, and urban planning. Students in the master's programs benefit from small classes, seminars, and studios, from close, individual contact and faculty mentorship, and from an interdisciplinary curriculum. Students and faculty make full use of the Phoenix metropolitan area and the Sonoran region as research bases, and they also profit from strong interaction with the professional communities. The faculty have earned national reputations in energy-efficient design, computer-assisted design, corporate interior design, design for special populations, urban design, and environmental policy. Programs of study, including internship and trainee opportunities, give graduates the best possible start on academic, research, and professional careers.

## ORGANIZATION

The college has three academic units: the School of Architecture, the School of Design, and the School of Planning and Landscape Architecture. The units and their faculty have strong ties with programs and faculty in business, computer science, construction, engineering, fine arts, geography, biological sciences, agribusiness, and public affairs.

## GRADUATE PROGRAMS

The new Ph.D. degree program in Environmental Design and Planning is a collegewide interdisciplinary degree offered by faculty representing the different disciplines comprising the Schools of Architecture, Design, and Planning and Landscape Architecture. Three areas of concentration are available: design; planning; and history, theory and criticism.

Faculty in the College of Architecture and Environmental Design offer six master's degree programs through the Graduate College: a professional program leading to the NAAB accredited degree Master of Architecture (the two-year as well as three-plus-year programs), a professional graduate program leading to the PAB accredited Master of Environmental Planning degree, a research and applications M.S. in Building Design, a M.S. degree in Environmental Resources, and the Master of Science in Design degree in Design with concentrations in graphic design, industrial design, and interior design. Faculty in the School of Architecture offer the Master of Architecture and the M.S. degrees in Building Design. Faculty in the School of Planning and Landscape Architecture offer the Master of Environmental Planning and the M.S. degrees in Environmental Resources. Faculty in the School of Design offer the professional Master of Science in Design degree.

## ADMISSION REQUIREMENTS

Applicants to each of the seven graduate degree programs must meet Graduate College admission requirements, in addition to requirements of the academic unit offering the program. For application requirements and deadlines of the Graduate College, see "Admission to the Graduate College," page 89. For application requirements and deadlines of each program, refer to the specific program section within "Graduate Programs and Courses," page 103.

**Doctor of Philosophy Degree in Environmental Design and Planning.** Applicants to the Ph.D. program must have completed a master's degree in architecture, environmental resources, graphic design, industrial design, interior design, landscape architecture, or planning, or must be able to demonstrate equivalent standing. The degree is structured as a 54-hour postmasters program, and not as an 84-hour post-baccalaureate program. The following test scores are required: Graduate Record Examination scores and Test of English as a Foreign Language (TOEFL) score of at least 600 from applicants whose native language is not English.

**Master of Architecture.** Applicants to the two-year program must have completed a four-year baccalaureate degree with a major in architectural studies or a similar preprofessional degree in architecture. The degree should be from an institution offering a National Architectural Accreditation Board-accredited degree in architecture. Applicants to the three-plus-year program must have completed a four-year baccalaureate degree in any discipline. International applicants whose native language is not English must achieve a TOEFL score of 550 or above.

**M.S. Degree in Building Design.** Students who have completed a professional baccalaureate degree in architecture (five or six years) or a baccalaureate degree in engineering or a related area and wish to pursue advanced study and research may apply for admission to this program. International applicants whose native language is not English must achieve a TOEFL score of at least 550.

**Master of Environmental Planning.** Applicants must hold a baccalaureate degree. International applicants whose native language is not English must achieve a TOEFL score of 550 or above.

**M.S. Degree in Environmental Resources.** Applicants are expected to have completed 18 semester hours in environmental sciences or closely related subjects and hold a baccalaureate degree.

**Master of Science in Design Degree in Design.** Applicants must hold a baccalaureate degree in graphic design, industrial design, interior design, or a related design disci-

## College of Architecture and Environmental Design Graduate Degrees and Majors

Major	Degree	Administered by
Architecture	M.Arch.	School of Architecture
Building Design Concentrations: computer-aided design, energy performance and climate-responsive architecture, facilities development and management	M.S.	School of Architecture
Design Concentrations: graphic design, industrial design, interior design	M.S.D.	School of Design
Environmental Design and Planning Concentrations: design; history, theory, and criticism; planning	Ph.D.	Environmental Design and Planning and Executive Committee
Environmental Planning Concentration: urban planning	M.E.P.	School of Planning and Landscape Architecture
Environmental Resources	M.S.	School of Planning and Landscape Architecture

pline as determined by the School of Design Graduate Program Committee. International applicants whose native language is not English must achieve a TOEFL score of 550 or above.

### SPECIAL PROGRAMS

A concurrent Master of Architecture/Master of Business Administration degree program is available. The School of Architecture offers programs for study in Paris and Italy. Also, a selective summer internship program places highly qualified students in nationally known American firms.

The Master of Environmental Planning program has special ties with the professional planning community and offers students considerable interaction with practitioners in the field, as well as experience in local planning offices and agencies.

The Master of Science in Environmental Resources program often works with state and federal agencies concerned with a range of investigations from hydrology research and shrub control to livestock and wildlife concerns.

All of the master's programs are interdisciplinary in focus and require or strongly recommend course work in other programs, departments, and colleges. Each program works with affiliated and associated faculty from other units within the college. Also, faculty from such areas as geography, engineering, public affairs, business, transportation, environmental studies, and fine arts collaborate with the faculty and graduate students of the college.

### COLLEGE FACILITIES

With the opening of the award-winning expansion to the Architecture building in spring of 1989, the college consolidated its facilities into a single complex and more than doubled the space available for instruction, research, and service activities. Expanded facilities include the library, the shop, studios, faculty and administrative offices, and research facilities. Research and special project rooms include a high-bay research laboratory, a lighting laboratory, community outreach and design excellence studios, a materials resource center, as well as a solar instrumentation laboratory and a rooftop outdoor solar and day lighting testing area. The college is especially proud of its computer facilities and the faculty-graduate student computer research lab-

oratory. The university maintains a computer site in the building and there is a local area network that ties together faculty, studio, and library resources. Emphasis is on mini- and microcomputer modeling, simulation, and design applications (see "Computing Facilities and Services," page 32). Teaching and research activities are also supported by a media center with photography and video services and a slide and media library. Individual studio work space is available to graduate students and the expansion features extensive jury, review, and display space.

As a branch of the university library, the college library is located in the expansion and provides easy access to books, periodicals, and reference materials for students and faculty. The collection includes approximately 30,000 volumes. Special research collections on the work of Paolo Soleri and Frank Lloyd Wright are located in an archival quality special collections suite.

The Gallery of Design is one of eight university galleries and museums. It provides premium space for traveling exhibitions and exhibitions of student and faculty work.

### ADVISING

**Architecture.** Students should contact the graduate secretary for general information about the school's programs and procedures. In addition, a graduate coordinator is available for preadmission and general advising. Upon enrollment, each student is assigned a faculty advisor for continuing assistance. Call 480/965-3536 or e-mail [arch.grad@asu.edu](mailto:arch.grad@asu.edu) for more information.

**Design.** Preadmission information, advising, and continued support are provided by the director of the school and the graduate program coordinator. Call 480/965-4135 or 480/965-4239 for more information.

**Planning.** The school director provides preadmission information and general advising. Each admitted student is initially assigned a faculty advisor but may later select a supervisory chair. This faculty member later serves as a chair of the committee. Call 480/965-7167 for more information.

### ACCREDITATION

In the United States, most state registration boards require a degree from an accredited professional degree

program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit U.S. professional degree programs in architecture, recognizes two types of degrees: the Bachelor of Architecture and the Master of Architecture. (A program may be granted a five-year, three-year, or two-year term of accreditation, depending on its degree of conformance with established educational standards.)

Master degree programs may consist of a preprofessional undergraduate degree and a professional graduate degree, which, when earned sequentially, comprise an accredited professional education. However, the preprofessional degree is not, by itself, recognized as an accredited degree.

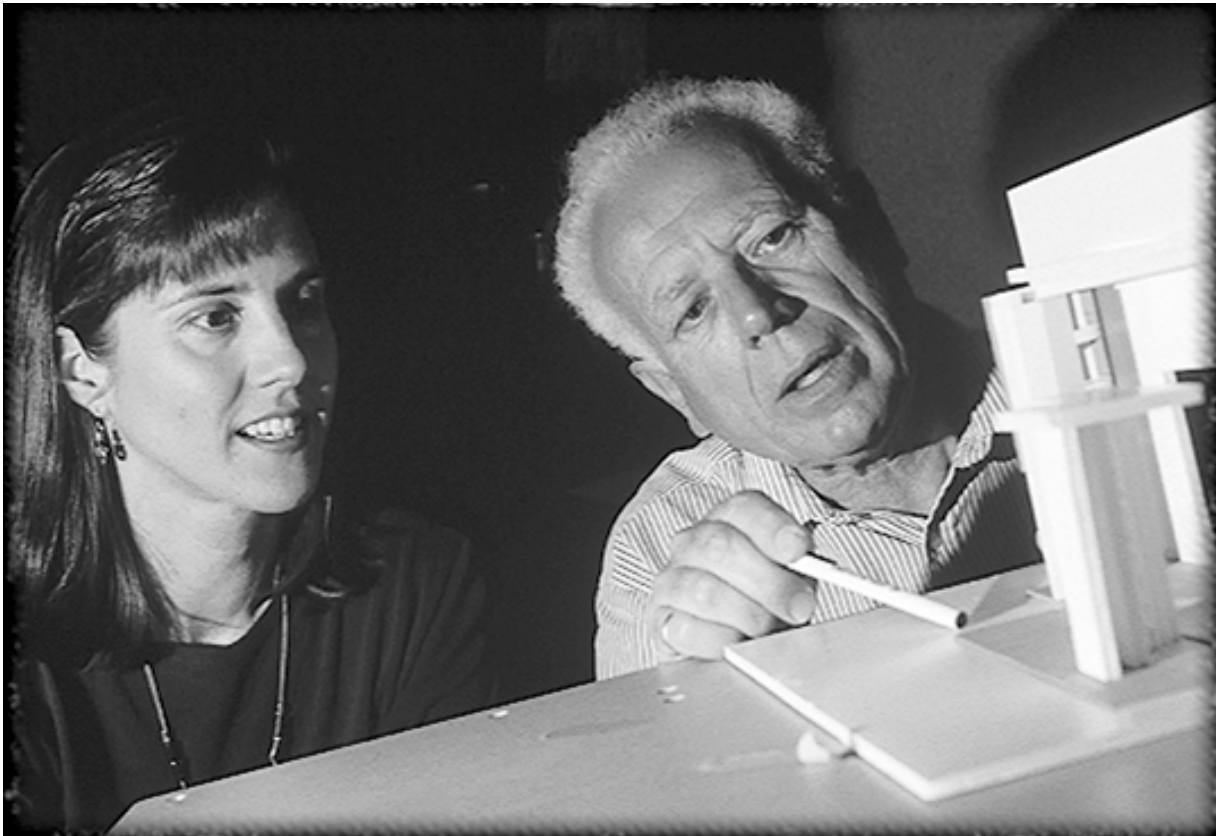
The Master of Architecture program at ASU is fully accredited by the NAAB. The Master of Architecture

requires a minimum of three years of study following an unrelated bachelor's degree or two years following a related preprofessional bachelor's degree. This professional degree is structured to educate those who aspire to registration/licensure as architects.

The School of Architecture is a full member of the Association of Collegiate Schools of Architecture, the Environmental Design Research Association, and the Architectural Research Centers Consortium.

The programs in the School of Planning and Landscape Architecture are affiliated with the Association of Collegiate Schools of Planning and the Council of Educators in Landscape Architecture.

The Master of Environmental Planning program is accredited by the Planning Accreditation Board.



Doctoral student Pat Olsen, left, observes a model with Regents' Professor of Architecture Jeffrey Cook.

Tim Trumble photo

# College of Business

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Larry E. Penley, Ph.D.

Dean

## PURPOSE

The College of Business is a professional school that pursues excellence in instruction and research. The pursuit of excellence in programs of instruction implies that the college admits only students who are especially well qualified for the study of business and who will, upon graduation, compete successfully for highly desirable positions, both nationally and internationally.

The mission of the College of Business is to expand the knowledge of business and to educate men and women for managerial leadership through research activities and professional educational programs that address issues of importance to future managers in a world characterized by racial, cultural, and gender diversity in the work force; demands for continuous improvements in quality; growing technological sophistication; and globalized markets.

The College of Business is a comprehensive research school of business that selects and retains faculty based on their ability to use their teaching and research skills to fulfill its mission.

The College of Business, through its research support, its Seidman Institute programs and centers, and its doctoral programs develops knowledge that is important to managers and the management of organizations. It endorses joint research projects that are not only supported by business but include managers as partners in the research objectives, process, and outcomes.

The College of Business anticipates that its mission will lead to research and professional degree programs that will result in its being recognized among the top schools of business in the U.S. Strategies to achieve its mission include an emphasis on the M.B.A. degree, increasing its quality such that it is competitive with the best 25 programs found at other large public schools of business, and developing a curriculum that incorporates the knowledge, skills and abilities identified in the mission of the college.

Strategies also include, relative to the doctoral program, raising admission standards, increasing stipends, assuring that students possess the teaching and research skills necessary for placement at peer schools of business. Consistent with the mission, an additional strategy is to improve retention and graduation rates of minority students through programs at the M.B.A. and doctoral levels.

Finally, the college will, through its Seidman Institute, increase the level of funded research by adding support services to facilitate grant preparation and by clarifying the mission of research centers as liaisons between faculty and businesses.

## ORGANIZATION

The college's seven academic units and several centers serve more than 1,400 graduate students enrolled in eight graduate degree programs. Academic units contributing to graduate offerings include the School of Accountancy and

Information Management, the School of Health Administration and Policy, and the Departments of Economics, Finance, Management, Marketing, and Supply Chain Management. The Seidman Institute serves as the college's focal point for applied research, and several centers are organized in conjunction with the Seidman Institute: the Arizona Real Estate Center, the Bank One Economic Outlook Center, the Center for Advanced Purchasing Studies, the Center for Business Research, the Center for Services Marketing and Management, and the Lincoln Center for Ethics.

## GRADUATE PROGRAMS

The M.B.A. program is the premier professional degree in the College of Business. The college offers the traditional full-time program, an Executive M.B.A. program, an evening program for working managers, and a program for high technology professionals at the ASU Research Park. The faculty also offer the Ph.D. degree in Economics and in Business Administration, with concentrations in accountancy, finance, health services research, information management, management, marketing, and supply chain management. Other master's offerings include the Master of Accountancy and Information Systems, Master of Health Services Administration, and M.S. degrees in Information Management and in Economics, an interdisciplinary program leading to a M.S. degree in Statistics, and the Master of Taxation.

## ADMISSION REQUIREMENTS

Applicants to all degree programs must meet the minimum Graduate College academic requirements. Acceptance is based on the applicant's previous college record, all relevant data provided with the application, and scores from the Graduate Management Admission Test or the Graduate Record Examination (GRE). GRE scores are required for the Economics programs only. Some degree programs require the submission of a statement of purpose from applicants and letters of recommendation. In addition, Test of English as a Foreign Language and Test of Spoken English scores are required of international applicants whose native language is not English.

## SPECIAL PROGRAMS

**Dual/Concurrent Degree Programs.** The College of Business and the American Graduate School of International Management (Thunderbird) have developed a dual degree and cross-registration graduate program for students interested in both business administration and international management. Thunderbird is an internationally recognized private graduate school, located in the Phoenix metropolitan area, offering course work in international studies, modern languages and world business. The dual degree program is designed to allow a limited number of qualified graduate students to pursue a Master of Business Administration

### College of Business Graduate Degrees and Majors

Major	Degree	Administered by
Accountancy and Information Systems	M.A.I.S.	School of Accountancy and Information Management
Business Administration	M.B.A.	College of Business
Business Administration Concentrations: accountancy, finance, health services research, <sup>1</sup> information management, management, marketing, supply chain management	Ph.D.	College of Business
Economics	M.S., Ph.D.	Department of Economics
Health Services Administration	M.H.S.A.	School of Health Administration and Policy
Information Management	M.S.	School of Accountancy and Information Management
Statistics	M.S. <sup>2</sup>	Committee on Statistics
Taxation	M.Tax.	School of Accountancy and Information Management

<sup>1</sup> Applications for this program are not being accepted at this time.

<sup>2</sup> This program is administered by the Graduate College. See "Graduate College," page 53.

(M.B.A.) degree at ASU and a Master of International Management (M.I.M.) degree at Thunderbird. Consequently, students in the dual degree program may earn their degrees earlier than those who pursue the degrees separately. Applicants must be regularly admitted to both the M.B.A. and M.I.M. programs and must petition for acceptance into the dual degree program through the school of initial attendance. Dual degree program participants and regularly admitted full-time students in the M.B.A. program may petition to take selected course work at Thunderbird at no additional tuition fees after completion of one year and prerequisites for Thunderbird are complete.

The College of Business and the Groupe Ecole Supérieure de Commerce Toulouse have developed a dual degree program for students interested in business administration and international management. Call 480/965-3332 for more information.

The college also offers the following concurrent degrees: Master of Business Administration/Master of Architecture, Master of Science in Economics/Juris Doctor, Master of Business Administration/Master of Science in Economics, Master of Business Administration/Juris Doctor, Master of Business Administration/Master of Health Services Administration, Master of Health Services Administration/Juris Doctor, and Master of Health Services Administration/Master of Science in Nursing, Master of Business Administration/Master of Science in Information Management, Master of Business Administration/Master of Accountancy and Information Systems.

Separate applications are required for each degree and each application is reviewed independently. It is recommended that the student apply simultaneously to both of the dual/concurrent degree programs. The M.B.A./J.D. is best completed by attending one year in the law school, then attend the M.B.A. program after the first or second year, and finally return to the law school to complete the third year. Students will not be admitted from the law school after the third year.

#### INSTITUTES/RESEARCH CENTERS

**L. William Seidman Research Institute.** The L. William Seidman Research Institute encourages, promotes, and supports multidisciplinary, cross-disciplinary, and applied

research on a wide range of business topics. The institute serves as the "port-of-entry" for applied business research in the College of Business as well as an incubator to transfer knowledge to the business community. The institute also acts as a facilitator for postdoctoral, continuing, and executive business education that is taught by ASU faculty and contributes funding for operations.

**Arizona Real Estate Center.** The Arizona Real Estate Center collects and analyzes data concerning the multifaceted real estate market to provide insight into solutions for problems confronting the real estate industry.

**Bank One Economic Outlook Center.** The Bank One Economic Outlook Center serves as the economic forecasting unit of the college and is responsible for the publication of the Arizona Blue Chip, Western Blue Chip, and Blue Chip Job Growth Update. The center sponsors seminars and workshops on the national and regional economies.

**Center for Advanced Purchasing Studies.** The Center for Advanced Purchasing Studies is a national affiliation agreement between the College of Business at ASU and the National Association of Purchasing Management. The center conducts in-depth research into the problems facing the purchasing profession today and the requirements of the future.

**Center for the Advancement of Small Business.** Endowed with private funding, the center's mission is to enhance the formation and management of small- and medium-size companies to enable them to compete in the global economy of the 21st century. The primary goal is to ensure that ASU students from all disciplines are provided with programs that prepare them for positions of leadership in small- and medium-size businesses.

**Center for Business Research.** The Center for Business Research collects, analyzes, and disseminates information on the economy and business climate of Arizona. Analyses of Gross State Product, prices, income, employment, and demographic data for Arizona are made available to business and the general public. The center coordinates interdisciplinary sponsored-research efforts to provide useful infor-

mation to business and a learning experience for students and faculty researchers.

**Center for Services Marketing and Management.** The Center for Services Marketing and Management is North America's leading university-based center for the study of services marketing and management. The center conducts extensive research in the field, offers specialized education and training to services executives, and provides the latest services information to organizations engaged in banking, insurance, health care, tourism, transportation, and other service industries. Its charter members include some of America's foremost services firms and nonservices firms that are using service and quality as a competitive edge.

**Joan and David Lincoln Center for Ethics.** The Joan and David Lincoln Center for Ethics conducts research and offers educational programs on ethical issues in business, government, and the professions.

**Manufacturing Institute.** The Manufacturing Institute is a joint venture of the College of Business and the College of Engineering and Applied Sciences, established to enhance manufacturing research and industrial collaboration at the interface between the two colleges. The mission of the institute involves integrating aspects of manufacturing in both the business and engineering areas, helping to fulfill ASU's goal of becoming one of the leading educational and research institutions in both manufacturing enterprise and manufacturing process technology issues.

**Dean's Council of 100.** The Dean's Council of 100, a prestigious group of area business leaders, represents the college's innovative partnership between business and education. A major goal of the council is development of private support for the priority needs of the College of Business. Membership is by invitation only.

**Economic Club of Phoenix.** The Economic Club of Phoenix is composed of business, labor, government, and academic leaders who recognize that, as frontrunners in one of the nation's fastest-growing metropolitan areas, they need information and access to expertise to deal effectively with rapid economic changes. Its programs bring current and future leaders together and provide them with the opportunity to meet and hear influential speakers.

**Council of Emeritus Advisers.** The Council of Emeritus Advisers founded by the College of Business and Dean's Council of 100, is a select group of retired executives who advise the dean and invite nationally known experts to Arizona as visiting scholars, lecturers, and speakers.

**Dean's Board of Excellence.** The Dean's Board of Excellence is composed of young business and community leaders committed to promoting excellence by awarding outstanding student and faculty performance. The Dean's Board of Excellence also enhances relations between the college and the business community through a discussion forum and communications with the dean.

**M.B.A. Council.** The M.B.A. Council plays an active role in linking students with alumni to enhance the M.B.A. student experience. The M.B.A. Council also assists to unite alumni and promote the national reputation of the M.B.A. program.

**Washington Campus.** The Washington Campus program at Georgetown University provides graduate business students with an in-depth understanding of the federal government and its relationship to the business community. ASU is one of 17 select universities that offer this unique opportunity. Participants earn graduate credit, observe the intricacies of national politics, and enjoy the excitement of the nation's capital. Competitive scholarships are available to business graduate students to cover the costs of lodging, meals, and instructional expenses.

## COLLEGE FACILITIES

The College of Business offers one of the most modern and sophisticated environments available for professional graduate study. The college facilities provide attractive and comfortable classrooms, computer systems, study areas, a television studio, modern auditoriums, and a graduate student reading room and lounge. Both mainframe interactive and networked microcomputer facilities are available to graduate students throughout the two business buildings. Refer to "Computing Facilities and Services," page 32.

### Black Student M.B.A. Association

The Black M.B.A. Association is an organization of ASU M.B.A. students dedicated to enhancing the educational experience of its members, promoting attributes of the M.B.A. program to the local business community, promoting awareness within the African American community of business, education, and economic development, and assisting the development of career opportunities for its members.

### Collegiate Volunteer Council

The Collegiate Volunteer Council (CVC) was created to foster volunteerism incorporating the assistance of students, faculty, and staff. Its goal is to provide value-added contributions to the community by assisting those in need. Traditional projects have included volunteering at the Special Olympics, the Papago Park Clean-up, the Jingle Bell Run for Arthritis, and holiday food and toy drives.

### Graduate Women in Business

The purpose of the Graduate Women in Business (GWB) is to promote the professional and personal development of women graduate students. As part of the National Network of Graduate Business School Women, GWB provides a link among women graduates in accredited business programs nationwide. The ASU chapter is open to men as well as women and offers activities and seminars in professional development and gender issues.

### Hispanic M.B.A. Student Association

The Hispanic M.B.A. Student Association (HMBASA) was created to meet the needs of Hispanic M.B.A. students. Members participate in a wide range of community services, coordinate a variety of professional development programs, and are offered the opportunity to become members of HMBASA's professional affiliated organization, the National Society of Hispanic MBAs. All M.B.A. students are encouraged to join and participate in HMBASA activities.

### International Business Association—I.B.A.

The primary mission of the International Business Association (IBA) is to assist M.B.A. students in acquiring the substantive knowledge, job-search skills, and personal con-



tacts necessary to enter and prosper in the international business field. IBA conducts seminars and panel discussions on important international business topics. These events—which generally are open to students, faculty, and others—address topics such as global or regional economic issues, cultural conflicts in cross-border activities, and job hunting strategies.

### **Masters Consulting Group**

The Masters Consulting Group (MCG) is a fully incorporated, nonprofit organization run solely by M.B.A. students. MCG provides opportunities for M.B.A. students to work as professional consultants in different functional specialties. Thus, students can complement their course work with real world experience.

### **M.B.A. Asia Student Association**

The MBAsia is a professional and social organization focused on promoting Pacific Rim opportunities for graduate business students. It strives to offer an exchange of learning through seminars, panel discussions, and conferences open to the whole community. MBAsia is also a forum for global, cultural, social interaction at events such as the monthly Asian Lunches and the semiannual Asian Dinner. Membership is open to any graduate business student with an interest in the Pacific Rim.

### **M.B.A. Association**

The M.B.A. Association at ASU is an independent, professional organization whose purpose is to provide a fully recognized, formally structured representative body through

which M.B.A. students may act or communicate in concert on items of interest. The M.B.A. Association sponsors an intensive agenda of experiences outside the classroom which include leadership development activities, executive presentations, career enhancement seminars, and social events.

### **M.B.A. Student Ambassadors**

The ASU M.B.A. Student Ambassadors are dedicated to promoting, developing, and participating in the community relations and recruitment activities of the M.B.A. Program. The ambassadors interact with many different groups including students, alumni, faculty, and administrative staff.

### **ADVISING**

Information sessions are held daily (Monday, Wednesday, and Friday at 10:00 A.M. and Tuesday and Thursday at 2:00 P.M.) in the M.B.A. Program Office, BA 140. M.B.A. brochures may be obtained at the office, call 480/965-3332, or e-mail at [asu.mba@asu.edu](mailto:asu.mba@asu.edu).

### **ACCREDITATION**

The College of Business and its School of Accountancy and Information Management are accredited by the American Assembly of Collegiate Schools of Business (AACSB). The AACSB is the recognized accrediting agency in the field of business education. The School of Health Administration and Policy is accredited by the Accrediting Commission on Education for Health Services Administration.



Water fountain near the College of Business

Tim Trumble photo



# College of Education

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**David C. Berliner, Ph.D.**

Dean

## **PURPOSE**

The College of Education is committed to the development of innovative programs that prepare graduate students for leadership roles in solving educational problems. The college provides a stimulating, challenging forum in which research and practice are viewed as essential and complementary. Faculty members are dedicated to producing quality scholarship and research that lead to excellence in teaching, professional practice, and administration of educational institutions.

## **ORGANIZATION**

The College of Education is organized into three divisions.

### **Division of Curriculum and Instruction**

Nicholas R. Appleton, Director  
(ED 409) 480/965-1644  
E-mail: karen.schultz@asu.edu

#### *Program Areas*

Early Childhood Education  
Educational Media and Computers  
Elementary Education  
Multicultural Education  
Reading and School Library Science  
Secondary Education  
Special Education

*Degrees:* M.A., M.Ed., Ed.D., Ph.D.

Graduate programs offered by faculty of the Division of Curriculum and Instruction, through the Graduate College, prepare students for positions in schools, colleges, universities, government agencies, and public or private organizations. Graduates work as educational leaders, researchers, media and computer specialists, and librarians. This division offers programs that prepare students for Arizona State teacher certification in the following areas: special, elementary, or secondary education. It is designed for students who have graduated from accredited colleges or universities with majors other than education. If desired, a master's degree may be pursued concurrently with teacher certification.

The M.A., M.Ed., and Ed.D. degrees in Curriculum and Instruction offer areas of concentration in bilingual education, communication arts, early childhood education, elementary education, English as a second language, Indian education, mathematics education, multicultural education, reading education, science education, secondary education, and social studies education. The Ed.D. also offers a concentration in curriculum studies.

The division is committed to research. Members of the faculty edit several national, scholarly journals, publish and present research papers, and direct funded research. Faculty members encourage and assist graduate students in conducting research, writing for publication, and making presenta-

tions at professional conferences. Particular research interests of the faculty are noted under each degree major.

### **Division of Educational Leadership and Policy Studies**

Mary Lee Smith, Interim Director  
(ED 108) 480/965-6248  
E-mail: delps@asu.edu  
<http://tikkun.ed.asu.edu/elps>

#### *Program Areas*

Education Policy Studies  
Educational Administration and Supervision  
Higher and Postsecondary Education

*Degrees:* M.A., M.Ed., Ed.D., Ph.D.

Graduate programs in this division are designed to develop leaders, researchers, and policy analysts for careers in schools, colleges, and private and government agencies. Graduates will be able to examine educational institutions, theories, and practices within broad economic, historic, political, social, and intellectual contexts in this country and abroad.

Two basic emphases exist within the division's programs. One strand focuses on the administration and policies of educational practices from preschool through secondary education. The other strand focuses on the administration and policies of postsecondary education. Specific details of these strands are given under the headings of the degree offerings in Educational Administration and Supervision, Educational Leadership and Policy Studies, Higher and Postsecondary Education, and Social and Philosophical Foundations.

Faculty within the division are involved in both data-based and theoretical research. Qualitative and quantitative paradigms are employed. Students have the opportunity to work on research projects in the College of Education and in school districts and educational agencies throughout the country.

### **Division of Psychology in Education**

Elsie Moore, Director  
(EDB 301) 480/965-3384  
E-mail: dpe@asu.edu

#### *Program Areas*

Counseling Psychology  
Counselor Education  
Learning and Instructional Technology  
Lifespan Developmental Psychology  
Measurement, Statistics, and Methodological Studies  
School Psychology

*Degrees:* M.A., M.Ed., M.C., Ph.D.

All program areas within this division strongly emphasize research activities. Areas of concentration within Educational Psychology include lifespan developmental psychol-

ogy; measurement, statistics, and methodological studies; and school psychology. The Ph.D. program in Counseling Psychology and Educational Psychology concentration in school psychology are accredited by the American Psychological Association and are based upon the scientist-practitioner model. The Master of Counseling program in community counseling is accredited by the Council for the Accreditation of Counseling and Related Educational programs (CACREP).

Members of the faculty are actively involved in a variety of research and other scholarly activities, including basic and applied educational research, editing and reviewing for a number of refereed journals, publishing and presenting research papers, and seeking external funding for research projects. The faculty encourage and assist graduate students' research, publications, and presentations at professional conferences. Particular research interests of the faculty are noted under each degree major.

## GRADUATE PROGRAMS

The College of Education offers degrees for the practitioner and for the academic researcher. The Master of Education and the Doctor of Education are designed for teachers and other practitioners working directly with students and schools. The Master of Counseling is designed to prepare helping professionals for work in a variety of counseling settings. The M.A. and Ph.D. degrees are designed for persons interested in careers in universities and other research settings. The M.A. and Ph.D. programs emphasize theory development, research methods, and acquisition of a broad base of knowledge about education, as well as in-depth knowledge of a chosen field of specialization.

The Interdisciplinary Committee on Curriculum and Instruction offers an interdisciplinary graduate program leading to the Ph.D. degree in Curriculum and Instruction. Areas of concentration are as follows: curriculum studies, early childhood education, educational media and computers, elementary education, English education, exercise and wellness education, music education, physical education, reading education, science education, and special education. The interdisciplinary committee sets guidelines and supervises programs of study, while an executive committee, appointed by the Dean of the College of Education and the dean of the Graduate College, has primary responsibility for the operation of the program. It is composed of faculty representing the various concentrations.

Most graduate programs of the College of Education include a core of courses designed to give students an understanding of the context of American education and of the methods of scholarship by which the understanding of the educational system is deepened.

Core course requirements along with specific requirements for the various types of degrees are given under the appropriate majors. The table presents a summary of those degrees authorized by the Arizona Board of Regents. Contact the division offices for further information about degrees offered through each faculty group. Several of the degrees have various concentrations.

## ADMISSION REQUIREMENTS

Applicants must meet the general admission requirements established by the Graduate College. For the M.Ed.

and M.C. degrees, test scores from the Miller Analogies Test or the Graduate Record Examination are required.

Individual divisions or programs may have admission standards higher than these minimums. Also, some units are limited by the number of faculty members or resources they have, and in keeping with the college's goals of providing a high quality education for all enrolled students, only a small proportion of the qualified students who apply are admitted. Students should consult the division director or program coordinator for specific admission requirements.

## SPECIAL PROGRAMS

Research and services to students and the community are provided through two centers authorized by the Arizona Board of Regents: the Center for Bilingual Education and Research and the Center for Indian Education. The College of Education offers graduate course work pertaining to the development and education of children and youth from diverse cultural, linguistic, and racial/ethnic populations. Faculty affiliated with multicultural education are actively involved in research related to effective schooling for children of Hispanic American and American Indian heritage, parents as partners in education, bilingual education, and English as a second language.

The college's Technology Based Learning and Research Facility conducts research activity related to software evaluation and the use of microcomputers in schools.

## CERTIFICATION AND ENDORSEMENT

Postbaccalaureate programs that lead to initial teaching certification are designed for people who hold bachelor's degrees in areas other than education. Postbaccalaureate programs are available in one of the following areas: elementary education, principalship, secondary education, special education, superintendent, and supervisor. Programs to earn endorsements, which are added to teaching certificates, include bilingual education, educating the gifted, library science, middle school education, reading, and teaching English as a second language. Programs that prepare students for certification by the State as a school counselor are offered by the Counselor Education Program.

## COLLEGE FACILITIES

In addition to the special programs mentioned earlier, other administrative units and centers provide services to students and the community. These include the College of Education Preschool, which provides young children a variety of learning experiences designed to encourage the development of thinking skills, intellectual curiosity, creative expression, and the foundation upon which academic skills will later be built. The preschool provides on-site observation opportunities for students preparing to become early childhood teachers, serves as a model preschool program for early childhood educators, and provides an opportunity for researchers to investigate how very young children grow and develop in an environment that encourages their personal and intellectual development.

The Arizona Educational Information System (AEIS) offers member school districts a computerized information retrieval system with access to thousands of educational topics.

The Center for Academic Precocity provides academic services to intellectually advanced students in grades K-12.

## College of Education Graduate Degrees and Majors

Major	Degree	Administered by
Counseling	M.C.	Division of Psychology in Education
Counseling Psychology	Ph.D.	Division of Psychology in Education
Counselor Education	M.Ed.	Division of Psychology in Education
Concentration: counseling and student personnel		
Curriculum and Instruction	M.A., M.Ed.	Division of Curriculum and Instruction
Concentrations: bilingual education, communication arts, early childhood education, elementary education, English as a second language, Indian education, mathematics education, multicultural education, <sup>1</sup> reading education, science education, secondary education, social studies education		
Curriculum and Instruction	Ed.D.	Division of Curriculum and Instruction
Concentrations: bilingual education, communication arts, curriculum studies, early childhood education, elementary education, English as a second language, Indian education, mathematics education, multicultural education, <sup>1</sup> reading education, science education, secondary education, social studies education		
Curriculum and Instruction	Ph.D. <sup>2</sup>	Interdisciplinary Committee on Curriculum and Instruction
Concentrations: curriculum studies, early childhood education, educational media and computers, elementary education, English education, exercise and wellness education, music education, physical education, reading education, science education, special education		
Educational Administration and Supervision	M.Ed., Ed.D.	Division of Educational Leadership and Policy Studies
Educational Leadership and Policy Studies	Ph.D.	Division of Educational Leadership and Policy Studies
Educational Media and Computers <sup>1</sup>	M.Ed.	Division of Curriculum and Instruction
Concentration: business education		
Educational Psychology	M.A., M.Ed.	Division of Psychology in Education
Educational Psychology	Ph.D.	Division of Psychology in Education
Concentrations: lifespan developmental psychology; measurement, statistics, and methodological studies; school psychology		
Higher and Postsecondary Education	M.Ed., Ed.D.	Division of Educational Leadership and Policy Studies
Concentration: higher education		
Learning and Instructional Technology	M.A., M.Ed.	Division of Psychology in Education
Learning and Instructional Technology	Ph.D.	Division of Psychology in Education
Concentrations: instructional technology, learning		
Social and Philosophical Foundations of Education	M.A.	Division of Educational Leadership and Policy Studies
Special Education	M.A.	Division of Curriculum and Instruction
Special Education	M.Ed.	Division of Curriculum and Instruction
Concentrations: gifted, mildly handicapped, multicultural exceptional, severely/multiply handicapped		

<sup>1</sup> Applications for this program are not being accepted at this time.

<sup>2</sup> This program is administered jointly by the College of Education and the Graduate College. See "Graduate College," page 53.

These services include individual assessment, talent identification, and a variety of courses.

The Counselor Training Center provides counseling for ASU students, faculty, staff, and the community-at-large in personal and career development, stress management, and marriage and family issues. Counseling is conducted by graduate students in Counseling and Counseling Psychology under the supervision of certified psychologists.

Other units within the college offering specialized research and educational services include the Office of Field Services; the Office of Diversity, Recruitment and Support Programs; and instructional resource libraries and collections in a number of curricular areas.

### ADVISING

General career advising in a program area can be obtained by contacting the director of the division or the

coordinator of the program area in which a degree program is offered. After admission to a degree program, specific advice related to degree activities is provided by supervisory committees.

### ACCREDITATION AND AFFILIATION

The Ph.D. programs in Counseling Psychology and Educational Psychology concentration in school psychology are accredited by the American Psychological Association. The school psychology program is also approved by the National Association of School Psychologists. The Master of Counseling is accredited by the Council for Accreditation of Counseling and Related Educational Programs (CACREP). The College of Education is approved by the State Board of Education (Arizona). The college is affiliated with the University Council for Educational Administration, The Holmes Partnership, and is a member of AACTE.



Classes using instructional television give students several convenient options. Some classes can be viewed at the Downtown Center, ASU East, or ASU West sites; at home via cable TV; or on closed-circuit systems at Phoenix-area corporations.

# College of Engineering and Applied Sciences

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**Peter E. Crouch, Ph.D.**

Dean

## **PURPOSE**

Faculty in the College of Engineering and Applied Sciences offer opportunities for graduate study through the Del E. Webb School of Construction and the School of Engineering. Degrees offered include the Master of Science in Engineering, the M.S. in the fields of engineering and computer science, the Master of Computer Science, the M.S. degree in Construction, and the Ph.D. in the fields of engineering and computer science.

The primary purpose of a graduate education is to provide the student with advanced training for a professional, teaching, or research career. The graduate program in the School of Engineering is designed to bridge the gap between knowledge of engineering sciences and creative engineering practice, while at the same time increasing the student's depth and breadth of knowledge in an area of emphasis. The performance of scholarly research and the acceptance of professional responsibility for the documented results are considered essential requirements for graduate degrees and entrance into professional careers.

Information about the College of Engineering and Applied Sciences can be accessed via the World Wide Web at [www.eas.asu.edu](http://www.eas.asu.edu). The individual department and research program Web pages may also be accessed through this main address.

## **ORGANIZATION**

The College of Engineering and Applied Sciences is organized as follows:

Del E. Webb School of Construction

### **School of Engineering**

Department of Chemical, Bio, and Materials Engineering

Department of Civil and Environmental Engineering

Department of Computer Science and Engineering

Department of Electrical Engineering

Department of Industrial and Management Systems  
Engineering

Department of Mechanical and Aerospace Engineering

Each academic unit, headed by a chair or director, offers various undergraduate and graduate degree programs. Faculty from these academic units participate in the research programs offered through the college research centers as well as individual laboratories and facilities. Drawing on the interests, strengths, and resources of academic units in the College of Engineering and Applied Sciences and other schools and colleges within the university, interdisciplinary research centers coordinate research, sponsor conferences and continuing education courses, and serve as liaison between the academic and industrial or technical communities.

## **ADMISSION REQUIREMENTS**

Applicants must meet the general admission requirements established by the Graduate College. Additional supporting materials may be required by individual academic units. These materials may include test scores from the Graduate Record Examination, letters of recommendation, and statements of educational and professional goals. International applicants whose native language is not English must also submit Test of English as a Foreign Language (TOEFL) scores. See the requirements listed under each major in this catalog for specific TOEFL information.

General information on admission, expenses, and other such topics may be obtained from the Office of the Associate Dean for Academic Affairs via the college's Web site at [www.eas.asu.edu](http://www.eas.asu.edu) or by e-mail at [asuengr@asu.edu](mailto:asuengr@asu.edu). Specific questions on a program should be addressed to the academic unit.

## **GRADUATE PROGRAMS**

Through the Graduate College, faculty in the College of Engineering and Applied Sciences offer various graduate programs leading to the M.S., Master of Engineering, Master of Computer Science, and Ph.D.

The college is committed to becoming a nationally prominent center for graduate research. Faculty members conduct research on government or industry-sponsored programs in such areas as aerodynamics, biotechnology, computer design, computer-integrated manufacturing, environmental fluid dynamics, innovative engineering education, microelectronics manufacturing, power systems, semiconductor materials and devices, signal processing, solar energy, solid-state electronic devices, structural dynamics, telecommunications, thermosciences, and transportation systems. The research activities of the academic units within the college are complemented and supported by the work of centers for research and development.

The Center for Low Power Electronics has the following areas of technical focus:

1. basic materials, alternative materials and their fabrication;
2. device design optimization;
3. design of digital, analog and hybrid low power circuits; and
4. power-based physical design for single and multi-chip VLSI systems.

Faculty and graduate students in the college participate in programs of the Center for Solid-State Electronics Research, coordinating the work of researchers from various units. The center emphasizes the development of solid-state electronics research and teaching and facilitates interaction

**College of Engineering and Applied Sciences Graduate Degrees and Majors**

<b>Major</b>	<b>Degree</b>	<b>Administered by</b>
<b>School of Engineering</b>		
Aerospace Engineering	M.S., M.S.E., Ph.D.	Department of Mechanical and Aerospace Engineering
Bioengineering	M.S., Ph.D.	Department of Chemical, Bio, and Materials Engineering
Chemical Engineering Concentrations: biomedical and clinical engineering, chemical process engineering, chemical reactor engineering, energy and materials conversion, environmental control, solid-state processing, transport phenomena	M.S., M.S.E., Ph.D.	Department of Chemical, Bio, and Materials Engineering
Civil Engineering	M.S., M.S.E., Ph.D.	Department of Civil and Environmental Engineering
Computer Science	M.C.S., M.S., Ph.D.	Department of Computer Science and Engineering
Electrical Engineering	M.S., M.S.E., Ph.D.	Department of Electrical Engineering
Engineering	M.E.	Tri-University Coordinating Board (ASU, NAU, UA) <sup>1</sup>
Engineering Science	M.S., M.S.E., Ph.D.	School of Engineering
Industrial Engineering	M.S., M.S.E., Ph.D.	Department of Industrial and Management Systems Engineering
Mechanical Engineering	M.S., M.S.E., Ph.D.	Department of Mechanical and Aerospace Engineering
Science and Engineering of Materials Concentrations: high-resolution, nanostructure analysis, solid-state device materials design	Ph.D. <sup>2</sup>	Committee on the Science and Engineering of Materials
<b>Del E. Webb School of Construction</b>		
Construction Concentrations: construction science, facilities, management	M.S.	Del E. Webb School of Construction

<sup>1</sup> This is a collaborative program offered by the three state universities.

<sup>2</sup> This program is administered by the Graduate College. See page "Graduate College," page 53.

with the electronics industry. The center operates modern, sophisticated research facilities, organizes colloquia and symposia, collaborates with external researchers, and sponsors visiting professorships.

The Center for Professional Development coordinates continuing education services for the local, national, and international technical community, sponsoring conferences, seminars, institutes, and short courses for professionals in the rapidly changing fields of science and technology. The center also coordinates distance-learning and media-delivered programs via television, satellite, and Web connections.

The College of Engineering and Applied Sciences serves the high technology community through the Interactive Instructional Television Program. The system allows employees of participating companies to attend graduate-level courses, special interest seminars, and video teleconferences without leaving their place of employment. In cooperation with the National Technological University, the college also provides instruction via satellite.

The college's Telecommunications Research Center focuses, plans, and promotes the research activities of the faculty with interests in antennas, propagation, and scatter-

ing; microwave circuits, devices, and measurements; optical communications; signal processing; and switching and data communications. The center conducts research, develops technologies, and provides educational programs. Industrial and multidisciplinary programs are encouraged. The center operates modern research laboratories, including an excellent, spacious electromagnetic anechoic chamber.

The Manufacturing Institute was established to broaden the scope of manufacturing research in the university to include research at the interface between the College of Business and the College of Engineering and Applied Sciences as well as research in manufacturing processes. The institute has codirectors from both colleges and also enjoys active industry involvement.

The Center for Systems Science and Engineering is jointly sponsored by the College of Engineering and Applied Sciences and the College of Liberal Arts and Sciences. Its main goals are the creation and enhancement of interdisciplinary and cooperative research, graduate education, and public service programs in the areas of systems science, applied mathematics, and computation. The center's focal areas include nonlinear and adaptive systems,

large scale systems, and scientific computing and simulation.

The purpose of the Center for Innovation in Engineering Education is to promote and encourage visionary approaches to educating engineering students by supporting the research, development, and assessment of new educational paradigms, unique curricula, improved courses, and new delivery systems that embrace a range of learning models, alternative classroom management strategies, improved pedagogies, and advanced educational technologies. The center also develops and offers workshops and seminars to encourage wide-scale implementation of those approaches that are shown to be effective in developing the attributes that will be needed by engineering graduates in the decade ahead.

The College of Engineering and Applied Sciences and the industrial and business communities of Arizona interact regularly through the Dean's Engineering Advisory Council. The council's primary purpose is to assist the college in its threefold mission:

1. to provide undergraduate and graduate students with a variety of high-quality educational opportunities that will serve their professional interests into the 21st century,
2. to enhance the economic well-being of Arizona and the nation, and
3. to meet the rapidly expanding need for research and educational support of the high-technology industry of Arizona.

The Engineering Excellence 2000 program sponsored by the college and the Arizona industrial and business communities has been instrumental in dramatically increasing state, federal, and private funding of undergraduate and graduate instruction and the college's research programs. Currently, the School of Engineering, which houses the college's six engineering departments, is emphasizing research in the areas of semiconductor electronics, manufacturing, communications and information systems, environmental engineering, biotechnology, and software engineering. The college's Del E. Webb School of Construction enjoys great community support for its active graduate program in construction sciences and facilities management.

Arizona's three state universities—Arizona State University, Northern Arizona University, and the University of Arizona—are cooperating in the offering of a new tri-university degree program; the Master of Engineering. The Master of Engineering is a graduate degree program that is intended to meet the educational needs of Arizona's practicing engineers. With input from industry professionals, the three universities expect to develop courses that address the enhancement and development of skills, knowledge, and understanding that are critical to today's practicing engineer. These courses will be offered through a variety of distance-delivery methods and in flexible formats. Students enrolled in the program will be able to take advantage of course offerings at any of the three universities. These offerings reflect the diversity of strengths across the state. The Master of Engineering offers the practicing engineer the opportunity to design, in conjunction with an advisory committee, a program of study that can reflect the increasingly interdisciplinary nature of engineering practice.

For more information on this degree program, see "Master of Science in Engineering," page 182, visit the program's Web site at [triuniv.engr.arizona.edu](http://triuniv.engr.arizona.edu), contact the College of Engineering and Applied Sciences at 480/965-1726, or e-mail at [m.eng@asu.edu](mailto:m.eng@asu.edu).

## COLLEGE FACILITIES

Numerous well-equipped laboratories, extensive library holdings, and widely available computer services encourage the best in research and graduate training. Laboratories include facilities for environmental fluid dynamics, interactive nonvisualization via scanning probe microscopy, materials and surface characterization, mechanical testing, molecular beam epitaxy, neuromechanical control, rapid manufacturing processes, transmission microscopy, and surface research, to name only a few of the diverse capabilities of the college's physical resources. Supporting the work of researchers, a well-equipped and well-staffed machine and structures fabrication shop makes special-purpose equipment for student and faculty projects. For more information about laboratories, consult the descriptions of individual programs and centers for research in this catalog.

The College of Engineering and Applied Sciences offers extensive computing facilities to its faculty and graduate students. The college centrally maintains computing resources for general engineering use, including a large Sun SPARCcenter 2000 superserver and Hewlett Packard 9000 superserver. Also available are specialty computers for World Wide Web services, electronic mail, Internet collaboration, and special applications. Distributed throughout the college are several thousands of networked UNIX workstations, PCs, and Macintoshes accessing UNIX, Novell, or NT servers available for research or instruction. UNIX workstations are provided by manufacturers such as Sun Microsystems, Hewlett Packard, Silicon Graphics, and Digital Equipment Corporation. All college computing resources are interconnected via the Internet standard TCP/IP on 10Mb or 100Mb ethernet.

## ACADEMIC STANDARDS

**Retention.** A student who has been admitted to a graduate program of study in the College of Engineering and Applied Sciences, on either a regular or provisional basis, must maintain a 3.00 or higher GPA in all work taken for graduate credit as well as an overall 3.00 GPA in all studies at ASU.

A student is placed on academic probation if

1. the student's GPA falls below 3.00 in the approved program of study;
2. the student's overall GPA for all postbaccalaureate courses taken at ASU falls below 3.00;
3. the student receives a "D" or "E" in a required deficiency or in a course at the 400 level or above; or
4. for reasons other than above, the student fails to make satisfactory progress toward a degree.

A student is recommended for withdrawal from a graduate program if

1. the student is on academic probation because his or her GPA has fallen below 3.00 in the approved program of study or for all postbaccalaureate courses taken at ASU and fails to bring the GPA to 3.00 or

- above by the time the next nine semester hours are completed;
2. the student receives a "D" or lower grade while on academic probation for any reason;
  3. the student fails to obtain at least a 3.00 GPA in all courses cited as deficiencies upon admission to a graduate program;

4. the student fails to meet any other conditions imposed as part of the probation; or
5. for reasons other than above, the student fails to make satisfactory progress toward a degree.

A student may appeal any action concerning academic probation and withdrawal by petitioning the graduate affairs committee within the student's academic unit.



Science and Engineering of Materials student John Edwards, right, and research scientist Peter Fuchs use a scanning tunneling microscope to study a new phase on a silicon surface.

Tim Trumble photo



# College of Fine Arts

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**J. Robert Wills, Ph.D.**

Dean

## **PURPOSE**

The College of Fine Arts offers preprofessional and professional education in the arts disciplines and opportunities for nonmajors to become culturally literate through participation and involvement in the creative and performing arts.

At the graduate level, the college provides students the opportunity to participate with faculty mentors in research, performance and performance practices, and other creative activities.

As the largest and most diverse fine arts academic unit in the Southwest, and one of the largest in North America, the College of Fine Arts has an implicit responsibility to maintain quality and leadership in all aspects of its activities. Through its programs in art, dance, music, and theatre, the college reflects a wide range of challenges facing the artist and scholar into the 21st century.

## **ORGANIZATION**

The College of Fine Arts houses the School of Art, the Department of Dance, the School of Music, the Department of Theatre, the University Art Museum, and the Institute for Studies in the Arts. An average of 2,000 students per semester enroll as majors in various degree programs offered through these units. Approximately one third of these are graduate students.

## **GRADUATE PROGRAMS**

Faculty in the School of Art, Department of Dance, School of Music, and Department of Theatre offer both research and professional degrees through the Graduate College: the M.A., Master of Fine Arts, Master of Music, Doctor of Musical Arts, and Ph.D. degrees. A full range of majors and concentrations is available.

## **ADMISSION REQUIREMENTS**

Admission requirements vary according to degree programs. However, applicants must first meet all admission requirements of the Graduate College. Most programs require a bachelor's degree with a major in the selected area; many of them also require an audition. See the specific degree program for pertinent admission requirements.

## **SPECIAL PROGRAMS**

Together with faculty, visiting scholars, and artists-in-residence, graduate students in all fields of the College of Fine Arts participate in dynamic, innovative programs. The creative energy that infuses the visual and performing arts finds expression in research and study.

The School of Art offers opportunities to explore and refine a new artistic medium: computer graphics. Students may work with software for "painting," solid modeling, animated solid modeling, and live video mapping. While computer graphics makes use of the latest technology, other

areas preserve and revitalize established media. The neon studio contributes to the revival of interest in neon as an artistic medium and trains students in this difficult craft. The Northlight Gallery has also become known internationally for photographic exhibitions. Graduate students gain valuable experience in the gallery.

In addition, the School of Art has three traveling fellowships that allow students to study or conduct research abroad. The Anthony Gully Travel Fellowship and the Rabiner Memorial Fellowship are for Art History students. The Nathan Cummings Travel Fellowship is for M.F.A. students.

Recognized as one of the top programs in the country, the Department of Dance emphasizes the choreography, performance, and theory of modern dance. Nationally prominent faculty and visiting artists create repertory for dance majors and for the Dance Arizona Repertory Theatre (DART), a student touring outreach company. An ambitious performance program offers to the public several concerts each year with additional works created and performed by graduate and undergraduate students. Students work closely with major artists and companies who visit campus annually, and with researchers in the areas of dance science, dance in relation to technology, dance music composition, labanotation, and sound and video production. ASU students and faculty have consistently taken top honors at the regional and national festivals of the American College Dance Festival Association. The department recently was selected to host the National Festival, which produced seven concerts and over 50 master classes in four days.

As the research center for the College of Fine Arts, the Institute for Studies in the Arts serves as a laboratory for the development and funding of creative ideas and for the exploration of new tools and technologies for artistic expression, a network for communication among creative scholars both within and outside the arts, and a resource base for the documentation, evaluation, and dissemination of research in the arts. Through technical and monetary support, the institute sponsors a wide variety of projects that address its mission of experimentation and innovation.

Faculty in the School of Music include a wide range of performers, teachers, conductors, composers, and scholars, whose knowledge and guidance support the training of students in the Doctor of Musical Arts and master's degree programs. Individuals who hold graduate degrees from ASU's School of Music hold prestigious performing and university teaching positions throughout the nation. The graduate programs are indeed comprehensive and provide for wide and diverse opportunities in performance, course work, and research.

Three concentrations are available in the M.F.A. in Theatre program: performance, scenography, and theatre for youth. The concentration in performance challenges performing artists to reinvigorate the classics, develop new works, explore new theatrical forms, and discover changing

**College of Fine Arts Graduate Degrees and Majors**

Major	Degree	Administered by
Art Concentrations: art education, art history	M.A.	School of Art
Art Concentrations: ceramics, drawing, fibers, intermedia, metals, painting, photographic studies, photography, printmaking, sculpture, wood	M.F.A.	School of Art
Composition	M.M.	School of Music
Creative Writing	M.F.A.*	Creative Writing Committee
Dance	M.F.A.	Department of Dance
History and Theory of Art	Ph.D.	School of Art
Music Concentrations: choral conducting, music education, music composition, solo performance (instrumental, keyboard, voice)	D.M.A.	School of Music
Music in Education Concentrations: choral music, general music, instrumental music, jazz studies	M.M.	School of Music
Performance Concentrations: music theatre musical direction, music theatre performance, performance pedagogy, piano accompanying, solo performance (instrumental, keyboard, voice)	M.M.	School of Music
Theatre	M.A.	Department of Theatre
Theatre Concentrations: performance, scenography, theatre for youth	M.F.A.	Department of Theatre
Theatre Concentration: theatre for youth	Ph.D.	Department of Theatre

\* This program is administered by the Graduate College. See "Graduate College," page 53.

relationships between art and technology. The Ph.D. in Theatre program offers a concentration in theatre for youth.

The Department of Theatre, with its strong playwriting program, has a special interest in new scripts that bring a wealth of professional productions and workshops to campus for the benefit of all students. The Department of Theatre takes special pride in its nationally and internationally acclaimed theatre for youth program, which provides comprehensive graduate training and attracts students, scholars, and artists from around the world. Graduate students are challenged to excel in every aspect of theatrical training. They are offered acting, directing, and other production opportunities for mainstage, studio, and touring shows, as well as research and teaching opportunities on and off campus. Students also help organize a biennial Youth Arts Festival that brings many multitalented artists and thousands of young people to campus. The program has developed Hayden Library's Child Drama Collection, which includes rare books, plays, memorabilia and personal and national association archives. It is the most complete and comprehensive child drama collection in the English-speaking world.

Students in the scenography program are actively involved in all aspects of design and technology for mainstage and studio productions and receive regional and national awards on a regular basis for their work.

A multiethnic theatre program provides opportunities for students to view and work with professional and semiprofessional multiethnic productions on campus.

The playwriting program enriches graduate study and brings together talented students with those who practice the theatrical arts.

The M.F.A. in Creative Writing encourages graduate students to work closely with writers of drama, fiction, and poetry, and with directors and producers from the Departments of English and Theatre. This interdisciplinary program, involving the artistic, research, and teaching interests of faculty in these departments, offers students a unique opportunity to tailor a course of study to fit individual needs, talents, and goals.

### COLLEGE FACILITIES

The arts programs are housed in the following buildings: Art Building; Dixie Gammage Hall; Physical Education Building East; Gammage Center for the Performing Arts; Matthews Center; Matthews Hall; the J. Russell and Bonita Nelson Fine Arts Center, which includes the University Art Museum; the 496-seat Paul V. Galvin Playhouse; six theatre studios; a 7,000-square-foot Experimental Dance Lab; and a video lab. The Music Building and expansion wing house four performance halls ranging in size from the 125-seat Recital Hall to the 500-seat Music Theatre and the 350-seat

Katzin Concert Hall, which is used primarily for solo and chamber music recitals. The Katzin Concert Hall contains a nine-foot Hamburg Concert Steinway piano. The new 175-seat Organ Hall was designed to house the Paul Fritts Tracker Organ, an instrument reflecting the aesthetics and style of North German organ building in the 17th century. The Theatre Department also stages productions in the renovated Lyceum Theatre and Prism Theatre. Many of these facilities are equipped with studios and laboratories, where needed.

The University Art Museum's collections are housed in a large complex of galleries and art study rooms in two locations: the Nelson Fine Arts Center and the second floor of the Matthews Center. The Oliver B. James Collection of American Art ranges from the early 18th century to the contemporary and includes major works by Stuart, Ryder, Homer, and the Ash Can School painters. Master works by great print-makers such as Durer, Rembrandt, Whistler, and Hogarth are often featured in special exhibitions selected from the university's extensive print collection.

The gallery devoted to Latin American art features folk art as well as paintings by celebrated 20th-century artists Rivera, Siquieros, and Tamayo. The museum also displays many fine examples of 19th- and 20th-century crafts, paintings, and sculpture.

The contemporary art holdings include works by Vernon Fisher, Leon Golub, Sue Coe, Luis Jimenez, and Robert Colescott. Exhibitions curated by the museum emphasize contemporary art and new media, crafts, and Mexican art.

All units have developed computer facilities for graduate student training. Also refer to "Computing Facilities and Services," page 32.

### ADVISING

Advising is handled as a decentralized activity within the college. To offer personalized attention, each academic unit establishes its own graduate advising procedures. Students are encouraged to make appointments through the central office of their major discipline.

### ACCREDITATION

While all of the arts programs in the college meet or exceed standards established by various arts accrediting agencies, the School of Music and the Department of Theatre hold formal memberships; the School of Music by the National Association of Schools of Music, and the Department of Theatre by the National Association of Schools of Theatre.



ASU Nelson Fine Arts Center

Tim Trumble photo

# College of Law

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**Patricia D. White, J.D.**

Dean

## **PURPOSE**

The College of Law educates students to assume various societal roles in government, legal aid and public defender offices, law enforcement, business, education, and the many other avenues opened by legal training. Some students, while still in school, develop programs of study that involve fields and disciplines outside the law in its conventional sense.

Students of the College of Law develop an understanding, through formal course work and clinical experience, of the tremendous responsibilities of the legal profession to society, and experience the satisfaction that comes from discharging, at a high standard, the duties of counselor and advocate. In addition, the college has a responsibility to contribute to the quality of justice administered in society through research and service to the community.

## **ORGANIZATION**

The College of Law offers a broad general curriculum supported by three leadership programs and an outstanding faculty of scholar-teachers with expertise in areas ranging from jurisprudence to advances in scientific evidence. Law school faculty maintain one of the most productive records of scholarship, research, and publication of any public law program in the nation.

The uniquely designed John S. Armstrong Hall building includes: classrooms and seminar rooms; the Clinical Programs offices; Student Services offices; a Career Planning Resource Center; the Willard H. Pedrick Great Hall, a full-bench setting that seats 400; a classroom equipped with a computer projection unit, broadband capability, VCR, sound system, and infrared system for the hearing impaired; a trial courtroom; and informal student lounges. The mezzanine level houses faculty, staff, and administrative offices.

The award-winning John J. Ross-William C. Blakley Law Library, named in memory of two prominent Phoenix attorneys, is one of the finest law libraries in the Southwest with a collection of more than 310,000 volumes and microform volume equivalents. The collection includes a broad selection of Anglo-American case reports and statutes as well as legal treatises, periodicals, encyclopedias, digests, citators, and administrative materials. The collection also includes growing special collections in the areas of international law, Indian law, Mexican law, and law and technology. In addition, the library has a 20-station computer lab as well as LEXIS and WESTLAW rooms each containing 10 stations, 27 meeting and study rooms, a microforms facility and a classroom. The library is also a selective U.S. government depository.

Students have ready access to the other campus libraries, including the Charles Trumbell Hayden Library, the Daniel E. Noble Science and Engineering Library, the Architecture and Environmental Design Library, and the Music Library.

The collections of the university's libraries comprise more than 3 million volumes.

## **GRADUATE PROGRAMS**

### **Juris Doctor Degree**

The College of Law offers a three-year program of professional study at the graduate level leading to the degree of Juris Doctor (J.D.).

### **Dual/Concurrent Degree Programs**

Law students wishing to pursue a joint degree program at ASU must have a joint degree application and program of study approved by the Associate Dean of the College of Law prior to pursuing the joint degree.

## **ADMISSION REQUIREMENTS**

Each applicant for admission to the Juris Doctor (J.D.) program must have earned an undergraduate degree from an accredited four-year college or university (B.A., B.S., or other equivalent). The College of Law Admissions Office considers an applicant's file complete only if it includes each of the following:

1. a completed Application for Admission form;
2. a completed Domicile Affidavit if claiming Arizona residency;
3. a \$45 application fee;
4. a personal statement that does not exceed three typed pages in length; and
5. a Law School Data Assembly Service (LSDAS) report with all transcripts and the Law School Admissions Test (LSAT) score(s) from the Law School Admission Services (LSAS).

To be assured consideration, all application materials must be complete by March 1.

## **SPECIAL PROGRAMS**

### **Center for the Study of Law, Science, and Technology**

The Center for the Study of Law, Science, and Technology is a multidisciplinary research center created by the Arizona Board of Regents in 1984. The center publishes research studies, sponsors seminars and symposia, and houses visiting scholars and teachers. Through these programs, the center seeks to contribute to the formulation and improvement of law and public policy affecting science and technology and to the wise application of science and technology in the legal system.

The College of Law offers a substantial number of courses in the law, science, and technology area including bioethics law and psychiatry, environmental law, health care law, intellectual property, land use regulation, law and evolutionary biology, law and medicine, law and social science,

mass communication, natural resources law, patent law, regulatory problems in law, science and technology, and water law. Each semester, the center publishes a student guide to other less obvious courses that contain science and technology issues. In recent semesters this guide has listed courses in AIDS and the law, commercial law, employment law, law and the handicapped, antitrust, statistical proof in employment discrimination litigation, and several courses offered by other departments on campus available for registration by law students. In addition to regular course offerings, students can arrange independent studies with supervising faculty on topics of special interest to them. The center also invites guest speakers from legal or scientific fields to visit with interested law students, generally during the noon hour.

In cooperation with the American Bar Association Section on Science and Technology and under the leadership of a faculty editor, second- and third-year students edit *Jurimetrics: The Journal of Law, Science and Technology*. Student editors do both editorial work on submitted articles and original writing for publication in the journal.

### Indian Legal Program

The College of Law offers an Indian Legal Program whose missions are to assist tribal courts and governments in improving justice in Indian country and to develop education and scholarship in Indian law. Students have the opportunity to participate in all phases of the Indian Legal Program and gain in-depth understanding of the legal issues affecting Indian tribes and peoples. Courses on Federal Indian law and seminars on advanced Indian law topics such as Tribal Court dispute resolution, economic development, American Indian cultural resources protection, and tribal

environmental law are part of the curriculum. Students may also participate in externships with the local tribal courts or spend a semester in Washington, D.C., working with the Senate Select Committee on Indian Affairs. This variety of academic and work experience provides the students an outstanding legal education with a firm grounding in both the theoretical and practical aspects of Indian law.

### Law Journal

The College of Law publishes a professional law review, the *Arizona State Law Journal*, edited by students of the second- and third-year classes. Membership on the law journal is determined by grade performance in the first year and by submitting written work in a writing competition. Participation on law review is hard but rewarding work. For those eligible, the review provides one of the finest avenues for legal education thus far developed. Its work contributes to the student's intellectual advancement, to the development of law and the legal profession, and to the stature of the law school.

### ADVISING

Preadmission information, advising, and continued support for the J.D. is provided by the College of Law Admissions Office, 480/965-1474.

### ACCREDITATION

The college is fully accredited by the American Bar Association and is a member of the Association of American Law Schools.



ASU Law Library

Tim Trumble photo

# College of Liberal Arts and Sciences

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**Gary S. Krahenbuhl, Ed.D.**

Dean

## **PURPOSE**

The graduate programs in the College of Liberal Arts and Sciences are characterized by both a diversity of disciplines and a commonality of purpose. The disciplinary diversity of the college is broad by intent, embracing those branches of learning most central to the foundations of society in the humanities and the sciences. Unity of purpose is achieved through a common commitment to intellectual integrity, to research, and to the preservation of freedom of academic inquiry, as well as through informal exchanges and cross-disciplinary centers.

The College of Liberal Arts and Sciences has active research programs in all units offering advanced degrees. In recent years, the rapid addition of excellent faculty has enhanced the cadre of senior scholars and scientists with whom graduate students work.

## **ORGANIZATION**

The College of Liberal Arts and Sciences, which offers graduate study in the humanities, the mathematical and the natural sciences, and the social sciences, brings together highly qualified faculty and advanced students to share learning and discovery in 20 academic units and in a number of interdisciplinary centers. In lectures and seminars, in laboratories and libraries, in creative endeavors, field experiences, and research projects, faculty and students cooperate in preserving, evaluating, and expanding knowledge.

## **GRADUATE PROGRAMS**

In cooperation with the Graduate College, faculty affiliated with various departments and units within the College of Liberal Arts and Sciences offer three research-oriented degrees: the M.A., the M.S., and the Ph.D. In addition, four professional degrees are offered: the Master of Natural Science, the Master of Teaching English as a Second Language, the Master of Physical Education, and the Master of Fine Arts, an interdisciplinary creative writing program offered in cooperation with the College of Fine Arts. The interdisciplinary master's program in Humanities draws faculty expertise from the Departments of Anthropology, Dance, English, History, Languages and Literatures, Philosophy, Religious Studies, and the School of Art. Interdisciplinary programs leading to the Ph.D. degree are offered in Exercise Science, Molecular and Cellular Biology, Science and Engineering of Materials, and Speech and Hearing Science. Many departments within the college participate in the Master of Education, Doctor of Education, and Doctor of Philosophy degrees offered and administered through the College of Education. Members of the Department of Mathematics faculty participate in the interdisciplinary M.S. degree in Statistics (with College of Business faculty);

members of the Departments of Biology, Chemistry and Biochemistry, Microbiology, and Plant Biology participate in the interdisciplinary M.S. and Ph.D. in Molecular and Cellular Biology; members of the faculty in the Departments of Anthropology, History, Languages and Literatures, Philosophy, Political Science, Psychology, Religious Studies, and Sociology participate in the interdisciplinary Ph.D. in Justice Studies program; members of the Departments of Geography, Political Science, and Sociology faculty contribute to the interdisciplinary Doctor of Public Administration program; and members of the Departments of English, Family Resources and Human Development, Sociology, and Speech and Hearing Science faculty participate in the interdisciplinary Ph.D. degree in Communication.

One of the unique features of an interdisciplinary program is that it draws upon faculty research and teaching interests from a number of academic units; thus a student may tailor a course of study to fit individual needs and goals.

## **ADMISSION REQUIREMENTS**

Applicants to graduate programs within the College of Liberal Arts and Sciences must meet general requirements for admission established by the Graduate College (see "Admission to the Graduate College," page 89). In addition, academic units usually require test scores from the Graduate Record Examination and Miller Analogies Test, letters of recommendation, and a statement of purpose. Consult the individual degree programs for particular requirements. International applicants must also submit Test of English as a Foreign Language (TOEFL) scores and are advised to submit application materials well in advance of deadlines.

## **SPECIAL PROGRAMS**

The college is characterized by the development of program thrusts in new areas, many of which are interdisciplinary in content. There is special strength, for example, in planetary geology, as well as in more traditional geological subdisciplines; in geochemistry, as well as in biochemistry and solid-state and materials science; and in magnetic properties of materials, as well as nuclear physics and surface physics. In psychology, traditional social, developmental, and clinical research is augmented by a new interest in preventive mental health. Flexibility and forward-looking program development pervade all college programs. The interdisciplinary degree in Exercise Science is internationally recognized. The graduate Creative Writing program brings talented students together with distinguished poets, playwrights, and novelists. The Teaching English as a Second Language program attracts students from all over the world.

## College of Liberal Arts and Sciences Graduate Degrees and Majors

Major	Degree	Administered by
Anthropology Concentrations: archaeology, bioarchaeology, linguistics, medical anthropology, museum studies, physical anthropology, social-cultural anthropology	M.A.	Department of Anthropology
Anthropology Concentrations: archaeology, physical anthropology, social-cultural anthropology	Ph.D.	Department of Anthropology
Biology <sup>1</sup> Concentration: ecology	M.S., Ph.D.	Department of Biology
Chemistry Concentrations: analytical chemistry, biochemistry, geochemistry, inorganic chemistry, organic chemistry, physical chemistry, solid-state chemistry	M.S., Ph.D.	Department of Chemistry and Biochemistry
Communication Disorders	M.S.	Department of Speech and Hearing Science
Creative Writing	M.F.A. <sup>2</sup>	Creative Writing Committee
English Concentrations: comparative literature, English linguistics, literature and language, rhetoric and composition	M.A.	Department of English
English Concentrations: literature, rhetoric/composition and linguistics	Ph.D. <sup>2</sup>	Department of English
Exercise Science Concentrations: biomechanics, motor behavior/sport psychology, physiology of exercise	M.S.	Department of Exercise Science
Exercise Science/Physical Education	M.S.	Department of Exercise Science and Physical Education
Family Resources and Human Development Concentrations: family studies, general family resources and human development	M.S.	Department of Family Resources and Human Development
Family Science <sup>1</sup> Concentration: marriage and family therapy	Ph.D.	Department of Family Resources and Human Development
French Concentrations: comparative literature, language and culture, literature	M.A.	Department of Languages and Literatures
Geography	M.A., Ph.D.	Department of Geography
Geology	M.S., Ph.D.	Department of Geology
German Concentrations: comparative literature, language and culture, literature	M.A.	Department of Languages and Literatures
History Concentrations: Asian history, British history, European history, Latin American history, public history, U.S. history, U.S. Western history	M.A.	Department of History
Humanities	M.A.	Graduate Committee on Humanities
Mathematics	M.A., Ph.D.	Department of Mathematics
Microbiology	M.S., Ph.D.	Department of Microbiology
Molecular and Cellular Biology	M.S., Ph.D.	Interdisciplinary Committee on Molecular and Cellular Biology

<sup>1</sup> Major with formalized concentration(s); other areas of study are available.

<sup>2</sup> This program is administered by the Graduate College. See "Graduate College," page 53.

## College of Liberal Arts and Sciences Graduate Degrees and Majors (continued)

Major	Degree	Administered by
Natural Science Concentrations: Biology Chemistry Geology Mathematics Microbiology Physics Plant Biology	M.N.S.	Department of Biology Department of Chemistry and Biochemistry Department of Geology Department of Mathematics Department of Microbiology Department of Physics and Astronomy Department of Plant Biology
Philosophy	M.A., Ph.D.	Department of Philosophy
Physical Education	M.P.E.	Department of Exercise Science and Physical Education
Physics	M.S., Ph.D.	Department of Physics and Astronomy
Plant Biology <sup>1</sup> Concentrations: ecology, photosynthesis	M.S., Ph.D.	Department of Plant Biology
Political Science Concentrations: American politics, comparative politics, international relations, political theory	M.A., Ph.D.	Department of Political Science
Psychology Concentrations: behavioral neuroscience, clinical psychology, cognitive/behavioral systems, developmental psychology, environmental psychology, quantitative research methods, social psychology	Ph.D.	Department of Psychology
Religious Studies	M.A.	Department of Religious Studies
Science and Engineering of Materials Concentrations: high-resolution nanostructure analysis, solid-state device materials design	Ph.D. <sup>2</sup>	Committee on the Science and Engineering of Materials
Sociology	M.A., Ph.D.	Department of Sociology
Spanish Concentrations: comparative literature, language and culture, linguistics, literature	M.A.	Department of Languages and Literatures
Spanish	M.A.	Department of Languages and Literatures
Speech and Hearing Science Concentrations: developmental neurolinguistic disorders, neuroauditory processes, neurogerontologic communication disorders	Ph.D. <sup>2</sup>	Committee on Speech and Hearing Science
Statistics	M.S. <sup>2</sup>	Committee on Statistics
Teaching English as a Second Language	M.TESL	Department of English

<sup>1</sup> Major with formalized concentration(s); other areas of study are available.

<sup>2</sup> This program is administered by the Graduate College. See "Graduate College," page 53.

The Southwest environment has favorably affected program development in several ways, ranging from research activities in water resources, archaeology, and fluvial geomorphology to distinguished programs in Hispanic language, literature, culture, and history.

In addition to traditional and innovative programs within departments, there are multidisciplinary research centers within the college, bringing together faculty from various departments. These include the Centers for Asian Studies, Exercise and Sport Research, Hispanic Research, Latin American Studies, Medieval and Renaissance Studies, Meteorite Studies, and Solid-State Science. Centers sponsor colloquia, workshops, conferences, and visiting scholars. They administer international exchange programs, enhance

library holdings and other collections, publish papers and monographs, maintain archives, and employ graduate research assistants.

#### COLLEGE FACILITIES

Strong and nationally funded research facilities, like the Facility for High Resolution Electron Microscopy and the Planetary Geology Laboratory have attained national and international prominence. Important research collections include one of the largest meteorite collections in the world, the holdings of the anthropology archives and museum, the space photography collection, the Herbarium, and extensive library holdings, including important manuscript collections



in late 19th-century British literature and historical documents of the Southwest.

Graduate students in all disciplines have access to outstanding computer facilities. Mainframe computing for research is provided free of charge. There are substantial microcomputer facilities within individual academic units as well as clusters serving the humanities and social sciences. Minicomputer capabilities are found in various academic units. Also refer to "Computing Facilities and Services," page 32.

#### **FINANCIAL ASSISTANCE AND SUPPORT**

In addition to the usual support for graduate students in the form of stipends and teaching and research assistantships, there is a vigorous funding program to support graduate student research. Not only do graduate students obtain grants from external sources to support their research

projects, they also receive support from the college and university to present papers at professional meetings.

#### **ADVISING**

Faculty advisors in each academic unit provide guidance to graduate students from admission through completion of the program. Consult the director of graduate studies in the appropriate academic unit. Graduate students must follow an approved program of study filed with the Graduate College. The calendar for enrollment activities is published in the schedule of classes for each semester. Teaching and research assistants, who are required to be enrolled in at least six hours, as well as those enrolled for individual project, thesis and dissertation credit, are subject to the same calendar deadlines as students enrolled in regularly scheduled classes.



The arboretum at ASU offers abundant shade for the ASU Main Campus.

Tim Trumble photo

# College of Nursing

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**Barbara A. Durand, Ed.D.**

Dean

## **PURPOSE**

The faculty of the College of Nursing acknowledges its responsibility to health care consumers for the preparation of individuals who will provide nursing care of professional quality through teaching, research, and service. The College of Nursing provides educational programs that prepare professional nurses to meet the nursing care needs of individuals, groups, and communities. To achieve this purpose, the college offers the baccalaureate, the graduate, and the continuing education programs. Within the context of a liberal education, the degree programs prepare professional nurses who

1. understand and respond to changing health and social needs and services,
2. influence nursing practice and health care through leadership and participation in professional and sociopolitical activities, and
3. utilize scientific knowledge to advance professional nursing practice.

The continuing education program provides opportunities for nurses to improve and expand their nursing practice, to meet the health care needs of various populations, and to further their own professional development.

## **ORGANIZATION**

The College of Nursing recognizes the three major missions of the university, i.e., teaching, research, and service. The responsibility of the associate dean for graduate programs and research is twofold: to oversee the master's program, including the progression of students through the program; and to work with faculty and students to facilitate research activities, such as research development. The associate dean for undergraduate programs and extended education is responsible for undergraduate degree programs, progression of students through the program, and extended and continuing education.

The faculty are grouped under two major clinical divisions within nursing: adult health/parent-child nursing and community health/psychosocial nursing systems. Each division has a chair, and each faculty member belongs to a division.

## **GRADUATE PROGRAM**

The graduate curriculum leads to the M.S. degree in Nursing. The graduate program provides an academic environment that fosters scholarship, critical thinking, and creativity, while preparing nurses for leadership as nurse specialists and beginning researchers. The program offers advanced-level courses that can be used as a base for doctoral study and for functional role development in teaching, management, or practice as a nurse practitioner.

Students may select one area of concentration from the following offerings:

Adult health nursing  
Community health nursing  
Community mental health/psychiatric nursing  
Nursing administration  
Parent-child nursing (options include childbearing family and nursing of children)

The curriculum also provides elective study in teaching, management, and practitioner roles, including adult, child, family, psychiatric, and women's health nurse practitioner roles.

A post-master's Family Nurse Practitioner Certificate is available.

A student may concurrently pursue the M.S. degree in Nursing (nursing administration concentration) and the Master of Health Services Administration (College of Business).

## **SPECIAL PROGRAMS AND SERVICES**

**Continuing Education Program.** This program presents a variety of noncredit offerings on the main campus, west campus, and off-campus locations. These offerings are designed to assist practicing professional nurses in maintaining and enhancing their competencies, broadening their scientific knowledge base, and further developing their skills in the changing health care environment. Workshops, conferences, institutes, short evening courses, and special programs are offered at times convenient to the working professional. Some offerings are multidisciplinary and are also open to individuals in professions outside of nursing.

**Student Services.** The Student Services Office in the College of Nursing provides academic advising, general advising, and referral to university resources. Prospective students with academic questions relating to the College of Nursing should contact the College of Nursing Student Services Office.

**Scholarships and Financial Assistance.** Information about scholarships and loan funds for nursing students may be obtained from the Student Financial Assistance Office, College of Nursing Office of Student Services, or the associate dean for graduate programs and research.

**College Council of Nursing Students.** The council is a member of ASASU (Associate Students of Arizona State University) and serves as the governing body of all student activities in the college. The College Council of Nursing provides for communication, cooperation, and understanding among undergraduate students, graduate students, and faculty, and represents the college in university and nonuniversity affairs.

**Graduate Nurse Organization.** The Graduate Nurse Organization (GNO) is the coordinating body for nursing students in the graduate program. It provides programs, infor-

mation, and orientation services for graduate students and complements their academic experiences.

**Sigma Theta Tau.** Beta Upsilon Chapter of Sigma Theta Tau was chartered at the ASU College of Nursing in 1976. Membership in Sigma Theta Tau is an honor conferred on students in baccalaureate and graduate programs who have demonstrated outstanding academic and professional achievement.

### COLLEGE FACILITIES

Learning experiences with patients and their families are provided under the supervision of qualified faculty with the cooperation of a variety of federal, state, county, and private health agencies. The College of Nursing has contracts with more than 240 agencies in the Phoenix metropolitan area and also operates a unique nurse-managed clinic in a community setting.

**Computer Facilities.** Computers are available for student use in the Learning Resource Center of the college. Also refer to "Computing Facilities and Services," page 32.

### ADVISING

Students are advised by the Student Services Office before admission to the graduate program. Upon admission, each student is assigned a faculty advisor within the area of concentration. Questions may also be directed to the associate dean for graduate programs and research.

### ACCREDITATION

The baccalaureate and master's programs of the College of Nursing are accredited by the Arizona State Board of Nursing and the National League for Nursing. The continuing education program is accredited by the Western Regional Accrediting Committee of the American Nurses' Association as a provider of Continuing Education for Nursing. The college is a member of the Council of Member Agencies for the Baccalaureate and Higher Degree Programs of the National League for Nursing, the Western Institute of Nursing, and the American Association of Colleges of Nurses.



Nursing student Jane Brady, right, reviews a health outcome report with Associate Professor Patricia Moore.

Tim Trumble photo

# College of Public Programs

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Anne L. Schneider, Ph.D.

Dean

## PURPOSE

The College of Public Programs offers a wide range of course work, in both on-campus and off-campus settings, to full-time and part-time students. Through the Graduate College, faculty offer various programs leading to graduate degrees. Each academic unit of the College of Public Programs not only assumes responsibility in preparing its own majors, but also provides a variety of service courses for the rest of the university. The college is committed to excellence in teaching, research, and public service. College units work closely with numerous public and private agencies at the national, state, and local levels.

## ORGANIZATION

The College of Public Programs consists of six academic units: the Department of Communication, the Walter Cronkite School of Journalism and Telecommunication, the Department of Recreation Management and Tourism, the School of Public Affairs, the School of Justice Studies, and the School of Social Work. Each academic unit is administered by a chair or director.

**Department of Communication.** The faculty in the Department of Communication advance the understanding of message-related human behavior in part through the M.A. degree in Communication. The focus of the M.A. degree program is research in one of five areas: intercultural communication, interpersonal communication, organizational communication, performance studies, and rhetoric/public address.

Faculty in the Department of Communication participate in offering the interdisciplinary Ph.D. degree in Communication. The program is designed to prepare scholars for research-oriented careers in universities and in the public and private sectors and offers areas of study in critical/cultural studies, information technology, intercultural communication, interpersonal communication, organizational communication, performance studies, relational communication, and rhetoric.

**Walter Cronkite School of Journalism and Telecommunication.** The faculty in the Walter Cronkite School of Journalism and Telecommunication offer the Master of Mass Communication degree (M.M.C.). The M.M.C. is designed to accommodate students who wish to study in the fields of journalism, broadcasting, or public relations. The program provides broader training for professionals employed in the media and for those who wish to enter media fields.

**Department of Recreation Management and Tourism.** The faculty in the Department of Recreation Management and Tourism offer a graduate program leading to the M.S. degree in Recreation. The program focuses both on building professional knowledge and developing the ability to critically analyze topics and issues related to the recreation and

tourism fields. Students choose between pursuing a more academic, focused thesis option or the more professionally applied nonthesis option. Each student takes graduate core courses in the department and then can pursue individual interests with related course work and a research project in one of four general concentration areas: outdoor recreation, recreation administration, social/psychological aspects of leisure, and tourism and commercial recreation.

**School of Public Affairs.** The faculty in the School of Public Affairs offer a professional graduate program leading to the Master of Public Administration degree. Courses are offered in the evenings to fit the scheduling needs of working students. The diversity of the school's program offerings accommodates both preservice students and midcareer public administrators. State and local government internships are available to those with no previous public sector experience. Students work with faculty on the school's active research and publications program, including public policy reports and other community service projects for state and local governments in Arizona.

The school also administers the interdisciplinary Doctor of Public Administration program under the auspices of the Graduate College. Faculty of the School of Public Affairs participate in offering this degree program.

**School of Justice Studies.** The School of Justice Studies provides an interdisciplinary social science perspective for studying law and justice, crime and delinquency, dispute resolution, gender justice, racial and ethnic minorities and the law, and social and economic justice. Its faculty have academic backgrounds in anthropology, criminology, history, law, philosophy, political science, psychology, and sociology.

Faculty in the School of Justice Studies also participate in offering the Doctor of Public Administration degree. The school administers the interdisciplinary Ph.D. program in Justice Studies under the auspices of the Graduate College.

**School of Social Work.** The School of Social Work offers the full complement of social work academic programs (B.S.W., M.S.W., and Ph.D.). The mission and goals of the school are consistent with the university's mission and overall objectives, as can be seen in the school's focus on excellence in professional instruction; the advancement of social work research and the understanding of social issues; and public/community service. Central to the mission of the school is the emphasis on an understanding of and respect for the unique cultural diversity of the Southwest and the promotion of social and economic justice.

## GRADUATE PROGRAMS

Graduate degree programs as shown in the "College of Public Programs Graduate Degrees and Majors" table, page 87, are offered by the faculty within the college.

## College of Public Programs Graduate Degrees and Majors

Major	Degree	Administered by
Communication	M.A.	Department of Communication
Communication	Ph.D.	Department of Communication
Concentrations: communicative development, intercultural communication, organizational communication		
Justice Studies	M.S. <sup>1</sup>	School of Justice Studies
Justice Studies	Ph.D. <sup>2</sup>	Committee on Law and Social Sciences
Concentrations: criminal and juvenile justice; dispute resolution; law, justice, and minority population; law, policy, and evaluation; women, law, and justice		
Justice Studies	J.D./Ph.D. <sup>3</sup>	Committee on Law and Social Sciences/College of Law
Mass Communication	M.M.C.	Walter Cronkite School of Journalism and Telecommunication
Public Administration	M.P.A.	School of Public Affairs
Concentrations: public information management, public management, public policy analysis and evaluation, urban management and planning		
Public Administration	D.P.A. <sup>2</sup>	Committee on Public Administration
Recreation	M.S.	Department of Recreation Management and Tourism
Concentrations: outdoor recreation, recreation administration, social/psychological aspects of leisure, and tourism and commercial recreation.		
Social Work	M.S.W., Ph.D.	School of Social Work

<sup>1</sup> Graduate students in the School of Justice Studies and the Department of Anthropology are able to receive a concurrent M.S. degree in Justice Studies and M.A. degree in Anthropology.

<sup>2</sup> This program is administered by the Graduate College. See "Graduate College," page 53.

<sup>3</sup> Ph.D. students in Justice Studies are able to acquire a joint J.D./Ph.D. with concurrent admission to the College of Law at ASU and fulfillment of joint requirements.

One of the unique features of an interdisciplinary program is that, because it uses faculty research and teaching interests from a number of academic units, a student may tailor a course of study to fit individual needs and goals.

### ADMISSION REQUIREMENTS

Admission requirements of all advanced degree programs within the college are connected with those required by the Graduate College. In addition, individual units may require further supporting materials such as letters of recommendation, scores on the Graduate Record Examination, statements of educational and career goals, and writing samples. Applicants should refer to requirements specified by the academic unit under each degree program in this catalog.

### SPECIAL PROGRAMS

**Concurrent M.A. in Anthropology and M.S. in Justice Studies.** Graduate students in the School of Justice Studies and the Department of Anthropology may pursue a concurrent M.S. degree in Justice Studies and M.A. degree in Anthropology with a concentration in social-cultural anthropology. The purpose of the program is to prepare individuals with combined, complementary knowledge and skills for basic and applied research, and administrative and educational activities related to both disciplines. Students must be admitted separately to each program, following the guidelines established by the Graduate College, Department

of Anthropology, and School of Justice Studies. Additional information on concurrent degrees may be obtained from the respective academic units.

**Concurrent Ph.D. in Justice Studies/J.D.** The purpose of the Ph.D. in Justice Studies/J.D. is to provide a rigorous education for highly qualified students interested in pursuing academic careers in law, law and the social sciences, or law and philosophy.

### COLLEGE FACILITIES

Microcomputer training and remote site terminal access are available to students in all programs within the College of Public Programs. Academic units provide facilities, equipment, and support for student research, including laboratory space, computer terminals connected to the main-frame computer, and personal computers for individual student use. See "Computing Facilities and Services," page 32.

Broadcast laboratories within the School of Journalism and Telecommunication have the latest in-studio and ENG-EEP equipment, and provide facilities for performance, writing, and the other necessary broadcast skills.

### ADVISING

Advising of graduate students is usually handled by graduate faculty or a committee. Once admitted, students are



typically assigned a temporary faculty advisor in the potential areas of specialization who will assist in planning a course of study. For those degree programs requiring the completion of a thesis, a chair and thesis supervisory committee are selected by the director of graduate studies, in consultation with the student, and appointed by the dean of the Graduate College.

## ACCREDITATION

The Walter Cronkite School of Journalism and Telecommunication is accredited by the Accrediting Council on Education in Journalism and Mass Communication (ACEJMC). The Master of Public Administration program is accredited by the National Association of Schools of Public Affairs and Administration. The School of Social Work is fully accredited by the council on Social Work Education.



Reflection of the sun in one of the university's many fountains and pools

Tim Trumble photo

# Graduate Studies at ASU Main and ASU East

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## GRADUATE DEGREES AND MAJORS

The Graduate College at ASU provides students with opportunities to study beyond the bachelor's degree. The college enrolls students in programs leading to both professional and research-oriented advanced degrees. The M.A., M.S., and Ph.D. degrees are awarded to students completing programs that culminate in research and creative endeavors. The Ph.D. degree is the highest university award, conferred on candidates who have proven their ability as scholars and original researchers.

Professional graduate programs emphasize training that leads to professional practice. In these degree programs, students develop a mastery of a comprehensive body of knowledge and the ability to organize and carry out significant investigations in their professional field. Professional degrees usually are named Master of (Professional Field) and Doctor of (Professional Field), although some Master of Arts and Master of Science degree programs have professional tracks. The professional doctoral degree is the highest university award to candidates completing academic preparation for professional practice. The following professional degrees are offered through the Graduate College:

- Master of Accountancy and Information Systems
- Master of Architecture
- Master of Business Administration
- Master of Computer Science
- Master of Counseling
- Master of Education
- Master of Engineering
- Master of Environmental Planning
- Master of Fine Arts
- Master of Health Services Administration
- Master of Mass Communication
- Master of Music
- Master of Natural Science
- Master of Physical Education
- Master of Public Administration
- Master of Science in Design
- Master of Science in Engineering
- Master of Science in Technology
- Master of Social Work
- Master of Taxation
- Master of Teaching English as a Second Language
- Doctor of Education
- Doctor of Musical Arts
- Doctor of Public Administration

Faculty members offering a specific graduate degree program may be members of a single academic unit (such as a department, school, or college), or they may form an interdisciplinary committee consisting of faculty from various academic units. The Graduate College awards degrees upon the recommendation of the faculty offering the graduate degree programs.

## Interdisciplinary Study

Although most graduate programs are administered by academic units, a diverse group of interdisciplinary programs falls directly under the supervision of the Graduate College. Many majors are in fields that are still emerging as recognized academic disciplines and, therefore, do not customarily form the academic basis for departments. Other fields of study are inherently interdisciplinary and do not fit well with conventional disciplines around which departments are formed. Curricula must reflect intrinsically broad disciplinary affinities, and faculty must be drawn from more than one department.

The Graduate College oversees nine interdisciplinary programs and has joint responsibility with the College of Education for another; several others are planned. Existing interdisciplinary programs are as follows:

- Creative Writing (M.F.A.)
- Curriculum and Instruction (Ph.D.) (jointly administered with the College of Education)
- Exercise Science (Ph.D.)
- Gerontology Program (Certificate in Gerontology)
- Justice Studies (Ph.D.)
- Public Administration (D.P.A.)
- Science and Engineering of Materials (Ph.D.)
- Speech and Hearing Science (Ph.D.)
- Statistics (M.S.)
- Transportation Systems (Certificate in Transportation Systems)

Other interdisciplinary programs include Communication (Ph.D.) (administered by the College of Public Programs), History and Theory of Art (Ph.D.) (jointly offered with the University of Arizona; administered by the School of Art), Humanities (M.A.) (administered by the College of Liberal Arts and Sciences), and Molecular and Cellular Biology (M.S., Ph.D.) (administered by the College of Liberal Arts and Sciences).

Each of these programs uses resources and faculty from several disciplines. The programs promote cooperative research and instruction among faculty who share common interests but are housed in different academic units. Interdisciplinary programs allow students to pursue degrees that are intellectually coherent while bringing together diverse strengths of the university.

## Certificate Programs

A number of certificate programs are offered by various academic units or programs on campus, see "Certificate Programs Offered at ASU Main, East, and West," page 17.

## ADMISSION TO THE GRADUATE COLLEGE

### Eligibility

Anyone who holds a bachelor's (or equivalent) or graduate degree from a college or university of recognized standing is eligible to apply for admission to the Graduate

College. Remedies for undergraduate deficiencies may be assigned if the undergraduate degree is based on credits not accepted by ASU, such as life experience or noncredit workshops and seminars.

### Graduate College Requirements

Generally, an applicant must have a GPA of 3.00 (scale is 4.00 = A), or the equivalent, in the last two years of work leading to the bachelor's degree. A student who enters a graduate degree program is expected to have undergraduate educational experiences, including general education studies, that are similar to those required for the baccalaureate degree at ASU.

### Requirements of the Academic Unit

Academic units, departments, or colleges, may have admission requirements in addition to those of the Graduate College. Many graduate programs require scores from a national admissions test such as the Graduate Record Examination, Graduate Management Admission Test, or the Miller Analogies Test. Some programs require a portfolio, letters of recommendation, or a statement of goals. Applicants should contact the academic unit regarding specific requirements.

### Submission of an Application

For admission information and procedures, access the Web site at [www.asu.edu/graduate/admission](http://www.asu.edu/graduate/admission) or refer to the *Application for Graduate Admission* booklet. Students may apply via the Web, by mail, or by fax.

### Application Fee

Each application for entry to ASU graduate programs must be accompanied by a nonrefundable application fee. The fee is \$45 to apply for admission to a degree program and \$15 to apply for nondegree studies. For admission information and procedures, access the Web site at [www.asu.edu/graduate/admission](http://www.asu.edu/graduate/admission), or refer to the *Application for Graduate Admission* booklet.

### International Applicants

Applicants who will attend the university while holding F-1 or J-1 visas must meet the regulations of the Immigration and Naturalization Services in addition to the requirements of the Graduate College and the academic units to which they apply.

International applicants must meet the requirements of the Graduate College as well as those of the degree programs to which they apply. Applicants from outside the United States are also required to submit additional materials and should follow the procedures described in the *Application for Graduate Admission* booklet, or access the Web site at [www.asu.edu/graduate/admission](http://www.asu.edu/graduate/admission). International applicants should read this information carefully to become familiar with all the requirements they must meet and should consult it often for the instructions they must follow in submitting materials. The *Graduate Catalog* provides essential information about ASU and its graduate programs, but applicants can also consult the ASU listings in *Peterson's Graduate Education Directory* and in the *Directory of Graduate Programs* (published by the Educational Testing Service).

**TOEFL Requirement.** Among the additional materials required of international students are scores from English language examinations. All applicants whose native lan-

guage is not English must submit a score from the Test of English as a Foreign Language (TOEFL). The TOEFL can be waived if the undergraduate degree is earned from an English-speaking institution. For a complete list of TOEFL requirements, see page 7 of the *Graduate Admissions* booklet or refer to the Web site at [www.asu.edu/graduate/admission](http://www.asu.edu/graduate/admission).

Among the additional materials required of international students are scores from English language examinations. All applicants whose native language is not English must submit a score from the Test of English as a Foreign Language (TOEFL). All international applicants who do not speak English as a primary language and who wish to apply for teaching assistantships must pass an examination that certifies their skill in speaking English—either the Test of Spoken English (TSE), which may be taken in the student's home country, or the Speaking Proficiency English Assessment Kit (SPEAK) test, which is administered at ASU. Some degree programs also require TSE or SPEAK scores of applicants whose native language is not English. For specific information about TSE requirements, contact the head of the academic unit.

As required by the U.S. Immigration and Naturalization Service, international applicants must also verify that they have the financial resources to cover their expenses during graduate study at ASU. The Financial Guarantee form is available in the *Application for Graduate Admission* booklet. It can also be accessed through the Graduate College Web site at [www.asu.edu/graduate/admission](http://www.asu.edu/graduate/admission). International applicants must see that the form with a verification from a bank or sponsoring organization is completed and submitted to Graduate Admissions. The I-20 or the IAP66 (documents needed to obtain a student visa) are issued only after the completed, properly verified Financial Guarantee form has arrived. International students may enroll at ASU only if they have been admitted to a degree program, a certificate program, or the postbaccalaureate teacher education program. They must meet all appropriate immigration standards and requirements.

Applications are processed when they are received. However, international applicants should submit all materials in December or January in order to begin study the following fall semester and in August or September in order to begin study the following spring semester. An application fee of \$45 (in U.S. funds) must accompany the formal application, which otherwise is not processed.

All F-1 or J-1 visa students must have insurance coverage against illness and accident before being permitted to register. Insurance must be maintained throughout the student's enrollment in the university and may be obtained at the time of registration.

Upon arrival on campus, students must report to the advisor in the International Student Office.

### Additional Information

The Graduate College does not have deadlines. Applications are processed as they are received. However, many academic units have specific and early deadlines; many units review applications once a year, usually in January or February for fall admission. Applicants are urged to contact the academic units regarding deadlines.

Academic units, which must indicate their willingness to admit applicants, frequently set higher standards than those established by the Graduate College. Many qualified appli-



cants are denied because of limits on the number of students admitted each year.

### Notice of Admission Decisions

Only the dean of the Graduate College can make formal offers of admission. The Graduate College notifies all applicants in writing of the admission decision.

All academic credentials and supporting materials received by the university in connection with an application for admission become the property of ASU. If the applicant does not enroll in the university within one year, the admission documents may be destroyed.

The date (month/day/year) on the Graduate College dean's letter of admission is the actual date of admission. If the student is enrolled in courses on the admission date, those courses—if applicable—may be considered part of a program of study. Courses taken the semester before this date are nondegree hours.

### Admission Classifications

**Regular Admission.** Applicants who fulfill all requirements for admission and are acceptable to both the academic unit and the Graduate College are granted regular admission.

**Regular Admission with Deficiencies.** A student whose grades and test scores are at an acceptable level but who does not have the undergraduate background expected by the academic unit and the university may be required to complete courses to remedy deficiencies. The letter of admission specifies the deficiencies that must be completed before the student is awarded a graduate degree. Deficiency courses may not be applied toward the minimum hours required for the degree program.

**Provisional Admission.** A student who does not meet minimum academic standards but has counterbalancing evidence to suggest the potential for success may be admitted on a provisional basis. Provisional admission provides an academic unit with more evidence on which to base its decision. Normally the academic unit reviews the student's status following completion of 12 semester hours of approved graduate study. At that time, the academic unit recommends to the Graduate College a change in status to either regular admission or withdrawal from the program. When students have completed their provisional requirements, they should check with their advisors to make sure that the change of status has been recommended. A provisional student may also be assigned deficiencies.

**Nondegree Admission.** A student not interested in earning a degree or not yet ready to apply to a particular degree program may enroll as a nondegree student. The application process is streamlined and does not require submission of transcripts or test scores. For nondegree admission information and procedures, access the Web site at [www.asu.edu/graduate/admission](http://www.asu.edu/graduate/admission) or refer to the *Application for Graduate Admission* booklet. Students may apply electronically. A maximum of nine hours taken at ASU while in this category may be applied toward a master's degree if appropriate for the student's program of study.

The six-year maximum time limit applies to nondegree semester hours appearing on a master's program of study. In addition, because of limited class size and resources, certain

academic units may limit the enrollment of nondegree students.

### Recognition of a Degree

Recognition of a degree is acknowledgment that the program leading to the degree is equivalent to a program offered by ASU or is an acceptable program for the proposed graduate major at ASU. A student who enters a graduate degree program at ASU is expected to have undergraduate educational experiences, including general education studies, that are appropriate for the program.

### Definition of a Unit of Credit

The Arizona Board of Regents has defined (May 26, 1979) a unit of credit for the institutions under its jurisdiction. A minimum of 45 hours of work by each student is required for each unit of credit. An hour of work is the equivalent of 50 minutes of class time (often called a "contact hour") or 60 minutes of independent study work. For lecture-discussion courses, this requirement equates to at least 15 contact hours and a minimum of 30 hours of work outside of the classroom for each unit of credit. Even though the values of 15 and 30 may vary for different modes of instruction, the minimum total of 45 hours of work for each unit of credit is a constant. Since the unit of credit as defined by the Arizona Board of Regents is the cornerstone of academic degree programs at ASU, degrees granted by other institutions that are recognized by ASU should be based on a similar unit of credit.

## GRADUATE COLLEGE PROCEDURES

### Change in Graduate Degree Program

A change from one graduate degree program to another requires a new application to the Graduate College. The usual admission procedures are followed. For details on matters relating to the application fee, see "Admission Application," page 42.

### Readmission to the Graduate College

Any graduate student who has not been in attendance at the university for one or more semesters must submit an application for readmission to the Graduate College. The application should be submitted at least one month before the beginning of the semester in which the student plans to re-enter. For details on readmission and other matters relating to the application fee, access the Web site at [www.asu.edu/graduate/admission](http://www.asu.edu/graduate/admission) or refer to the *Application for Graduate Admission* booklet.

### Determination of Catalog Requirements

The *Graduate Catalog* is published annually. Requirements for an academic unit or college, campus, or the university as a whole, may change and are often upgraded.

A student graduates under the curriculum, course requirements, and regulations for graduation in effect at the time of admission to a graduate degree program at ASU. A student may also choose to graduate under any subsequent catalog issued. *In determining graduation requirements, a student may use only one catalog.*

Some changes in policies and procedures affect all students regardless of the catalog used by the student. These policies and procedures may appear in the catalog or in other university publications.

## Registration

Graduate students, like all university students, register during the intervals indicated in the *Schedule of Classes* issued by the Office of the Registrar. Details regarding registration and course drop-add procedures are also provided in the *Schedule of Classes*. Day and evening graduate classes, offered on or off campus, during the two regular semesters and the summer sessions, are considered part of the regular program.

InTouch, the ASU touch-tone telephone system for registration and fee payment, and the online registration system, accessed at any registrar site, ease the enrollment process.

## Audit Enrollment

Graduate students may register as auditors in one or more courses with the approval of the supervisory committee chair and the consent of the instructor involved. The student must be registered properly and pay the fees for the course. An audited course is counted in the student's maximum course load. It does not count for students who must take a minimum number of credits, e.g., teaching assistants or students receiving financial assistance. The mark of "X" is recorded for completion of an audited course, unless the instructor determines that the student's participation or attendance has been inadequate, in which case a "W" may be recorded.

## Withdrawal Policies and Procedures

Students who find it necessary to withdraw from the university should obtain and complete an official withdrawal form from any registrar site. Until officially withdrawn, the student is registered in all courses and, at the end of the semester, receives grades appropriate for the performance in each course. A student who officially withdraws from the university during the first four weeks of a semester receives the mark of "W" in all courses registered. A student who officially withdraws from the university later than the fourth week receives a mark of "W" or "E," depending upon the quality of work at the time of official withdrawal. No student is permitted to withdraw during or after the last two weeks of the semester (the last week of classes and final examination week).

Failure to withdraw officially from a course results in a grade of "E," which is used in the computation of the GPA. The *Schedule of Classes* lists the procedures for withdrawal.

An instructor may withdraw a student from a class with a mark of "W" or a grade of "E" for disruptive classroom behavior. A student may appeal an instructor-initiated withdrawal to the standards committee of the college in which the course is offered. The decision of the committee is final.

A graduate student who does not enroll for three calendar years is considered withdrawn and must reapply for admission to a degree program.

**Unrestricted Withdrawal.** During the first four weeks of a semester or the first six days of a summer session, a student may withdraw from any course with a mark of "W." See the *Schedule of Classes* or the *Summer Sessions Bulletin* for the dates of the unrestricted withdrawal period.

**Restricted Withdrawal.** From the fifth week to the end of the 10th week of a semester and from the seventh day to the end of the third week of a summer session, students may withdraw with a mark of "W" from courses only in which the instructor certifies that they are passing at the time of the

withdrawal. See the *Schedule of Classes* or the *Summer Sessions Bulletin* for dates of the restricted withdrawal period.

**Medical Withdrawal.** Normally, a medical withdrawal request is made in cases where serious illness or injury prevents a student from continuing courses and incompletes or when other arrangements with the instructor are not possible. Consideration is usually given for complete withdrawal. An application for less than a complete withdrawal must be well documented to justify the selective nature of the medical withdrawal request. This policy applies both to cases involving physical health problems and those involving mental or emotional difficulties.

To receive permission for a medical withdrawal from courses, a student must present a Request for Documented Medical Withdrawal form and proper documentation (usually a letter from a physician) of the medical condition to the medical withdrawal designee of the college of the student's major. For complete procedural information, contact the appropriate medical withdrawal designee.

## Course Load

The course load is determined by the supervisory committee but is not to exceed 15 semester hours of credit during each of the two semesters. Refer to the current *Summer Sessions Bulletin* for course load limit for five-week and eight-week sessions. An audited course is counted in the student's maximum load.

All teaching and research assistants and associates must enroll for a minimum of six semester hours during each semester (fall and spring) of their appointment. The six hours cannot include audit enrollment. Enrollment in continuing registration (595, 695, or 795) does not fulfill the six-hour requirement. A half-time (50 percent) teaching and research assistant or associate working 20 clock hours per week may not register for more than 12 hours of course work each semester; a third-time (33 percent) assistant or associate for more than 13 hours; and a quarter-time (25 percent) assistant or associate for more than 15 hours.

All graduate students doing research, working on theses or dissertations, taking comprehensive or final examinations, or using university facilities or faculty time must be registered for a minimum of one semester hour of credit, not audit, that appears on the program of study or is an appropriate graduate-level course, such as 595, 695, or 795 Continuing Registration.

Doctoral students fulfilling residence requirements for the Doctor of Philosophy and Doctor of Musical Arts degrees must be enrolled full time (nine semester hours minimum or six semester hours for research assistants or teaching assistants) during the specified period. See "Residency Classification Procedures and Policies," page 45, and specific degree requirements for fulfilling residence requirements for other doctoral degree programs.

**Summer Course Loads.** Refer to the current *Summer Sessions Bulletin* for course load limit for five-week and eight-week sessions.

**Enrollment Verification Guidelines.** The registrar is responsible for verifying enrollment according to the general guidelines in the "Enrollment Verification Guidelines" table, page 93.

## Enrollment Verification Guidelines

	Full-Time	Half-Time	Less Than Half-Time
<b>Regular semester</b>			
Graduate	9 or more hours	5–8 hours	4 or fewer hours
Graduate assistant*	6 or more hours		
<b>Five-week summer session</b>			
Graduate	3 or more hours	2 hours	1 hour
Graduate assistant*	2 or more hours	1 hour	
<b>Eight-week summer session</b>			
Graduate	5 or more hours	3–4 hours	2 or fewer hours

\* For enrollment verification purposes, “graduate assistant” is a generic term that includes teaching assistants, research assistants, graduate assistants, teaching associates, research associates, and graduate associates.

## GRADUATE COLLEGE DEGREE REQUIREMENTS

## Graduate Advising

Advising is much more than technical support; it is an integral part of graduate education. Students’ programs of study are generally tailored to meet individual needs, and students should seek advice from faculty or advisors as they plan their course work, examinations, and other degree requirements.

## Grading

The “Grades” table, page 93, defines grades and gives their values.

A grade of “P” (pass) in a 400-level course may not appear on a program of study. Grades on transfer work or ASU law credit are not included in computing GPAs.

Grades of “D” and “E” cannot be used to meet the requirements for a graduate degree, although they are used to compute the GPAs. A student receiving a grade of “D” or “E” must repeat the course in a regularly scheduled (not an independent study) class if it is to be included in the program of study. However, both the “D” or “E” and the new grade are used to compute the GPAs.

Graduate course work (500-, 600-, and 700-level courses) reported as an “I” (incomplete) must be completed within one calendar year. At the time the “I” grade is given, the student must complete a “Request for Grade of Incomplete” form. The form first serves as a record of the “I” grade and the work required to complete it. When the student has completed the work, the form then serves as a change-of-grade authorization.

If the work specified on the form is not completed within one calendar year, the “I” grade (500-, 600-, and 700-level courses) becomes part of the student’s permanent transcript. The student is not allowed to complete the course work as specified on the “Incomplete” form. The student may, however, repeat the course after the “I” has become permanent, by reregistering, paying fees, and fulfilling all course requirements. The grade for the repeated course appears on the transcript but does not replace the permanent “I.”

**Repeating ASU Courses.** Graduate students (degree or nondegree) may retake any courses at any level at ASU, but all grades remain on the student transcript as well as in GPA calculations.

## Grades

Grade	Definition	Value
A	Excellent	4.00
B	Good	3.00
C	Passing	2.00
D	No graduate credit	1.00
E	Failure	0.00
W	Withdrawal <sup>1</sup>	
I	Incomplete	
X	Audit	
Y	Satisfactory	
Z	Course in progress <sup>2</sup>	

<sup>1</sup> This grade is given whenever a student officially withdraws.

<sup>2</sup> This grade is usually given pending completion of courses.

## University Policy for Student Appeal Procedures on Grades

**Informal.** The steps outlined below, beginning with step A, must be followed by any student seeking to appeal a grade. Student grade appeals must be processed in the regular semester immediately following the issuance of the grade in dispute (by commencement for fall or spring), regardless of whether the student is enrolled at the university. It is university policy that students filing grievances and those who are witnesses will be protected from retaliation. Students who believe they are victims of retaliation should immediately contact the dean of the college in which the course is offered.

- A. The aggrieved student must first undergo the informal procedure of conferring with the instructor, stating the evidence (if any) and reasons for questioning that the grade received was not given in good faith. The instructor is obliged to review the matter, explain the grading procedure utilized, and show how the grade in question was determined. If the instructor is a graduate assistant and this interview does not resolve the difficulty, the student may then go to the faculty member in charge of the course (regular faculty member or director of the course sequence) with the problem.
- B. If the grading dispute is not resolved in step A, the student may appeal to the department chair or other appropriate chair of the area within the department (if any).

The department chair may confer with the instructor to handle the problem. Step B applies only in departmentalized colleges.

- C. If these discussions are not adequate to settle the matter to the complainant's satisfaction, the student may then confer with the dean of the college concerned (or the dean-designate), who will review the case. If unresolved, the dean or designate may refer the case to the college academic grievance hearing committee to review the case formally. In most instances, however, the grievance procedure does not go beyond this level.

**Formal.** The following procedure takes place after steps A, B, and C (or A and C) have been completed.

- D. Each college has on file in the office of the dean (and in each department of the college) the procedures and composition of the undergraduate or graduate academic grievance hearing committee for student grievances. Each college committee shall operate under grievance procedures as stated, which satisfy due process requirements. The committee shall always meet with the student and the instructor in an attempt to resolve the differences. At the conclusion of the hearing, the committee shall send its recommendations to the dean.
- E. Final action in each case is taken by the dean after full consideration of the committee's recommendation. Grade changes, if any are recommended, may be made by the dean. The dean shall inform the student, instructor, department chair (if any), the registrar, and the grievance committee of any action taken.

### Scholarship

To be eligible for a degree in the Graduate College, a student must achieve two GPAs of "B" (3.00) or higher. The first GPA is based on all courses numbered 500 or higher that appear on the transcript. (Courses noted as deficiencies in the original letter of admission are not included.) The second GPA is based on all courses that appear on the program of study.

Graduate students (degree or nondegree) may retake any courses at any level at ASU, but all grades remain on the student transcript as well as in GPA calculations.

Academic excellence is expected of students doing graduate work. Upon recommendation from the head of the academic unit, the dean of the Graduate College can withdraw a student who is not progressing satisfactorily.

The designation of honors (*summa cum laude*, *magna cum laude*, and *cum laude*) is reserved for undergraduates. The Graduate College does not use these academic distinctions.

### Graduate Credit Courses

Courses at the 500, 600, and 700 levels are graduate credit courses. Courses at the 400 level apply to graduate degree requirements when appearing on an approved program of study. However, 400-level courses are not graduate courses by definition and cannot be certified as such for purposes of employment or transferring to other institutions.

**Reserving of Course Credit by Undergraduates.** Seniors at ASU within 12 semester hours of graduation may enroll in a 400-level or graduate course and reserve the credit for possible use in a future graduate program. The course cannot be used to meet a baccalaureate graduation requirement.

Before registration in the class, the student must submit a Graduate College Petition form requesting credit reservation; the form must be signed by the student's advisor, the head of the academic unit offering the class, and the dean of the Graduate College.

Permission to reserve a course does not guarantee admission to a graduate degree program or that the course may be used toward graduate degree requirements. A maximum of nine hours of credit may be reserved, and only courses with an "A" or "B" grade are applicable. Reserved credit earned before admission to a graduate degree program is classified as nondegree credit. The maximum course load for a student enrolled in a reserved course is 15 semester hours during a regular semester and six hours during a summer session.

**Transfer Credit.** Transfer of credit is the acceptance of credit from another institution for inclusion in a program of study leading to a degree awarded by ASU. The number of hours transferred from other institutions may not exceed 20 percent of the total minimum semester hours required for a master's degree unless stated otherwise for a specific degree program.

Transfer credit taken before admission to a graduate degree program at ASU Main or East is nondegree credit. Nondegree credit taken at ASU Main or East combined with nondegree credit taken at another institution may not exceed nine hours on the master's program of study. The nine-hour limit does not apply to doctoral programs.

The date (month/day/year) on the Graduate College dean's letter of admission is the actual date of admission. If the student is enrolled in courses on the admission date, those courses—if applicable—may be considered part of a program of study. Courses taken the semester before this date are nondegree hours. Courses taken at ASU West are considered transferred credit.

Transfer credits must be acceptable toward graduate degrees at the institution where the courses were completed. Certain types of graduate credits cannot be transferred to ASU, including the following:

1. credits awarded by postsecondary institutions in the United States that lack candidate status or accreditation by a regional accrediting association;
2. credits awarded by postsecondary institutions for life experience;
3. credits awarded by postsecondary institutions for courses taken at noncollegiate institutions (e.g., government agencies, corporations, and industrial firms);
4. credits awarded by postsecondary institutions for noncredit courses, workshops, and seminars offered by other postsecondary institutions as part of continuing education programs; and
5. credits given for extension courses.

Acceptable academic credits earned at other institutions that are based on a different unit of credit than the ones prescribed by the Arizona Board of Regents are subject to conversion before being transferred to ASU.

Only resident graduate courses with an "A" or "B" grade may be transferred. A course with the grade of pass, credit, or satisfactory may not be transferred.

Official transcripts of any transfer credit to be used on a program of study must be sent directly to the Graduate

Admissions Office from the Office of the Registrar at the institution where the credit was earned.

### Graduate Supervisory Committees

When the program of study is filed, upon the recommendation of the head of the academic unit, the dean of the Graduate College appoints a graduate student's supervisory committee, consisting of a chair and other resident faculty members. The number of members serving on this committee depends on the degree program.

Academic professionals (e.g., research scientists, research engineers), nontenure-track faculty (e.g., adjunct professors, research professors), and individuals granted affiliated faculty status through established university procedures may serve as cochairs, members, or extra members of thesis and dissertation committees upon approval by the Graduate College. Individuals who are recommended by an academic unit as eligible to serve as a cochair must meet the criteria established by the academic unit and be approved by the Graduate College.

Upon the recommendation of the committee chair and head of the academic unit, ASU West tenured (or tenure-track) faculty may serve on master's and doctoral committees at ASU Main. ASU West tenured (or tenure-track) faculty may serve as cochairs for theses and dissertations at ASU Main upon the recommendation of the head of the academic unit and approval of the dean of the Graduate College. Cochairs must meet the academic unit's criteria for chairing theses and dissertations.

Qualified individuals outside the university, upon the recommendation of the head of the academic unit and approval of the Graduate College, may serve as members of thesis and dissertation committees; however, such individuals may not serve as chairs or cochairs (unless they have affiliated faculty status). With the approval of the academic unit and the dean of the Graduate College, former ASU faculty with students completing their degrees may continue to serve as cochairs. At least 50 percent of the committee must be faculty from ASU Main.

### Foreign Language Requirements

A graduate degree program may require proficiency in a foreign language. If a foreign language is required, students must demonstrate at least a reading knowledge in the area of study required by the supervisory committee and consistent with the requirements for the graduate degree program. Normally, the language is selected from French, German, Russian, or Spanish, although other languages may be recommended when there is adequate justification.

Students who are required to demonstrate proficiency in a foreign language must pass a foreign language examination specific to their particular graduate program. The examinations are administered three times each year by the Department of Languages and Literatures, which certifies language competency. Students planning to take the examination must register in the Graduate College at least one month in advance of the examination date. The chair of the student's supervisory committee is responsible for providing the Department of Languages and Literatures with materials from which the examination is then prepared. The chair should submit or recommend relevant books or journals of approximately 200 pages in length in the desired foreign language.

A student may petition the Graduate College for a re-examination but must pass the examination in no more than three attempts.

### Theses and Dissertations

The master's thesis or equivalent is an introduction to research writing. All doctoral degree candidates must submit a dissertation, with the exception of the Doctor of Musical Arts degree in Music (concentrations in choral conducting and solo performance), which requires three recitals and a research paper. The Ph.D. dissertation should be a valuable educational experience that demonstrates the candidate's mastery of research methods, theory, and tools of the discipline. It should demonstrate the candidate's ability to address a major intellectual problem and to propose meaningful questions and hypotheses. The dissertation should be a contribution to knowledge that is worthy of publication by an established press as a book or monograph or as one or more articles in a reputable journal.

For format, the Graduate College must review the final copy of the master's thesis, doctoral dissertation, and other final documents that are required to be placed in the library. Copies of the *Format Manual* are available in the Graduate College and on the Web at [www.asu.edu/graduate/fr\\_search.html](http://www.asu.edu/graduate/fr_search.html). The student is required to submit a complete copy of the thesis or dissertation for format review at least 10 working days (two weeks if there are no holidays during the time period) before the oral defense. Doctoral students must submit a completed Survey of Earned Doctorates Awarded in the United States, conducted by the National Research Council.

Graduate students and their supervisory committee chairs jointly select a style guide or journal format representative of the field of study. The Graduate College allows certain flexibility in the format of the manuscript, but Graduate College and library guidelines must be followed.

The student must submit two final copies of a thesis or dissertation to the ASU Bookstore for binding. The student is responsible for the binding fees. Bound copies are placed in the Hayden Library and Archives. Doctoral students must submit one copy of the title page, approval page, and abstract (which must not exceed 350 words); the original signature of the doctoral student must appear on the University Microfilms International (UMI) Dissertation Agreement Form. The student is responsible for the UMI microfilming fee, which covers the expense of having the document sent to UMI, where it is microfilmed and catalogued. Information on the dissertation will appear in *Dissertation Abstracts International*.

### Application for Graduation

Students should apply for graduation no later than the date specified in the "Graduate College Calendar," page 18. All fees are payable at that time. Students applying for graduation after the deadline listed in the "Graduate College Calendar" are required to pay a late fee. At the end of the semester in which they apply for graduation, students are officially notified of any requirements for their degree that they have not yet completed.

Students are requested to complete a questionnaire that serves as a graduate student exit survey.

Students who do not complete all degree requirements by their anticipated graduation date are required to pay a re-filing fee.

## Summer Sessions

Work taken during the summer sessions carries the same scholastic recognition as that taken during the regular semester. A complete schedule of offerings is available in the *Summer Sessions Bulletin*, which may be obtained from the Office of Summer Sessions.

## Dates and Deadlines

The “Graduate College Calendar,” page 18, lists deadlines for the submission of theses and dissertations to the Graduate College, the last day to apply for graduation, the last day to hold an oral defense of a thesis or dissertation, and the last day to submit theses and dissertations to the ASU Bookstore for binding.

## Student Responsibility

It is the responsibility of the graduate student to know and observe all procedures and requirements of the Graduate College as defined in the *Graduate Catalog*, the *Schedule of Classes*, and the *Format Manual*. Each student should also be informed about the requirements concerning the student’s degree program and any special requirements within the academic unit.

## ACADEMIC INTEGRITY

The highest standards of academic integrity are expected of all students. The failure of any student to meet these standards may result in suspension or expulsion from the university and/or other sanctions as specified in the academic integrity policies of the individual colleges.

Violations of academic integrity include, but are not limited to, cheating, fabrication, tampering, plagiarism, or facilitating such activities.

The university academic integrity policy is available in the Office of the Senior Vice President and Provost or refer to the *Student Affairs Policies and Procedures Manual* STA 104-01, on the Web at [www.asu.edu/aad/manuals/sta/sta104-01.html](http://www.asu.edu/aad/manuals/sta/sta104-01.html).

## MISCONDUCT IN SCHOLARLY RESEARCH AND CREATIVE ACTIVITIES

Students are expected to maintain the highest standards of integrity and truthfulness in scholarly research and creative activities. Misconduct in scholarly research and creative activities includes, but is not limited to, fabrication, falsification or misrepresentation of data, and plagiarism. Misconduct by any student may result in suspension or expulsion from the university and other sanctions as specified by the individual colleges. Policies on misconduct are available in the Office of the Vice Provost for Research and on the Web at [www.asu.edu/aad/manuals/rsp/rsp111.html](http://www.asu.edu/aad/manuals/rsp/rsp111.html).

## ASSISTANTSHIPS AND ASSOCIATESHIPS

**Application Procedure.** Since it is necessary for all applicants to be admitted to degree programs before awards are made, students should apply for admission through the Graduate Admissions Office at the same time they apply for financial assistance.

**Teaching and Research Assistantships and Associateships.** Appointments as teaching or research assistants and associates are available in most academic units offering graduate work to students admitted with regular status. Students who have completed a master’s degree or the equivalent

may be considered for graduate associateships when available. All teaching and research assistants and associates must enroll for a minimum of six semester hours during each semester of their appointment. The six hours cannot include audit enrollment. A half-time (50 percent) teaching and research assistant or associate working 20 clock hours per week may not register for more than 12 hours of course work each semester; a third-time (33 percent) assistant or associate for more than 13 hours; and a quarter-time (25 percent) assistant or associate for more than 15 hours.

During the summer sessions, teaching or research assistants and associates employed 25 percent time may enroll for a maximum of six semester hours during a five-week session or nine hours during the eight-week session; those employed 50 percent time may enroll for a maximum of five hours during a five-week session or seven hours during the eight-week session; and those employed 100 percent time may enroll for a maximum of three hours during a five-week session or four hours during the eight-week session.

Teaching and research assistantships and associateships allow nonresident graduate students to pay tuition at the resident tuition rate. Eligibility applies to teaching and research assistants and associates working 25 percent or more time if their first working day occurs before the end of the first five days of instruction during the semester in question. Only under exceptional circumstances are exceptions granted by the Dean’s Office.

A number of academic units administer assistantships and associateships under research programs sponsored and supported by government, industry, and foundations. Inquiries concerning requirements and deadlines as well as applications should be sent to the head of the appropriate academic unit.

**Assistantships, Associateships, and Commercial Services.** All graduate students who are hired for class/course support or who hold assistantships or associateships *for a specific course*—including teaching assistants and research assistants—may not take or provide notes for *that* course to commercial notetaking services or students. An exception may be made by the course instructor(s) on a case-by-case basis as an authorized support service for a disabled student. This policy covers all commercial activities (e.g., notetaking and paid review sessions) that might be associated with a course for which the assistant or associate has assigned responsibilities.

## STUDENT RECORDS

### Family Educational Rights and Privacy Act of 1974

This act, known as the Buckley Amendment, sets forth the requirements governing the protection of the privacy of the educational records of students who are or have been in attendance at ASU.

### Definitions

**Eligible Student.** For the purpose of this act, an *eligible student* is defined as any individual formally admitted to and enrolled at ASU or the parents of a *dependent* eligible student. Dependency is defined by Section 152 of the Internal Revenue Code of 1954.

**Record.** Any information or data recorded in any medium, including, but not limited to, handwriting, print, tapes, film, microfilm, microfiche, and electronic means.

### Types of Information

**Educational Record.** The educational record refers to those records that are directly related to a student and are maintained by an educational institution. Two types of educational records are subject to the provisions of this act, (1) *directory information* and (2) *personally identifiable information*. The term does not include those records specifically excluded by Section 99.3 of the Privacy Act.

**Directory Information.** *Directory information* includes the following student information: name, local and permanent address, local telephone number, date and place of birth, citizenship, residency status, academic level, major field of study, college of enrollment, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, degrees and awards received, and the most recent previous educational agency or institution attended by the student.

**Personally Identifiable Information.** *Personally identifiable information* includes the name of a student, the student's parent or other family member(s), a personal identifier such as the student's Social Security number, a list of personal characteristics, or other information that would make the student's identity easily traceable and any information, including directory information, that the student has indicated not to be released.

### Access to Records

Eligible students, or parents of a dependent eligible student, may inspect and review their educational records. Some form of photo identification must be displayed before access to educational records is allowed.

*Directory information* may be released to anyone without consent of the student, unless the student indicates otherwise. Students may request that this information not be released by completing a form in the Office of the Registrar. Request to withhold this information will exclude the student from being listed in the annual *Directory*.

All other educational records that contain *personally identifiable information* may not be released without the written consent of the student. Parents of a dependent student may challenge denial of such access by producing the most current copy of Internal Revenue Form 1040. If that form lists the student in question as a dependent, the parents will be required to sign an affidavit that affirms that the student is their dependent. The affidavit will be retained by the Office of the Registrar. Upon receipt of the affidavit, the university will make student records available to parents for the rest of that calendar year as specified under the Privacy Act.

Students may grant access to parents or agencies by completing a form in the Office of the Registrar.

### Location of Policy and Records

The Custodian of Educational Records at ASU is the Office of the Registrar. Copies of this policy are available in the following offices: the Reserve Section of Hayden Library and the Noble Science and Engineering Library, the Office of the Registrar, the Offices of Undergraduate and Graduate Admissions, and the Student Life Office. The

Office of the Registrar also maintains a directory that lists all education records maintained on students by ASU.

### POLICIES AND PROCEDURES OF THE GRADUATE COUNCIL APPEALS BOARD

The Graduate Council Appeals Board (GCAB) acts as the appeals body for graduate students seeking redress on academic decisions regarding their graduate program. Before filing an appeal, the graduate student should discuss the situation with the associate dean of the Graduate College to explore resolution of the matter at the unit or college level.

**GCAB.** The purpose of the board is to review written appeals of graduate students. (On occasion a faculty member may be appealing the decision about a graduate student made by a program, an academic unit, the Graduate College, or another college.) Such appeals concern

1. retention in graduate programs;
2. other academic issues (except grade appeals, which are handled in academic colleges); and
3. procedural matters in graduate student programs (e.g., programs of study, thesis/dissertation, exams).

The GCAB consists of three or more members of the Graduate Council appointed by the dean of the Graduate College at the beginning of each academic year. In specific cases the GCAB may ask for additional members from the faculty or one or more graduate students to be appointed by the dean of the Graduate College. The GCAB is chaired by one of the members as designated by the dean or associate dean. The GCAB is assisted by the assistant dean, who oversees the hearing but does not serve as a member of the GCAB. Membership is on an annual basis, but members of the Graduate Council may serve for a maximum of three consecutive years. To the extent possible, GCAB membership does not change during a student appeal. A member continues to serve on the GCAB into the next academic year if an appeal is continued during that time.

**Meetings.** The board meets when notified by the assistant dean that an appeal is pending. The GCAB requires two-thirds of the committee present for a quorum. A GCAB member must disqualify herself or himself if a case involves a student in her or his academic unit or the member has some direct tie to the student who is appealing. The dean of the Graduate College replaces the individual with a current or past Graduate Council member. A recording secretary is selected before each appeal. This person keeps notes of the hearing. Secretarial support for typing notes is provided by the assistant dean. A tape is made of the hearing.

**Jurisdiction.** The GCAB has the authority to receive written appeals from graduate students on the review of any action or decision by any university faculty member, staff member, or administrator. However, any appeal must first be reviewed at the level of the academic unit from which the graduate student is making an appeal.

The GCAB has the right to decide not to hear an appeal. In this case, the decision of the academic unit is final. The GCAB may hear appeals on program dismissal, other academic issues, or procedural issues. In addition, the GCAB hears any appeal referred to it by the dean of the Graduate College.

The GCAB does not review

1. appeals of course grades, including omnibus courses such as independent research, thesis, or dissertation, which are handled through the academic colleges;
2. appeals concerning academic dishonesty, which are handled by the academic unit with appeals to the University Hearing Board;
3. appeals concerning scientific misconduct, which are handled by the academic unit with appeals to the Council of Research and Creative Activity through the Office of the Vice Provost for Research;
4. appeals for which the graduate student has not fully used all other appeal and review processes (e.g., the academic unit);
5. appeals filed more than 30 calendar days after receiving notification of the action taken at an appeal by the academic unit (or, if appropriate, another university committee);
6. allegations of discrimination; and
7. other appeals or grievances under the jurisdiction of other university boards and committees.

Appeals are not heard during the summer. The calendar stops on the last day of exams for the spring semester and begins on the first day of classes for the fall semester.

**Mediation.** Mediation between the graduate student and any university official is always a preferred option to a hearing. If mediation appears beneficial when the initial appeal is filed with the GCAB, the GCAB may recommend that mediation occur and select a mediator. If mediation is successful and both parties agree to the decision, a written record of the outcome is filed by the mediator with the GCAB, all parties involved, and the dean of the Graduate College. If mediation is not successful, the graduate student has 30 days from the end of the mediation process to request in writing a formal appeal hearing.

**Authority.** The GCAB may affirm or reverse the original decision being appealed and make such recommendations for further actions as appropriate. In the course of any hearing, the GCAB is authorized to request additional evidence or testimony by any student, faculty or staff member, administrator, other university employee, or other individual as a witness. The GCAB has final authority in procedural matters. The decision of the GCAB is final. The chair of the GCAB notifies all parties of the decision.

**Filing an Appeal.** Before an appeal comes to the GCAB, the normal channels for resolving disputes must have been consulted. The appellant should consult with the major professor to resolve the issue at that level. If the issue cannot be resolved with the major professor, the appellant should seek out the department chair or designated individual for resolution. In some cases, if the major professor and department chair have not been able to resolve the issue or the outcome still needs to be pursued, it may be appropriate to pursue the issue with the academic college dean. If the issue has not been resolved at one of these levels, an appeal to the GCAB may be pursued.

Before initiating an appeal, the graduate student should speak to the associate dean of the Graduate College to see if the issue can be resolved informally. Should negotiation,

through the associate dean of the Graduate College, not succeed, the graduate student may submit a written appeal.

All appeals must be submitted in writing to the associate or assistant dean of the Graduate College. Witnesses and any other pertinent evidence must be listed in the appeal. The written appeal must specify the grounds for the appeal as listed in the document "Guidelines for Appeals," available in the Graduate College. Only documents that follow the guidelines are considered, although university regulations pertinent to the case may be used as supporting grounds. It is incumbent upon the student to demonstrate to the GCAB that grounds for the appeal exist. The written appeal may not exceed 10 pages.

The associate or assistant dean notifies the appellee and requests, in writing, information from the appellee related to the case. The initial written response by the appellee is submitted within 15 days of receiving notice of the appeal.

## Master's Degrees

Faculty at ASU offer programs leading to the Master of Arts (M.A.) degree, the Master of Science (M.S.) degree, and various professional master's degrees. The M.A. and M.S. programs serve primarily as an introduction to research; the professional master's programs are intended primarily as a preparation for a career in professional practice.

For more information, refer to the appropriate section within "Graduate Programs and Courses," page 103.

**Admission to all Master's Degree Programs.** Students wishing to enroll in a master's program at ASU are admitted according to the procedure described under "Admission to the Graduate College," page 89. Since graduate work presupposes adequate preparation in a selected field at the undergraduate level, deficiencies are specified at the time of admission by the academic unit involved.

**Credit Requirements.** A minimum of 30 semester hours of graduate work approved by a student's supervisory committee and the Graduate College is required. More than 30 semester hours are required in certain programs.

**Supervisory Committee.** The supervisory committee is responsible for the guidance and direction of the student's graduate program. The committee is composed of a minimum of three members, including a chair, for students writing a thesis or equivalent.

**Program of Study.** After regular status has been granted, it is in the student's best interest to have an official program of study filed with the Graduate College at the earliest possible date. When the program of study is filed, a supervisory committee is appointed by the dean of the Graduate College upon the recommendation of the head of the academic unit (verified by the signature on the program of study). Changes in the planned program may be made by the student's supervisory committee, with the approval of the head of the academic unit and the dean of the Graduate College. Forms for the submission of the program of study are available in the Graduate College and in the Graduation section of the Office of the Registrar, Student Services Building. A student is not eligible to apply for the comprehensive or final examination until a program of study has been approved and any foreign language requirement completed.



**Credit Completed Before Admission.** With the approval of the student's supervisory committee, the head of the academic unit, and the dean of the Graduate College, a maximum of nine semester hours of ASU (Main and East) graduate course work completed before admission to a graduate degree program may be included in the program of study for a master's degree. The date (month/day/year) on the Graduate College dean's letter of admission is the actual date of admission. If the student is enrolled in courses on the admission date, those courses—if applicable—may be considered part of a program of study. Courses taken the semester before this date are nondegree hours. Individual academic units may have a policy of accepting fewer than nine semester hours attained before admission. For details, refer to the specific degree program.

Graduate credit earned at another institution before admission to a graduate degree program at ASU is nondegree credit. Nondegree credit earned at ASU Main and East combined with nondegree credit earned at another institution may not exceed nine semester hours in the program of study. For example, if six semester hours earned before admission to ASU are transferred from another institution, only three nondegree semester hours may be from ASU Main or East for a master's degree program. (See "Transfer Credit," page 94.)

The six-year maximum time limit applies to nondegree/transferred semester hours appearing on a program of study. (See "Maximum Time Limit," page 100.) Certain degree programs may have different maximum time limits. The student should refer to the specific degree program.

**College of Law Credit.** The Graduate College accepts a numerical grade of 70 or above for courses taken in the College of Law at ASU as part of an approved program of study for a master's degree program. These grades are not used in the two GPAs calculated for graduation: the courses on the program of study and all courses numbered 500 and above.

A maximum of six semester hours taken in the College of Law may be included in a 30-hour program of study for a master's degree. For a 36- to 45-hour program, the number of hours is limited to a maximum of nine semester hours of course work in the College of Law.

**Foreign Language Requirements.** A graduate degree program may have a foreign language requirement. This requirement must be fulfilled before the student is eligible to apply for the final written comprehensive examination or the defense of the thesis or equivalent. For certification of proficiency, see "Foreign Language Requirements," page 95.

**Comprehensive Examinations.** A comprehensive examination, written, oral, or both, administered by the academic unit, is required in all professional master's programs that do not have a thesis or equivalent requirement. A comprehensive examination is optional in other programs. Students are not eligible to apply for the comprehensives or for the oral defense of the thesis or equivalent until they have been regularly admitted, have filed an approved program of study, removed any deficiencies, and fulfilled any foreign language requirements. Students are required to register for at least one semester hour of credit that appears on the program of study or one hour of appropriate graduate-level credit (such as 595, 695, and 795 Continuing Registration) during the

semester or summer session in which they take their comprehensive examinations. Failure in the comprehensive examination is considered final unless the supervisory committee and the head of the academic unit recommend, and the dean of the Graduate College approves, a re-examination. Only one re-examination is permitted. A re-examination may be administered no sooner than three months and no later than one year from the date of the original examination.

**Thesis or Equivalent Requirements.** To satisfy the research requirement for most M.A. or M.S. degrees, a student is expected to present a thesis or equivalent, which is defended in an oral examination. Some professional master's programs may also require a thesis, research project, performance, or exhibition. The requirement varies with each major. Each student writing a thesis or equivalent must register for a minimum of six semester hours of thesis or for a combination of research and thesis totaling six hours, which are directed toward a common research problem.

Credit taken to fulfill the thesis or equivalent enrollment requirement must appear on the program of study.

A student writing a thesis must include on the program of study six hours of 592 Research and 599 Thesis, at least three of which must be 599 Thesis. Although additional 592 Research hours may be included on a program of study, a maximum of six hours of 599 Thesis may be used.

A thesis or equivalent should be of high quality, giving evidence that the program provided an introduction to research. Format evaluation of the thesis or equivalent, described under "Theses and Dissertations," page 95, must be obtained before its submission to the Graduate College for the oral defense. The final approved copy is bound and placed in Hayden Library. Copies of the *Format Manual* are available in the Graduate College or you may access the Web site at [www.asu.edu/graduate/formatmanual/index.html](http://www.asu.edu/graduate/formatmanual/index.html).

The final copy of the thesis or equivalent must be reviewed by the student's supervisory committee and submitted to the Graduate College for format evaluation at least 10 working days before the defense date. The final oral examination in defense of the thesis or equivalent must be conducted at least one week before the degree conferral date. The examination is conducted by the supervisory committee. Applications for the examination are available at the Graduate College.

Each student must be enrolled for at least one semester hour of credit that appears on the program of study or one hour of appropriate graduate-level credit (such as 595, 695, or 795 Continuing Registration) during the semester or summer session in which the student defends the thesis or equivalent.

**Open Thesis Defenses.** Master's thesis defenses are open to all members of the university community. The oral defense engages the supervisory committee and the candidate in a critical, analytical discussion of the research and findings of the study as well as a review of the relation of the thesis to the major field. The presentation of a thesis defense in an open forum fosters a broader awareness of the state of graduate research at the university, promotes a wider scholarly dialogue among disciplines, and recognizes publicly the scholarly contributions of thesis candidates. Announcements are posted in prominent places in the student's

department. Members of the university community are invited to thesis defenses through announcements published in *ASU Insight*, the university's weekly news bulletin. The supervisory committee may conduct the final part of its questioning in closed session. Committee deliberations and final vote are conducted in closed session.

**Graduation.** The student is eligible for graduation when all course work is successfully completed, the Graduate College scholarship requirements have been met, any required comprehensive examinations have been passed, and the thesis or equivalent, if applicable, has been approved by the supervisory committee and accepted by the head of the academic unit and the dean of the Graduate College. See "Application for Graduation," page 95.

**Maximum Time Limit.** Unless stated otherwise for a specific degree program, all work offered toward a master's degree must be completed within six consecutive years. The six years begin with the first course included on a student's approved program of study. For example, if the first course listed was taken fall semester 1999, the student must complete all requirements by August 2005. The six-year maximum time limit applies to nondegree transferred semester hours appearing on a program of study. (See "Credit Completed Before Admission," page 99.)

**Withdrawal Policy.** See "Withdrawal Policies and Procedures," page 92.

**Programs Leading to Two Master's Degrees.** A student may pursue concurrent master's degrees or a second master's degree provided that a maximum of one-sixth of the minimum total semester hours required for the completion of both degrees is common to the two programs of study. The total number of hours common to both degree programs may vary from this maximum value only when the Graduate Council has formally approved coordinated degree programs.

In all cases, these guidelines must be followed:

1. course work common to both programs must constitute a well-planned and meaningful part of each of the programs;
2. the course work common to both programs may not include 599 Thesis or 592 Research credits leading to the thesis or equivalent in either degree;
3. graduate credit transferred from another institution may be applied toward only one degree program; and
4. when the two degree programs are pursued at the same time, they must have the approval of the heads of both academic units involved.

## Doctoral Degrees

Faculty at ASU offer programs leading to the Doctor of Philosophy (Ph.D.) degree and various professional doctoral degrees. For more information, refer to the appropriate section within "Graduate Programs and Courses," page 103.

### DOCTORAL DISSERTATIONS

The doctoral dissertation is based on a substantial and sustained research project and constitutes a significant contribution to knowledge in the student's discipline. Accord-

ingly, it is presumed that the results should be published in scholarly journals, books, or other appropriate forms, either before or following completion of the doctoral degree. The research on which the dissertation is based should have been conducted during the time of the student's doctoral studies at ASU, under guidance of ASU faculty, and in accord with Graduate College policies and procedures.

The pedagogical function of the dissertation is twofold. On the one hand, students learn to conduct a major, independent research project and to present the results, all under the guidance of an experienced doctoral mentor. On the other hand, the dissertation is a demonstration of the student's ability to conduct a major research project at the highest level of professional competence. The research experience culminates in a final oral exam, commonly known as the "dissertation defense." At ASU, defenses are public; students and faculty from the candidate's unit especially are encouraged to attend. In the successful dissertation defense, doctoral study culminates in a public affirmation of the student's scholarly competence and of his or her new status in the community of scholars.

The doctoral student must submit two final copies of the dissertation or research paper (research papers are for certain D.M.A. concentrations only) to the ASU Bookstore for binding. The student is responsible for the binding fees. Bound copies are placed in Hayden Library and Archives. See "Theses and Dissertations," page 95, for more information.

### Open Dissertation Defenses

Doctoral dissertation defenses are open to all members of the university community. The oral defense engages the supervisory committee and the candidate in a critical, analytical discussion of the research and findings of the study as well as a review of the relation of the dissertation to the specialized field in which it lies. The presentation of dissertation defenses in an open forum fosters a broader awareness of the state of graduate research at the university, promotes a wider scholarly dialogue among disciplines, and recognizes publicly the scholarly contributions of doctoral candidates. Announcements are posted in prominent places in the student's department. Members of the university community are invited to dissertation defenses through announcements published in *ASU Insight*, the university's weekly news bulletin. If circumstances warrant, the supervisory committee may conduct the final part of its questioning in closed session. Committee deliberations and the final vote are conducted in closed session.

### Coauthored Work in Doctoral Dissertations

The Graduate Council recognizes the necessity of collaborative research by graduate students with their mentors and with other graduate students. These efforts often result in coauthored works such as journal articles and presentations at meetings. When data or information contained in coauthored works or the actual coauthored works themselves appear in a doctoral dissertation, the graduate author should obtain necessary permission from involved parties (such as written consent from coauthors and the journal that holds the copyright), credit the sources and inspiration of the research, and properly acknowledge the coauthors. For more information, see the *Research and Sponsored Projects Policies and Procedures Manual* —RSP 106 at [www.asu.edu/aad/manuals/rsp/rsp106.html](http://www.asu.edu/aad/manuals/rsp/rsp106.html).

### Course Work After Admission to Doctoral Program

A student with an appropriate master's degree must complete at ASU a minimum of 54 to 60 semester hours of approved graduate work, including 24 hours of dissertation and research (or recital for Music majors), after admission to the doctoral degree program. A student without an appropriate master's degree usually must complete 84 to 90 semester hours of work at ASU.

### Research and Dissertation Credits on Programs of Study

The doctoral program of study generally consists of appropriate graduate course work and 24 hours of 792 Research and 799 Dissertation. No more than 24 hours of 799 Dissertation may be included on the doctoral program of study.

### Thesis Credit on Doctoral Programs of Study

A maximum of six hours of thesis credit may be included in a doctoral program of study. The thesis credit must be recorded, the thesis successfully defended, and the degree conferred.

### College of Law Credit

The Graduate College accepts a numerical grade of 70 or above for courses taken in the College of Law at ASU as part of an approved program of study for a doctoral degree program, if the ASU law courses are deemed appropriate. These grades are not used in the two GPAs calculated for graduation, i.e., the courses on the program of study and all courses numbered 500 and above.

### Withdrawal Policy

See "Withdrawal Policies and Procedures," page 92.

## DOCTOR OF PHILOSOPHY

The Doctor of Philosophy degree is granted upon evidence of excellence in research and the demonstration of independent, creative scholarship culminating in a dissertation.

**Admission.** See "Admission to the Graduate College," page 89, for general requirements. Graduate students may apply for admission to the Ph.D. program by filing a written application with the Graduate Admissions Office.

**Program Committee.** Upon the recommendation of the head of the academic unit, the dean of the Graduate College appoints the program committee, consisting of a chair and at least two other members. The program committee advises the student in planning the program of study. The recommendation for the program committee is reviewed simultaneously with the program of study.

**Comprehensive Examination Committee.** Ph.D. comprehensive examinations are administered by a committee consisting of three to five members, depending on the requirements of the academic unit.

**Dissertation Committee.** Upon the recommendation of the head of the academic unit, the dean of the Graduate College appoints the student's dissertation committee, consisting of a chair and at least two other members. This committee must approve the subject and title of the dissertation. The members of the dissertation committee have the necessary knowledge and skills to advise the student during the formu-

lation of the research topic and during the completion of the research and the dissertation. The chair of the program committee may serve as the chair of the dissertation committee. In some cases, the same members serve on both committees. However, the two different committees may have memberships with overlapping functions.

If the head of the academic unit recommends changes in membership for either committee after the committee has been appointed, the student must submit a change of committee form to the Graduate College and receive the approval of the dean of the Graduate College.

**Program of Study.** The program of study should be submitted as early as possible and must have the approval of the student's supervisory committee, head of the academic unit, and the dean of the Graduate College. The program of study is reviewed simultaneously with the recommendation for the program committee. In general, Ph.D. degree students should expect to devote to the program of study the equivalent of at least three academic years (84 semester hours) beyond the bachelor's degree. A minimum of 84 semester hours is required; 24 of these hours must be a combination of 792 Research and 799 Dissertation. Of the 84 semester hours, at least 30 hours (which may include research credit) of the approved Ph.D. program and 24 research and dissertation hours must be completed *after admission* to a Ph.D. program at ASU. No more than 24 hours of 799 Dissertation may be included on the 84-hour program of study. On the Ph.D. program of study, a student may use up to six hours (maximum) of thesis credit from the master's degree. The master's thesis must have been defended and the hours must have been used as part of a completed master's program.

**Continuous Enrollment.** Once admitted to a Ph.D. degree program, the student is expected to be enrolled continuously, excluding summer sessions, until all requirements for the degree have been fulfilled. Continuous enrollment promotes steady progress toward the completion of the degree and an ongoing relationship between the student and faculty offering the program. If additional credit is not required toward the Ph.D. degree, the student may enroll for 595, 695, or 795 Continuing Registration. Continuing Registration does not carry credit; no grade is given. If a program of study must be interrupted for one or more semesters, the student may apply for leave status, not to exceed one calendar year. A student on leave is not required to pay fees, but is not permitted to place any demands on university faculty or use any university facilities. A student who interrupts a program without obtaining leave status may be removed automatically from the Graduate College, under the assumption that the student has decided to discontinue the program. A student removed from the Graduate College for this reason may reapply for admission; the application is considered along with all other new applications to the degree program.

An application for leave status, endorsed by the members of the student's supervisory committee and the head of the academic unit, must be approved by the dean of the Graduate College. This request must be filed and approved no later than the last day of registration in the semester of anticipated absence.

**Residency.** In general, Ph.D. degree students should expect to devote to their program of study the equivalent of at least

three academic years (84 semester hours) beyond the bachelor's degree. At least two consecutive semesters subsequent to admission to the Ph.D. program must be spent in full-time residence at ASU. At least 30 hours of the approved Ph.D. program in which they are enrolled, in addition to the 24 hours of research and dissertation credit, must be completed after admission to the Ph.D. at ASU. These courses must appear on an approved program of study.

It is expected that, during the period spent in residence, full time (nine semester hours minimum or six semester hours for research assistants or teaching assistants) is devoted to graduate studies. This period is designed to provide an opportunity for students to avail themselves of university resources and to interact fully with faculty and fellow graduate students. This time represents total involvement in the academic major of the program in which they are enrolled.

**Foreign Language Requirements.** Language requirements are determined by the academic unit concerned. For information concerning certification of proficiency, see "Foreign Language Requirements," page 95.

**Comprehensive Examinations.** When students have essentially completed the course work in an approved program of study, they should request permission from the Graduate College to take the comprehensive examinations. Some academic units may require that the foreign language requirements be fulfilled before taking the comprehensive examinations. These written and oral examinations are designed to test the student's mastery of the field of specialization. Ph.D. comprehensive examinations are administered by a committee consisting of three to five members, depending on the requirements of the academic unit. Failure in the comprehensive examinations is considered final unless the supervisory committee and the head of the academic unit recommend, and the dean of the Graduate College approves, a re-examination. A re-examination may be administered no sooner than three months and no later than one year from the date of the original examination. Only one re-examination is permitted.

**Candidacy.** Ph.D. students will achieve candidacy status in a letter from the Graduate College dean upon:

1. passing the foreign language examination, if applicable;
2. passing the comprehensive examinations; and
3. successfully defending the dissertation prospectus.

Students must enroll for a minimum of 12 hours of 792 Research and 799 Dissertation credit (combined) in subsequent semesters, following the semester in which they are advanced to candidacy.

**Research and Dissertation Requirements.** Each candidate must register for a combined total of 24 semester hours of credit for 792 Research and 799 Dissertation. No more than 24 hours of 799 Dissertation may be included on the 84-hour program of study. Courses or semester hours taken beyond the listed requirements should not be included on the program of study. The final copy of the dissertation must be reviewed by the supervisory committee and the Graduate College at least three weeks before the degree conferral date. Copies of the *Format Manual* are available in the Graduate College.

**Final Examinations.** The final oral examination in defense of the dissertation is mandatory and must be held on the main campus. The oral defense is scheduled by the supervisory committee with the approval of the dean of the Graduate College.

**Graduation.** The student is eligible for graduation when the Graduate College scholarship requirements have been met, the final oral examination has been passed, and the dissertation has been approved by the supervisory committee and accepted by the head of the academic unit and the dean of the Graduate College.

**Maximum Time Limit.** The candidate must take the final oral examination in defense of the dissertation within five years after passing the comprehensive examinations. Any exception must be approved by the supervisory committee and the dean of the Graduate College and ordinarily involves repetition of the comprehensive examinations.



Wells Fargo Arena is home to ASU Sun Devil athletic events, science fairs, commencements, and other special events.

Tim Trumble photo

# Graduate Programs and Courses

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All graduate degree programs and certificate programs are organized alphabetically by the name of the major or certificate. One of the few exceptions is that French, German, and Spanish are found under "Languages and Literatures," page 231.

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## Accountancy and Information Systems

Philip M.J. Reckers  
*Director*

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[www.cob.asu.edu/acct/degrees.html#doc](http://www.cob.asu.edu/acct/degrees.html#doc)

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### PROFESSORS

J.R. BOATSMAN, BOYD, FLAHERTY, JOHNSON, KAPLAN, PANY, PHILIPPAKIS, RECKERS, RENEAU, SCHULTZ, SHRIVER, R. SMITH, STEINBART, TIDWELL, WYNDELTS

### ASSOCIATE PROFESSORS

CHRISTIAN, GOLEN, GOUL, GUPTA, KEIM, KIANG, KULKARNI, MOECKEL, O'DELL, O'LEARY, PEI, REGIER, ROY, ST. LOUIS, VINZE

### ASSISTANT PROFESSORS

CHEN, CHENOWETH, DAVID, DOWLING, HWANG, IYER, MISHRA, SANTANAM, K. SMITH, WHITECOTTON

### SENIOR LECTURERS

MacCRACKEN, SHREDNICK

### LECTURERS

BALOGH, J.L. BOATSMAN, GEIGER, HAYES, TAYLOR

The faculty in the School of Accountancy and Information Management, College of Business, offer specialized professional programs leading to the Master of Accountancy and Information Systems, Master of Science in Information Management ("Information Management," page 225), and Master of Taxation (see "Master of Taxation," page 295) degrees.

The student, in consultation with a faculty advisor, must prepare a program of study composed of common required courses, required courses for a particular area of study, and elective courses from those available which meet the candidate's specific needs.

The faculty participate in offering the program leading to the Master of Business Administration degree. See "Master of Business Administration," page 128, for information on the Master of Business Administration degree.

The faculty also participate in offering the program leading to the Ph.D. in Business Administration degree. See "Doctor of Philosophy," page 129, for information on this degree program.

## MASTER OF ACCOUNTANCY AND INFORMATION SYSTEMS

The Master of Accountancy and Information Systems degree provides specialized preparation for careers in professional accounting in accounting information systems/management (i.e., computer systems design and security, EDP audit and management consulting).

**Admission.** Applicants must complete the program prerequisites. Refer to the School of Accountancy and Information Management for a current listing of required course prerequisites for the program. Applicants must also submit scores from the GMAT exam. All applicants are also required to submit the supplemental application materials required from the school. International applicants whose native language is not English must submit scores from the TOEFL and TSE exams. A complete advising guide and application packet may be obtained from

ARIZONA STATE UNIVERSITY  
COLLEGE OF BUSINESS  
SCHOOL OF ACCOUNTANCY AND INFORMATION  
MANAGEMENT  
PO BOX 873606  
TEMPE AZ 85287-3606

**Program of Study.** The program of study consists of a minimum of 30 semester hours, as follows:

ACC 515 Professional Practice Seminar .....	3
At least four of the following courses .....	12
ACC 511 Taxes and Business Strategy (3)	
ACC 541 Strategic Cost Management and Uses of Information Technology (3)	
ACC 567 Financial Models in Accounting Systems (3)	
ACC 586 Shareholder Value Creation and Financial Statement Analysis (3)	
ACC 587 Computerized Accounting Systems (3)	
ACC 591 Seminar: Computer Security (3)	
ACC 591 Seminar: Electronic Commerce (3)	

Additional courses in accounting, computer information systems, computer science, industrial engineering, or other acceptable areas to complete the degree program are selected in consultation with a faculty advisor.

**Course Load.** Students are limited to 12 hours per trimester.

**Foreign Language Requirements.** None.

**Thesis Requirements.** A thesis is optional.

**Final Examinations.** A final comprehensive, written examination is required of all candidates. In addition, an oral examination in defense of the thesis is required of candidates who elect to write a thesis.

## RESEARCH ACTIVITY

The research interests of the School of Accountancy and Information Management faculty and graduate students cover most areas of accounting and computer information

systems, broadly defined. The following list of project areas is intended to be illustrative—but not all-inclusive—of the work being done: processing of information by decision makers at the individual and group level, behavior decision theory, information systems, modeling of internal control systems, database management systems architecture, design of computer networks, minicomputer security, analytical reviews in auditing, managerial influence on internal auditors' professional judgments, heuristics for audit sampling, adequacy of financial statement disclosures, effect of segment reporting on prediction of earnings and cash flow, financial reporting of changing prices, accounting policy formulation, real asset risk determinants of systematic risk, reporting for accounting changes, social and psychological influences related to tax, audit and general accounting issues, tax planning models, partnership taxation, tax policy and practice, microeconomic aspects of tax law changes, and behavioral research in taxation.

### ACCOUNTANCY (ACC)

#### ACC 502 Financial Accounting. (3) A

Financial accounting concepts and procedures for external reporting. Prerequisite: M.B.A. degree program student.

#### ACC 503 Managerial Accounting. (3) A

Managerial accounting concepts and procedures for internal reporting. Prerequisite: M.B.A. degree program student.

#### ACC 511 Taxes and Business Strategy. (3) A

Economic implications of selected management decisions involving application of federal income tax laws. Recognition of tax hazards and tax savings. Prerequisite: ACC 502 or equivalent.

#### ACC 515 Professional Practice Seminar. (3) A

History, structure, environment, regulation, and emerging issues of the accounting profession.

#### ACC 521 Tax Research. (3) A

Tax research source materials and techniques. Application to business and investment decisions. Prerequisite: ACC 430.

#### ACC 533 EDP Auditing. (3) N

Analysis of EDP audit techniques and evaluation methods. Emphasis on current topics such as distributed processing and microcomputers. Prerequisite: ACC 450.

#### ACC 541 Strategic Cost Management and Uses of Information Technology. (3) A

Strategic cost management emphasizing contemporary topics, including activity-based costing and strategic uses of information technology systems. Cooperative learning, lecture. Prerequisite: ACC 350 or 503.

#### ACC 567 Financial Models in Accounting Systems. (3) A

Development and application of financial models by accountants. Analysis of decision support systems as financial modeling environments. Prerequisite: ACC 330.

#### ACC 571 Taxation of Corporations and Shareholders. (3) A

Tax aspects of the formation, operation, reorganization, and liquidation of corporations and the impact on shareholders. Prerequisite: ACC 430.

#### ACC 573 Taxation of Partners and Partnerships. (3) A

Tax aspects of the definition, formation, operation, liquidation, and termination of a partnership. Tax planning is emphasized. Prerequisite: ACC 430.

#### ACC 575 Estate and Gift Taxation. (3) A

Tax treatment of wealth transfers at death and during life time, with emphasis on tax planning. Prerequisite: ACC 430.

#### ACC 577 Taxation of Real Estate Transactions. (3) A

Income tax aspects of acquisition, operation, and disposal of real estate; syndications; installment sales; exchanges; dealer-investor issues; alternative financing; and planning. Prerequisite: ACC 521 or instructor approval.

#### ACC 582 Auditing Theory and Practice. (3) N

Function and responsibility of the auditor in modern society. Advanced topics in auditing theory and methods. Contemporary issues in auditing. Prerequisite: ACC 450.

#### ACC 586 Shareholder Value Creation and Financial Statement Analysis. (3) N

Develop skills necessary to exploit financial reporting information in a business environment and appreciation of reporting issues faced by management.

#### ACC 587 Computerized Accounting Systems. (3) A

Design and evaluation of computer-based accounting information system. Development of computer-based financial models for planning and control. Prerequisite: ACC 330.

#### ACC 591 Seminar on Selected ACC Topics. (3) A

Topics such as the following are offered:

- (a) Computer Security
- (b) Data Warehouse and Data Mining
- (c) Electronic Commerce
- (d) Enterprise Modeling

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Aerospace Engineering

Don L. Boyer

*Chair*

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### PROFESSORS

BOYER, CHATTOPADHYAY, LAANANEN, LIU, REED,  
SARIC, WIE

### ASSOCIATE PROFESSORS

KOURIS, MIGNOLET, RANKIN, WELLS

### ASSISTANT PROFESSOR

LEE

The faculty in the Department of Mechanical and Aerospace Engineering offer graduate programs leading to the M.S., Master of Science in Engineering, and Ph.D. degrees in Aerospace Engineering. A number of areas of study may be pursued, including aerodynamics, design, dynamics and control, propulsion, and structures.

The faculty also offer graduate degree programs in Mechanical Engineering.

All of the department's graduate programs stress a sound foundation leading to a specialized area of study.

**Graduate Record Examination.** All applicants are required to take the Graduate Record Examination; the subject test in Engineering is highly recommended but not required.

### MASTER OF SCIENCE

See "Master's Degrees," page 98, for general requirements.

### MASTER OF SCIENCE IN ENGINEERING

See "Master of Science in Engineering," page 182, for information on the Master of Science in Engineering degree.

## DOCTOR OF PHILOSOPHY

The Ph.D. degree is conferred upon evidence of excellence in research leading to a scholarly dissertation that is an original contribution to knowledge in the field of aerospace engineering.

See "Doctor of Philosophy," page 101, for general requirements.

**Program of Study.** The program of study must be established no later than the first semester after successfully completing the qualifying examination.

**Qualifying Examinations.** The purposes of the qualifying criteria are to assess if the student is prepared to continue in the doctoral program and to detect deficiencies in the student's background that can be corrected by appropriate course work and individual study. Within the first year of graduate studies at ASU, a graduate student pursuing a Ph.D. program of study in Aerospace Engineering must complete three 500-level core courses, preferably in the major area of interest, and one 500-level mathematics course, both with an average GPA of 3.25 or higher.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Written and oral comprehensive examinations are required. The examinations are administered by the program committee.

**Dissertation Requirements.** A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required.

**Final Examinations.** A final oral examination in defense of the dissertation is required.

## RESEARCH ACTIVITY

The department has established a wide variety of theoretical and experimental research programs in Aerospace Engineering to prepare graduate students for careers with industry, universities, and government agencies. The faculty are organized into groups pursuing research topics directly related to general improvement of knowledge in engineering fields or to the application of engineering principles to problems of high national priority.

Some recent and current examples of faculty and student research projects include studies in: acoustic fatigue; aeroelasticity; aerospace vehicle dynamics, guidance, and control; aerospace structures; aerospace vehicle design and performance optimization; aircraft crashworthiness; applied computational methods; atmospheric dynamics and surface layers; biomechanics; boundary-layer transition; combustor modeling; composite materials; concurrent engineering; convection heat transfer in complex flows; finite element techniques; flow-induced vibrations; fracture mechanics; fluid-structure interactions; heat transfer in airbreathing and space propulsion systems; high speed aerodynamics; hydrodynamic stability; hypersonics; laminar flow control; laser diagnostics in combustion and flows; micromechanics;

modal analysis; modeling and optimal design of rotor-bearing systems; noise control; nonlinear vibrations and structural dynamics; nonlinear waves and dynamics; perturbation methods; rotorcraft aerodynamics and acoustics; separated and transitional flows; spray combustion; structural optimization; supersonic flows; thermionics; three-dimensional boundary layers; transonic aerodynamics; turbulent flow modeling; turbine cooling; and unsteady aerodynamics.

Experimental investigations are carried out in a number of specialized laboratories and facilities: computer-aided engineering and expert systems laboratory; computer-aided design/computer-aided manufacturing laboratory; combustion laboratory; composite materials laboratory; direct energy conversion laboratory; dynamics and controls laboratory; heat transfer laboratory; laser diagnostics laboratory; hydrodynamic stability laboratory; stratified flow laboratory; supersonic wind tunnel laboratory; robotics laboratory; thermoscience laboratory; turbulent fluid mechanics laboratory; unsteady wind tunnel facility; and vibrations and dynamics laboratory. Equipment fabrication is supported by the college's well-equipped development shop with a staff of machinists and electronic technicians.

## Computer Resources and Facilities

Aerospace Engineering graduate education and research is supported by an extensive array of college- and university-supported computer hardware and software, in addition to laboratory minicomputers and microcomputers.

ASU operates an IBM ES9000-732, an IBM 3090-300E, a VAX 6000-634, a MASPAR-MP-2, and a cluster of four IBM RISC-6000 substations, which are available to support graduate research. The College of Engineering and Applied Sciences supports a Convex C220, one Motorola 8640, one DEC VAX, a SPARC 2000, and many minicomputers and microcomputers. All of these machines are available for use by the engineering faculty and students for classroom and research work.

The ASU Computing Commons is equipped with three IBM RS/6000-590s, one MASPAR, several DEC VAX 5000s, numerous Sun Sparc servers, and many other platforms. Access to these computers is via the ASU Advanced Communications Support System (ACSS) broadband network as well as via dial-in lines. The university also operates microcomputer sites with more than 400 IBM and Apple Macintosh systems.

## MECHANICAL AND AEROSPACE ENGINEERING

The faculty in the Department of Mechanical and Aerospace Engineering offer graduate programs leading to the degrees of Master of Science, Master of Science in Engineering, and the Doctor of Philosophy with majors in Aerospace Engineering and Mechanical Engineering. The courses supporting both majors are offered under the common MAE prefix. See page 246 for the courses that support the degree programs in Aerospace Engineering. Additional 300- and 400-level courses, which may be used to remove deficiencies, are described in the *General Catalog*.

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## Agribusiness

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### PROFESSORS

EDWARDS, GORDON, KAGAN, MARQUARDT, SEPERICH,  
 STILES, THOR

### ASSOCIATE PROFESSOR

RACCACH

### ASSISTANT PROFESSORS

BURKINK, PATTERSON, RICHARDS, SCHMITZ, STANTON

### MASTER OF SCIENCE

The Agribusiness faculty in the Morrison School of Agribusiness and Resource Management offer a program leading to the M.S. degree in Agribusiness. Courses are offered at the ASU East site. Concentrations are available in agribusiness management and marketing and food quality assurance. An area of study may be in resource management. This program is designed to prepare students for managerial and administrative positions in agribusiness and government. Students receive broad training in agribusiness functional areas and analytical methods. To apply the knowledge and skills gained in course work, each student conducts a research project and writes a thesis.

**Admission.** Applicants to the program are expected to meet the minimum requirements for admission to the Graduate College. In addition, scores from the Graduate Record Examination, Miller Analogies Test, or Graduate Management Admission Test are recommended. Applicants are expected to have completed 18 hours of agribusiness or other closely related course work, with at least nine hours specifically in agribusiness. Applicants not meeting this last requirement may be considered for admission with deficiencies.

**Program of Study.** Candidates must complete a minimum of 30 semester hours of approved graduate-level course work, excluding courses taken to remove deficiencies. A minimum of 12 semester hours should consist of regularly scheduled course work within the agribusiness core, not including hours taken in research, thesis, reading and conference, special topics, or courses of a similar nature. Students must complete the following courses:

AGB 510 Advanced Agribusiness Management I.....	3
AGB 528 Advanced Agribusiness Marketing .....	3
or AGB 511 Advanced Agribusiness Management II (3)	
AGB 532 Advanced Agribusiness Finance .....	3
AGB 561 Agribusiness Research Methods .....	3
Research and Thesis.....	6
Total .....	18

Other course work will be selected in order to develop an effective graduate program for each individual.

**Cooperative Degree Program.** The Morrison School of Agribusiness and Resource Management and the American Graduate School of International Management (Thunderbird) have a cooperative agreement for students interested in both agribusiness and international management. Thunderbird is an internationally recognized private graduate school, located in the Phoenix metropolitan area, offering course work in international studies, modern languages, and world business. This agreement enables students of ASU to take up to nine semester hours of course work at Thunderbird. To participate, the ASU student must be enrolled full-time (nine semester hours) and may only take three semester hours per semester at Thunderbird. The goal of this agreement is to enhance the educational opportunities available to qualified students of both institutions while making optimal use of the resources and facilities of both institutions.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Each student must pass a written comprehensive examination covering materials presented in the Agribusiness program of study.

**Thesis Requirements.** All students are required to write a thesis.

**Final Examinations.** An oral examination in defense of the thesis is required.

### RESEARCH ACTIVITY

The research projects in agribusiness reflect the varied interests of the faculty. Marketing studies involving agricultural products are conducted to determine consumer desires or the attitudes of institutional personnel toward foods. Management studies designed to improve the efficiency of agribusiness or to identify the job stress factors of the employees represent another sector. Finance studies examine the capacity of financial institutions to provide capital for agribusiness firms or the ability of managers to optimize the returns to financial resources under their control. In addition, the research conducted by the food industry faculty is directed toward the safety and wholesomeness of food, both at the institutional and consumer levels.

### AGRIBUSINESS (AGB)

**AGB 410 Agribusiness Management II.** (3) S  
 Principles of human resource management in agribusiness firms. Prerequisite: AGB 310.

**AGB 411 Agricultural Cooperatives.** (3) S  
 Organization, operation, and management of agricultural cooperatives.

**AGB 414 Agribusiness Analysis.** (3) F, S  
 Analysis of agribusiness firm decisions in the ecological, economic, social, and political environments. Special emphasis on ethical issues surrounding food production and consumption. Prerequisite: General Studies L1 course. *General Studies: L2.*

**AGB 420 Food Marketing.** (3) S  
 Food processing, packaging, distribution, market research, new food research and development, and social implications. Prerequisite: AGB 320.

**AGB 424 Sales and Merchandising in Agribusiness.** (3) SS  
 The principles and techniques of selling and merchandising in the agricultural and food industries.



**AGB 425 Agricultural Marketing Channels.** (3) F

Operational stages of agricultural commodities in normal distribution systems and implementation of marketing strategies. Prerequisite: AGB 320.

**AGB 432 Agribusiness Finance II.** (3) S

Examines topics in sourcing and using capital: optimal capital structure, dividend policy, cost of capital, lender-borrower relationships, and risk management. Prerequisite: AGB 332.

**AGB 434 Advanced Commodity Trading.** (3) S

Advanced analysis of trading techniques, with emphasis on hedging in the futures markets. Prerequisites: AGB 332, 334.

**AGB 440 Food Safety.** (3) S

Control, prevention, and prediction of microbial and chemical food-borne diseases. Prerequisite: AGB 442 or instructor approval.

**AGB 441 Food Chemistry.** (4) N

The biochemical and chemical interactions that occur in raw and processed foods. Lecture, lab. Prerequisites: CHM 115, 231.

**AGB 442 Food and Industrial Microbiology.** (3) N

Food- and industrial-related microorganisms; deterioration and preservation of industrial commodities. Lecture, lab. Prerequisite: microbiology course with lecture and lab.

**AGB 443 Food and Industrial Fermentations.** (4) N

Management, manipulation, and metabolic activities of industrial microbial cultures and their processes. Lecture, lab. Prerequisite: AGB 442 or instructor approval.

**AGB 450 International Agricultural Development.** (3) S

Transition of developing countries from subsistence to modern agriculture. Technology transfer and food improvement programs are emphasized. *General Studies: G.*

**AGB 454 International Trade.** (3) S

International practices in trading of agribusiness, technology, and resource products and services.

**AGB 456 World Agricultural Resources.** (3) F

World production and consumption of agricultural products, international relationships, and agencies concerned with world agricultural development problems. *General Studies: G.*

**AGB 460 Agribusiness Management Systems.** (4) S

The development and use of decision support systems for agribusiness management and marketing. Lecture, lab.

**AGB 470 Comparative Nutrition.** (3) N

Effects of nutrition on animal systems and metabolic functions. Prerequisite: CHM 231.

**AGB 471 Diseases of Domestic Animals.** (3) S

Control and prevention of infectious and noninfectious diseases of domestic animals. Prerequisite: AGB 442 or microbiology course with lecture and lab.

**AGB 473 Animal Physiology I.** (3) N

Control and function of the nervous, muscular, cardiovascular, respiratory, and renal systems of domestic animals. Prerequisites: BIO 181; CHM 113.

**AGB 479 Veterinary Practices.** (3) F, S

Observation of and participation in veterinary medicine and surgery supervised by local veterinarians. Prerequisite: advanced preveterinary student.

**AGB 480 Agribusiness Policy and Government Regulations.** (3) S

The development and implementation of government food, drug, pesticide, and farm policies and regulations that affect the management of agribusiness.

**AGB 490 Recent Advances in Agribusiness.** (1) F, S

Reports and discussions of current topics and problems associated with agribusiness. May be repeated for credit.

**AGB 501 Master's Thesis Preparation.** (1) F, S

Step-by-step guidelines to major elements of a master's thesis along with practical guidelines for conduction research.

**AGB 510 Advanced Agribusiness Management I.** (3) F

Managing and financing agribusiness, emphasizing environmental and economic sustainability in a global economy undergoing radical change. Prerequisite: AGB 310.

**AGB 511 Advanced Agribusiness Management II.** (3) S

Analysis of organization behavior, change, and resource requirements within agribusiness systems. Prerequisite: AGB 310.

**AGB 512 Food Industry Management.** (3) S

Operations and management of food-processing factories, food distribution centers, and retail food-handling firms.

**AGB 513 Advanced Cooperatives.** (3) F

Advanced study of cooperatives and other nongovernmental organizations (NGO) focusing on management and proposal preparation for international agencies.

**AGB 514 Advanced Agribusiness Analysis I.** (3) S

Vertical integration and differentiation in food and agricultural industries. Prerequisite: AGB 510 or 528.

**AGB 515 Agribusiness Coordination.** (3) S

Organizational alternatives for agribusiness with emphasis on cooperatives and trading companies. Prerequisite: AGB 510 or 528.

**AGB 528 Advanced Agribusiness Marketing.** (3) F

Theory and analysis of marketing farm commodities, risks, and the effect of future trading on cash prices.

**AGB 529 Advanced Agribusiness Marketing Channels.** (3) S

Analysis of agribusiness market channel systems. Formulation of marketing strategies.

**AGB 532 Advanced Agribusiness Finance.** (3) F

Financial management of agribusiness firms; agribusiness financial analysis, investment analysis, agricultural risk management, and introduction to agricultural financial intermediaries. Prerequisites: computer literacy and 1 finance course or instructor approval.

**AGB 535 Commodity Analysis.** (3) F

Analysis of commodity markets.

**AGB 540 Advanced Food Science.** (3) N

Chemical and physical nature of processed foods. Emphasis on food product development.

**AGB 550 International Agricultural Development.** (3) F

Emphasis on cultural, economic, and technical aspects of development and their implications for U.S. agribusiness working abroad.

**AGB 551 World Agricultural Development.** (3) S

Factors that influence production, processing, and marketing of agricultural products in developing countries.

**AGB 552 Advanced International Trade.** (3) F

Advanced international practices in trading of agribusiness, technology, and resource products and services.

**AGB 557 Resource Policy and Sustainability.** (3) F

Considers the evolution of policy design, focusing on how resource and environmental concerns have affected agricultural development and trade policies.

**AGB 558 Advanced Bioremediation.** (3) S

Management and policy issues related to bioremediation of minetailing and animal waste and replacement of chemical control with biological methods. Lecture, case studies.

**AGB 560 Advanced Agribusiness Management Systems.** (3) N

Development and use of decision support systems for agribusiness management decision making. Prerequisite: AGB 510.

**AGB 561 Agribusiness Research Methods.** (3) F

The use of model building, hypothesis testing, and empirical analysis in solving agribusiness problems.

**AGB 580 Advanced Agribusiness Policy.** (3) F

Policy-making history, structure, and process.

**AGB 581 Advanced Agribusiness Policy.** (3) N

Policy-making history, structure, and process.

**AGB 587 Resource Policy and Sustainability.** (3) F

Considers the evolution of policy design, focusing on how resource and environmental concerns have affected agricultural development and trade policies.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Anthropology

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### REGENTS' PROFESSOR TURNER

#### PROFESSORS

AGUILAR, ALVAREZ, BAHR, BRANDT, CARR, CHANCE,  
 CLARK, COWGILL, EDER, HUDAK, JOHANSON, KINTIGH,  
 KOSS-CHIOINO, MARTIN, MARZKE, MERBS, NASH,  
 REDMAN, SCHOENWETTER, STARK, WILLIAMS

#### ASSOCIATE PROFESSORS

BARTON, FALCONER, HEDLUND, HEGMON, KIMBEL,  
 B. NELSON, M. NELSON, RICE, SPIELMANN

#### ASSISTANT PROFESSORS

BAKER, REED, STEADMAN, WELSH

#### SENIOR LECTURER

WINKELMAN

The faculty in the Department of Anthropology offer graduate programs leading to the M.A. and Ph.D. degrees in Anthropology.

**Admission.** In addition to the general requirements for admission to the Graduate College, the Department of Anthropology requires applicants to provide a statement of their interests and professional goals, and three letters of recommendation. Applicants who received their B.A. during the past ten years must also submit scores on the Graduate Record Examination. Undergraduate course work in anthropology is not a prerequisite for admission to the M.A. program. Admission to the Ph.D. program normally presumes an M.A. in Anthropology; students may be admitted without such a background on the condition that they acquire a knowledge of general anthropology in a manner to be specified at the time of admission.

**Program of Study.** Special training programs designed to terminate with a master's degree are possible at the discretion of the student and faculty advisors. For example, the concentrations in linguistics, museum studies, medical anthropology, and bioarchaeology are at the master's level. The primary purpose and scope of the graduate program in anthropology, however, is intended to lead to the Ph.D. degree.

The doctoral program is divided into three phases. The first consists of 24 semester hours of course work and readings, usually within a subdiscipline and closely allied areas, followed by six semester hours for the M.A. thesis (or publishable paper). The faculty may require additional hours of course work or other preparation for entering students who are unfamiliar with the concepts of general anthropology at a level equivalent to that of the Arizona State undergraduate anthropology core. Mastery of the phase I course material is demonstrated by successful completion of a written qualify-

ing examination in social-cultural anthropology or, in physical anthropology, bioarchaeology, and archaeology, by successful completion of a sequence of core courses.

Admission to phase II of the doctoral program is granted to students on the basis of performance in phase I, the quality of M.A. research, prior course work, faculty recommendations, and other relevant information. The second phase consists of 30 semester hours of course work, reading in anthropology and related fields, and directed research designed to prepare the student for the dissertation project. Proficiency in one foreign language or quantitative methods may be required by the supervisory committee. The second phase is completed when the following have been met: (1) passing a written comprehensive examination, and (2) passing the oral defense of the dissertation proposal. The successful student is then advanced to candidacy.

The final phase consists of 24 semester hours of research and dissertation.

**Certificate in Museum Studies.** The certificate is awarded to nondegree or graduate students who are accepted into the certificate program and who complete 12 hours of required course work and a six-semester hour internship at an approved museum. The certificate may be taken independently or in conjunction with the M.A. degree in Anthropology with a concentration in museum studies.

**Master of Public Health.** The faculty in the department participate in offering a Master of Public Health (M.P.H.) with a concentration in cultural and behavioral dimensions of public health as a part of the Arizona Graduate Program in Public Health on the University of Arizona campus. This program concentration offers theoretical and practical learning experiences to enable the student to develop competencies in understanding and planning health programs for culturally diverse clients and communities in the United States and across the world. The central objective of the concentration is understanding and evaluating cultural influences on health and illness, health promotion, and disease prevention.

### MASTER OF ARTS

Concentrations are available at the master's level in archaeology, bioarchaeology, linguistics, medical anthropology, museum studies, physical anthropology, and social-cultural anthropology.

The new medical anthropology concentration emphasizes biocultural perspectives on the study of health and illness behavior. The faculty has a range of teaching and research activities that span biological, physical, ecological, socio-cultural, and applied areas of medical anthropology. The program combines theoretical approaches with an applied problem-solving focus to prepare students for careers both in academia and in health care delivery and public health.

See "Master's Degrees," page 98, for general requirements.

### Concurrent M.A. Anthropology and M.S. Justice Studies

Graduate students in the Department of Anthropology and the School of Justice Studies are able to receive a concurrent M.A. in Anthropology with a concentration in social-cultural anthropology and a M.S. degree in Justice Studies. The principal purpose of the program is to prepare

individuals with complementary knowledge and skills for basic and applied research, in addition to administrative and educational activities related to justice studies and anthropology.

Students must be admitted separately to each program, following the guidelines of the Graduate College, Department of Anthropology, and School of Justice Studies. Additional information on the M.A. in Anthropology and the M.S. in Justice Studies may be obtained from each academic unit.

### DOCTOR OF PHILOSOPHY

Concentrations are available at the doctoral level in archaeology, physical anthropology, and social-cultural anthropology.

See "Doctor of Philosophy," page 101, for more information on the Ph.D. degree.

### RESEARCH AND TEACHING ACTIVITIES

Faculty in the Department of Anthropology are actively engaged in research on a wide range of problems and in a variety of geographical settings, with special strength in the American Southwest, Southeast Asia, Mesoamerica, the Near East, and the Arctic. Individual faculty conduct research in Arizona, New Mexico, Ohio, Alaska, Canada, Guatemala, Mexico, England, Spain, Jordan, Morocco, Kenya, Madagascar, New Guinea, Thailand, Indonesia, and the Philippines.

While most research and teaching center on problems associated with one of the traditional subfields of anthropology, many departmental programs include faculty from various branches of anthropology. Research and teaching in archaeology center on archaeological theory, research methods, quantitative methods, computer and statistical applications, paleoecology of hunter-gatherers, and the archaeology of social complexity. The program in social-cultural anthropology emphasizes social organization, religion, ecology and demography, research methods, human biology and social behavior, and anthropological linguistics. The physical anthropology program stresses osteology, dental anthropology, primatology, functional morphology, growth and development, paleoanthropology, human biological variation, disease ecology, and human origins. The program in museum studies includes emphases in curation, exhibition, educational programming, and administration. The medical anthropology program emphasizes biocultural perspectives on the study of health and illness behavior. The bioarchaeology program applies a holistic, ecological perspective in considering biological, environmental, demographic, and cultural processes at regional and local scales. The program in linguistics is interdisciplinary and has strengths in American Indian and Southeast Asian languages, bilingualism, language renewal, language and education, and ethnopoetics.

Among the research resources of the department are large archaeological, ethnographic, dental, and osteological collections; a majority of available fossil hominid casts; numerous archaeological and physical anthropology laboratories; departmental computers; radiographic, serologic, and pollen facilities; ethnographic and linguistic archives. The department publishes a monograph series, *Anthropological Research Papers*, and two series of field reports, *Anthropological Field Studies* and *OCRM Reports*. The department

also maintains the Office of Cultural Resource Management and the Arizona State University Museum of Anthropology. The department operates the Deer Valley Rock Art Center in north Phoenix, a research and interpretive center situated at the largest concentration of petroglyphs in the Phoenix area. The Museum of Anthropology, which is housed in the Anthropology Building, works closely with the Heard Museum of Native American Cultures and Art, the Desert Botanical Gardens, the Pueblo Grande Museum, the Tempe Historical Society, and other museums in the area.

### ANTHROPOLOGY (ASB)

- ASB 400 Cultural Factors in International Business.** (3) S Anthropological perspectives on international business relations; applied principles of cross-cultural communication and management; regional approaches to culture and business. *General Studies: G.*
- ASB 411 Kinship and Social Organization.** (3) S Meanings and uses of concepts referring to kinship, consanguinity, affinity, descent, alliance, and residence in the context of a survey of the varieties of social groups, marriage, rules, and kinship terminological systems. Prerequisite: 6 hours of anthropology or instructor approval.
- ASB 412 History of Anthropology.** (3) F Historical treatment of the development of the culture concept and its expression in the chief theoretical trends in anthropology between 1860 and 1950. Prerequisite: ASB 102 or instructor approval. *General Studies: L2/SB.*
- ASB 416 Economic Anthropology.** (3) F Economic behavior and the economy in preindustrial societies; description and classification of exchange systems; relations between production, exchange systems, and other societal subsystems. Prerequisite: ASB 102 or instructor approval. *General Studies: L2/SB.*
- ASB 417 Political Anthropology.** (3) A Comparative examination of the forms and processes of political organization and activity in primitive, peasant, and complex societies. Prerequisite: ASB 102 or instructor approval.
- ASB 462 Medical Anthropology: Culture and Health.** (3) F 2000 Role of culture in health, illness, and curing; health status, provider relations, and indigenous healing practices in United States ethnic groups. Lecture, discussion. *General Studies: C.*
- ASB 471 Introduction to Museums.** (3) F History, philosophy, and current status of museums. Exploration of collecting, preservation, exhibition, education, and research activities in different types of museums. Prerequisites: ASB 102 and ASM 101 or instructor approval. *General Studies: L2.*
- ASB 480 Introduction to Linguistics.** (3) F Descriptive and historical linguistics. Survey of theories of human language, emphasizing synchronic linguistics. *General Studies: SB.*
- ASB 481 Language and Culture.** (3) S Application of linguistic theories and findings to nonlinguistic aspects of culture; language change; psycholinguistics. Prerequisite: ASB 102 or instructor approval. *General Studies: SB.*
- ASB 483 Sociolinguistics and the Ethnography of Communication.** (3) N Relationships between linguistic and social categories; functional analysis of language use, maintenance, and diversity; interaction between verbal and nonverbal communication. Prerequisites: ASB 480 and ENG 213 (or FLA 400) or instructor approval. *General Studies: SB.*
- ASB 501 Applied Medical Anthropology.** (3) F Overview of anthropology's applications in medicine and its adaptations to U.S. ethnic populations. Requires research project in medical setting. Lecture, seminar. Prerequisite: graduate standing or instructor approval.
- ASB 502 Health of Ethnic Minorities.** (3) S Prevalence of illness, risk factors, health ecology, and medical and indigenous treatments. Lecture, seminar. Prerequisite: graduate standing or instructor approval.
- ASB 503 Advanced Medical Anthropology.** (3) F Theory in Medical Anthropology and cross-cultural studies that illustrate particular theories. Lecture, seminar. Prerequisite: graduate standing or instructor approval.

**ASB 504 Ethnic Relations.** (3) F

Structural processes of intergroup relations, methods for investigating psychocultural dimensions of ethnicity with focus upon U.S. ethnic groups. Lecture, seminar. Prerequisite: graduate standing or instructor approval.

**ASB 505 Culture and Psychiatry.** (3) F

Psychiatry as a cultural phenomenon and indigenous definitions and treatments of mental disorders across cultures. Lecture, seminar. Prerequisite: graduate standing or instructor approval.

**ASB 506 Gender, Emotions, and Culture.** (3) S

Relationships among gender and emotion across cultures. Lecture, seminar. Prerequisite: graduate standing or instructor approval.

**ASB 529 Culture and Political Economy.** (3) N

Origin and spread of Western capitalism and its impact on non-Western societies. Ethnographic and historical case studies are utilized. Prerequisite: graduate standing.

**ASB 530 Ecological Anthropology.** (3) A

Relations among the population dynamics, social organization, culture, and environment of human populations, with special emphasis on hunter-gatherers and extensive agriculturalists.

**ASB 532 Graduate Field Anthropology.** (2–8) S

Independent research on a specific anthropological problem to be selected by the student in consultation with the staff. May be repeated for credit. Prerequisites: ASM 338 or equivalent; instructor approval.

**ASB 536 Ethnohistory of Mesoamerica.** (3) N

Indigenous societies of southern Mexico and Guatemala at Spanish contact and their postconquest transformation. Emphasis is on the Aztec Empire. Prerequisite: graduate standing.

**ASB 537 Topics in Mesoamerican Archaeology.** (3) N

Changing organization of pre-Columbian civilizations in Mesoamerica is explored through interpretive issues, such as regional analysis, chiefdoms, urbanism, and exchange. Prerequisite: instructor approval.

**ASB 540 Method and Theory of Sociocultural Anthropology and Archaeology I.** (3) F

Basic issues concerning concepts of social and ethnic groups, cultural and sociological theory, and the nature of anthropological research. Prerequisite: instructor approval.

**ASB 541 Method and Theory of Social and Cultural Anthropology.** (3) S

Continuation of ASB 540. Prerequisite: ASB 540 or instructor approval.

**ASB 542 Method and Theory of Archaeology II.** (3) S

Models of human evolution, culture change, and interpretation of hunter-gatherer and tribal societies, ceramic, lithic, and faunal materials. Prerequisite: instructor approval.

**ASB 543 Method and Theory of Archaeology III.** (3) F

Covers concepts of social complexity along with economy, demography, and social dynamics, followed by archaeological research design. Prerequisite: instructor approval.

**ASB 544 Settlement Patterns.** (3) N

Spatial arrangement of residences, activity sites, and communities over landscape. Emphasis on natural and cultural factors influencing settlement patterns. Prerequisite: instructor approval.

**ASB 546 Pleistocene Prehistory.** (3) F

Development of society and culture in the Old World during the Pleistocene epoch, emphasizing technological change through time and the relationship of people to their environment. Prerequisite: ASB 361 or equivalent.

**ASB 547 Issues in Old World Domestication Economies.** (3) S

Archaeological evidence for transitions in Old World subsistence economies from hunting and gathering to dependence on domesticated plants and animals. Prerequisite: ASB 362 or equivalent.

**ASB 550 Economic Archaeology.** (3) N

Prehistoric economies in hunter-gatherer, tribal, and complex societies. Subsistence strategies, craft production and specialization, and exchange covered. Prerequisite: instructor approval.

**ASB 551 Prehistoric Diet.** (3) N

Includes (1) a critical review of techniques for recovering dietary information and (2) theoretical models concerned with explaining diet and nutrition. Prerequisite: instructor approval.

**ASB 555 Complex Societies.** (3) S

Structural variations in hierarchically organized societies, along with origins, dynamics, and collapse, are examined. Seminar.

**ASB 559 Archaeology and the Ideational Realm.** (3) N

"Post-processual" and other views concerning relevance of mental phenomena for understanding sociocultural change. Various approaches to inferring prehistoric meanings.

**ASB 563 Hunter-Gatherer Adaptations.** (3) N

Evolution of prehistoric hunter-gatherer societies in the Old and New Worlds from the most ancient times through protohistoric chiefdoms. Prerequisite: instructor approval.

**ASB 567 Southwestern Archaeology.** (3) S

Broad coverage of Southwestern cultural developments focusing on current debates and rigorous use of archaeological data in making cultural inferences.

**ASB 568 Intrasite Research Strategies.** (3) F

Research issues within a single site context. Topics include quantitative spatial analysis, site definition, sampling, distributional analysis, and substantive interpretation.

**ASB 571 Museum Principles.** (3) F

History, philosophy, and current status of museums. Exploration of collecting, preservation, exhibition, education, and research activities in different types of museums. Prerequisites: ASB 102 and ASM 101 or instructor approval.

**ASB 572 Museum Collection Management.** (3) S

Principles and practices of acquisition, documentation, care, and use of museum collections; registration, cataloging, and preservation methods; legal and ethical issues. Prerequisite: ASB 571 or instructor approval.

**ASB 573 Museum Administration.** (3) S

Formal organization and management of museums; governance; personnel matters; fund raising and grantsmanship; legal and ethical issues. Prerequisite: ASB 571 or instructor approval.

**ASB 574 Exhibition Planning and Design.** (3) S

Exhibition philosophies and development; processes of planning, designing, staging, installing, evaluating, and disassembling temporary and long-term exhibits. Prerequisites: ASB 571 and 572 or instructor approval.

**ASB 575 Computers and Museums.** (3) F

Basics of museum computer application; hardware and software; fundamentals of database management; issues of research, collections management, and administration.

**ASB 576 Museum Interpretation.** (3) F

Processes of planning, implementing, documenting, and evaluating educational programs in museums for varied audiences—children, adults, and special interest groups. Lecture, discussion. Prerequisite: ASB 571.

**ASB 577 Principles of Conservation.** (3) S

Preservation of museum objects: nature of materials, environmental controls, and causes of degradation; recognizing problems, damage, and solutions; proper care of objects. Prerequisites: ASB 571 and 572 or instructor approval.

**ASB 579 Critical Issues in Museum Studies.** (3) F

Current debates of museum practice from an anthropological perspective. Issues of collection, presentation, authenticity, and authority are addressed. Seminar. Prerequisite: ASB 571 or instructor approval.

**ASB 591 Seminar.** (3) N

Selected topics in archaeology, linguistics, and social-cultural anthropology.

- (a) Archaeological Ceramics
- (b) Archaeology of North America
- (c) Cultural Anthropology
- (d) Culture and Personality
- (e) Evolution and Culture
- (f) Historical Archaeology
- (g) Interdepartmental Seminar
- (h) Language and Culture
- (i) Linguistics
- (j) Museum Studies
- (k) Problems in Southwestern Archaeology
- (l) Problems in Southwestern Ethnology
- (m) Social Anthropology

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**ANTHROPOLOGY (ASM)****ASM 435 Archaeological Pollen Analysis.** (3) F

Theory, methodology, and practice of pollen analytic techniques. Compares uses in botany, geology, and archaeology. 2 hours lecture, 3 hours lab, possible field trips. Prerequisite: instructor approval.

**ASM 452 Dental Anthropology.** (4) F

Human and primate dental morphology, growth, evolution, and genetics. Within- and between-group variation. Dental pathology and behavioral-cultural-dietary factors. 3 hours lecture, 3 hours lab. Prerequisite: instructor approval. *General Studies: S2.*

**ASM 454 Comparative Primate Anatomy.** (4) S

Functional anatomy of the cranial, dental, and locomotor apparatus of primates, including humans, emphasizing the relation of morphology to behavior and environment. 3 hours lecture, 3 hours lab, dissections, demonstrations. Prerequisite: instructor approval.

**ASM 455 Primate Behavior Laboratory.** (3) N

Instruction and practice in methods of observation and analysis of primate behavior. Discussion of the relationship between class work on captive animals and field techniques for studying free-ranging groups. Directed readings, 6 hours lab. Prerequisites: ASM 343; instructor approval. *General Studies: L2.*

**ASM 465 Quantification and Analysis for Anthropologists.** (3) S

Statistical, quantitative, and geometric strategies for envisioning and exploring archaeological, physical anthropological, bioarchaeological, and sociocultural data. Univariate and multivariate methods. Prerequisites: introductory statistical course; instructor approval.

**ASM 507 Anthropological Study of Disease.** (3) A

In-depth introduction to the study of disease processes from an anthropological perspective. Lecture, seminar. Prerequisite: graduate standing or instructor approval.

**ASM 548 Geoarchaeology.** (3) F

Geologic context relevant to archaeological research. Topics include sediments, deposition environments, soils, anthropogenic and biogenic deposits, and quaternary chronology. Prerequisite: instructor approval.

**ASM 555 Advanced Human Osteology.** (3) N

Laboratory and field techniques in dealing with the human skeleton. Emphasis on preparation, identification, radiography, sectioning, microscopy, and data processing. 1 hour lecture, 6 hours lab. Prerequisite: ASM 341 or instructor approval.

**ASM 565 Quantitative Archaeology.** (3) S

Formal methods of structuring, codifying, and analyzing data for archaeological problems. Designing research to yield data amenable to productive analysis.

**ASM 566 Advanced Topics in Quantitative Archaeology.** (3) F

Archaeological issues associated with quantitative analysis, e.g., Bayesian and Monte Carlo approaches, simulation, diversity. May be repeated for credit. Prerequisite: ASM 565 or instructor approval.

**ASM 573 Lithic Analysis.** (3) N

Analysis and interpretation of chipped stone artifacts. Focus on both techniques and underlying concepts and their application to real collections. Prerequisite: instructor approval.

**ASM 591 Seminar.** (3) N

Selected topics in archaeology and physical anthropology.

- (a) Bioarchaeology
- (b) Evolution and Culture
- (c) Interdepartmental Seminar
- (d) Physical Anthropology
- (e) Primates and Behavior

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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**REGENTS' PROFESSOR**

COOK

**PROFESSORS**BOYLE, McCOY, MEUNIER, RAPP,  
SCHEATZLE, UNDERHILL**ASSOCIATE PROFESSORS**HARTMAN, KROLOFF, KUPPER, LOOPE, McINTOSH,  
OZEL, SHEYDAYI, UNDERWOOD, ZYGAS**ASSISTANT PROFESSORS**

ELLIN, HAHN, MURFF, PETRUCCI, SOROKA, VAN DUZER

**RESEARCH PROFESSOR**

JONES

The faculty in the School of Architecture offer a professional program leading to the Master of Architecture degree.

The faculty in the school also offer a research-based graduate program leading to the M.S. degree in Building Design. See "Building Design," page 126, for information on this degree program.

The faculty in the school also participate in offering a Ph.D. in Environmental Design and Planning. See "Environmental Design and Planning," page 192, for information on this degree program.

**MASTER OF ARCHITECTURE**

The Master of Architecture is the accredited professional degree program at ASU. There are two typical programs of study available: (1) a two-year program for applicants who have completed the four-year Bachelor of Science in Design (with a major in Architectural Studies) at ASU or an equivalent degree from another school that offers an accredited professional degree in architecture, and (2) a three-plus-year program for applicants with an undergraduate degree in a discipline or field other than architecture. Both programs promote broad areas of knowledge, professional skill, and a social awareness that the architect must command if architecture is to enhance contemporary life and remain an enduring and valid expression of society.

The program represents an attempt to develop the knowledge and skills necessary for graduates to achieve future leadership roles in the professional practice of architecture and related environmental design fields.

It is the intention of the faculty that the programs also

1. ensure a basic level of educational experience sufficient to enter the practice of architecture after successfully completing state licensing requirements and examination,

2. encourage the student to develop proficiencies in specific areas compatible with individual interests and university instructional capabilities,
3. provide a breadth of understanding that will encourage and motivate the student to continue learning throughout a professional career, and
4. develop opportunities that combine instruction and research directed toward adding value to the built environment.

Elective foci currently offered in the program include energy-conscious design, computer applications, urban design, architectural history and theory, and architectural administration and management.

In the first year of the two-year program, graduate design studio projects focus on advanced comprehensive problems that require integration of the full range of knowledge and skills from students' undergraduate education. In the second year, students select design studios and undertake final design projects that complement their areas of interest. Courses in technology, history and theory, and architectural management are structured alongside the studio sequence.

The three-plus-year program begins with an intensive 10-week summer session introducing architecture and design fundamentals and continues with a preparatory year of architectural history, technology, and design. The final two years are similar to the two-year program described above. Students with no work experience in architecture must also complete a summer internship between the first and second years.

**Application Requirements.** An applicant to the M.Arch. program must hold a baccalaureate or graduate degree from a college or university recognized by ASU and must meet the minimum GPA requirements as established by the Graduate College.

In addition, all applicants are required to submit for review a design portfolio, GRE scores (except for international students), a statement of intent, and letters of reference. Applicants are accepted on a space-available basis only. Students may be admitted to the two-year program *with deficiencies* if their previous course work is not equivalent to the ASU undergraduate requirements and standards.

Students intending to apply for admission to the professional program in architecture at the *graduate level* should write to the graduate program coordinator well in advance of the application deadline.

International applicants whose native language is not English must submit a TOEFL score of 550 or above. International students should write the Graduate Admissions Office at least one year before the date they plan to begin study.

**Application Procedures.** Applicants must submit separate application materials to the Graduate College and the School of Architecture.

**School of Architecture.** In addition to the Graduate College admission requirements, applicants must file all of the following admission materials with

ACADEMIC ADVISOR,  
 MASTER OF ARCHITECTURE PROGRAM  
 SCHOOL OF ARCHITECTURE  
 ARIZONA STATE UNIVERSITY  
 PO BOX 871605  
 TEMPE AZ 85287-1605

Applicants are encouraged to contact the academic advisor to be sure that all materials have been received (480/965-2507, arch.grad@asu.edu).

1. *Statement of Intent.* A personal narrative (maximum 600 words or two pages typed) indicating the applicant's interest, previous academic and practical background, and personal and professional educational objectives must be submitted. Students wishing to be considered for a teaching or research assistantship should include an additional one-page statement outlining subject areas in which they feel competent or special skills and qualifications. This statement may be placed at the front of the portfolio.
2. *Letters of Recommendation.* A minimum of three letters of recommendation in support of the applicant must be mailed directly to the Graduate Admissions Committee, School of Architecture. The references should be from professionals or educators familiar with the applicant's experience and capability for graduate work.
3. *Portfolio.* A portfolio of work is required of all applicants. It is extremely important to the judgment of an applicant's qualification for admission and in determining advanced standing. Accordingly, applicants should take appropriate care in its preparation. The portfolio *must* be in a nonzippered presentation binder with acetate sleeves and, for convenience and economy, *must* be no larger than 9" x 12" (image size). The admissions committee is interested in the quality of the work submitted; applicants are therefore advised not to lavish energy and expense on special or unusual packaging. Loose sheets, original drawings, and 35 mm slides should not be submitted. The portfolio should include at least five projects with a range of complexity and concise explanatory statements for each project. Included should be the dates of execution and a brief analysis of the results.

When the work is not completely original, the sources must be given. When the work is of a team nature, the applicant's role and contribution to the project should be clearly indicated. Additional examples of self-directed skills and creative endeavors may also be included. Applicants who have professional experience and wish to submit examples of work done professionally may do so. Of greatest interest are projects in which the applicant has played a *principal* role in design. The applicant's contributions to professional projects must be clearly described.

The portfolio is returned after final admission procedures *provided* the applicant encloses a self-addressed return mailer with sufficient prepaid postage or appears in person to claim the materials within one year of submission. Unclaimed portfolios are retained for only one year. The School of Architecture assumes no liability for lost or damaged materials.

Because of space limitations, not all qualified applicants can be accommodated and the admission process is necessarily selective.

Students should indicate for which program of study they are applying. Those with a four-year degree equivalent to the B.S.D. in Architectural Studies should apply for the two-year program. Those with an undergraduate degree not in architecture should apply for the three-plus-year program. Students who are uncertain about which program suits them should write to the graduate program coordinator for determination of appropriate application. Students must have their name clearly visible on all parts of application; portfolio, statement of intent, etc.

Students with a previous professional degree in architecture (five or six years) who wish to pursue advanced study in climate responsive architecture, building energy performance, computer-aided design, energy simulation and analysis, and facilities development and management should apply to the Master of Science in Building Design program. See "Building Design," page 126.

**Application Deadline.** Priority consideration is given to completed applications received on or before January 15. All fellowship and scholarship appointments for entering students are normally made from applicants in this group. Applications for admission received after January 15 can be considered only for remaining vacancies and "alternate" placement. Students are not admitted to the two-year Master of Architecture program at any time other than the beginning of the fall semester. Students are not admitted to the three-plus-year Master of Architecture program at any time other than the beginning of the first summer session.

**Personal Interview.** A personal interview is not required. However, a candidate wishing to visit the school is welcome and should make arrangements by contacting the Graduate Programs Coordinator in the School of Architecture.

**Requirements for the Two-Year Program.** The two-year graduate program requires a minimum of 56 semester hours of approved courses and electives and a comprehensive examination. For most students, this program involves an average of 14 semester hours per semester. An internship may be offered as an elective to be taken in the summer before the final year of study. The internship is an honors program individually arranged and approved by the Master of Architecture Committee. Students electing to take a summer internship normally take 12–13 hours per semester during the second year.

Students who can adequately demonstrate competence through experience or previous academic course work for any of the specific requirements outlined below are encouraged to petition the graduate advisor for a course substitution.

**Typical Program of Study**

**First Year**

<b>Fall</b>	
ADE 521	Advanced Architectural Studio I.....5
APH 505	Foundation Theory Seminar.....3
ATE 553	Building Systems III.....3
ATE 563	Building Structures III.....3
Total	.....14
<b>Spring</b>	
AAD 551	Architectural Management I.....3

ADE 522	Advanced Architectural Studio II.....5
APH 515	Current Issues and Topics.....3
Professional elective*	.....3
Total	.....14

**Second Year**

<b>Fall</b>	
ADE 621	Advanced Architectural Studio III.....5
ANP 681	Project Development.....3
ATE 556	Building Development.....3
Professional elective*	.....3
Total	.....14

<b>Spring</b>	
AAD 552	Architectural Management II.....3
ADE 622	Advanced Architectural Studio IV.....5
Approved elective	.....3
Professional elective*	.....3
Total	.....14
Master of Architecture total	.....56

\*At least one professional elective must be taken in the area of computers.

**Requirements for the Three-Plus-Year Program.** The three-plus-year graduate program requires a minimum of 99 semester hours of approved courses and electives and a comprehensive examination. For most students, this program involves 12 semester hours in the first summer and 14–15 semester hours in each of the subsequent six semesters. A summer internship is also required after the first full year of study unless the student has work experience in an architectural office. A second internship may be offered as an elective to be taken in the summer before the final year of study. The second internship is an honors program individually arranged and approved by the Master of Architecture Committee. Those electing to take a summer internship normally take 12–13 hours per semester during the final year.

Students who can adequately demonstrate competence through experience or previous academic course work for any of the specific requirements outlined below are encouraged to petition the graduate advisor for a course substitution.

**Typical Program of Study**

**First Year**

<b>Summer</b>	
ADE 510	Foundation Architectural Studio.....6
APH 200	Introduction to Architecture <i>HU, G</i> .....3
APH 509	Foundation Seminar.....3
Total	.....12

<b>Fall</b>	
ADE 511	Core Architectural Studio I.....6
APH 313	History of Western Architecture I <i>L2/HU</i> .....3
ATE 353	Architectural Construction.....3
ATE 521	Building Environmental Science.....3
Total	.....15

<b>Spring</b>	
ADE 512	Core Architectural Studio II.....6
APH 314	History of Western Architecture II <i>L2/HU</i> .....3
ATE 361	Building Structures I.....3
ATE 452	Building Systems II.....3
Total	.....15

**Summer**

ARP 584 Clinical Internship .....	1
Total .....	1

**Second Year****Fall**

ADE 521 Advanced Architectural Studio I .....	5
APH 505 Foundation Theory Seminar .....	3
ATE 462 Building Structures II .....	3
ATE 553 Building Systems III .....	3
Total .....	14

**Spring**

AAD 551 Architectural Management I .....	3
ADE 522 Advanced Architectural Studio II .....	5
APH 515 Current Issues and Topics .....	3
Professional elective* .....	3
Total .....	14

**Third Year****Fall**

ADE 621 Advanced Architectural Studio III .....	5
ANP 681 Project Development .....	3
ATE 556 Building Development .....	3
ATE 563 Building Structures III .....	3
Total .....	14

**Spring**

AAD 552 Architectural Management II .....	3
ADE 622 Advanced Architectural Studio IV .....	5
Approved elective .....	3
Professional electives* .....	3
Total .....	14
Total hours in program .....	99

\* At least one professional elective must be taken in the area of computers.

**Comprehensive Examinations.** The faculty require that all students pass an oral comprehensive examination based, in part, on a defense of their final design project in ADE 622. Each student is required to undertake an independent design project in ADE 622, based on an approved proposal completed the previous semester in ANP 681. Examiners typically include members of the Architecture faculty and may include distinguished practitioners not on the faculty.

**M.Arch./M.B.A. Concurrent Degree Program.** A Master of Architecture/Master of Business Administration concurrent degree program is offered through cooperative arrangement between the faculty of the College of Business and the College of Architecture and Environmental Design. Students may obtain both degrees in approximately three years of study by concurrently meeting the requirements for each degree program. Separate applications are required by the respective units.

This program requires a minimum of 88 semester hours. Once admitted, in consultation with their respective advisors, students develop programs of study that meet degree requirements of both programs and their particular interests. Students interested in this offering should request further information from the School of Architecture graduate advisor.

**RESEARCH ACTIVITY**

Faculty and students in the graduate programs of the School of Architecture are involved in the following areas of research: energy-conscious design, computer graphics, housing, urban design, building technology, environmental analysis, arid region design, and architectural history and theory.

The School of Architecture maintains laboratories for solar, structural, and materials testing, including a 1,500-square-foot rooftop testing laboratory for solar research.

Facilities for basic research activities and community service oriented programs in energy technology, design, real estate development, and planning are also provided by the College of Architecture and Environmental Design through the Herberger Center for Design Excellence and the joint urban design program.

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**Architecture**

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Courses offered by the faculty of the School of Architecture are categorized in the instructional areas described below.

*Architectural Administration and Management (AAD).*

AAD courses investigate the organization and managerial aspects of contemporary architectural practice. These studies examine the overall processes relative to management coordination, administration procedures, ethics, legal constraints, and the financial controls and measures of contemporary architectural practice.

*Architectural Design and Technology Studios (ADE).* ADE encourage synthesis of the knowledge and understanding the student has gained from previous and parallel course work, and from other sources, toward the comprehensive design of architectural projects. The laboratories integrate the needs, limitations, and determinants of design problems while applying analytical methods and technical skills in seeking and comparing alternative solutions for assigned problems.

*Architectural Philosophy and History (APH).* APH develops an understanding of architecture as both a determinant and a consequence of man's culture, technology, human needs, and behavior in the past and present. These studies are concerned with the rationale for the methods and results of design and construction.

*Architectural Technology (ATE).* ATE develops knowledge of the technical determinants, resources, and processes of architecture. These studies are concerned primarily with the science and technology of design and construction, including materials, structural systems, construction systems, environmental control systems, active and passive solar systems, acoustics and lighting.

*Architecture Professional Studies (ARP).* ARP provides students with residency and off-campus opportunities and educational experience in group and individual studies relative to specific student interests and faculty expertise.

The program also offers several opportunities to study abroad. In addition, various required and optional field trips



are undertaken in course work. (Supplemental fees are assessed for these offerings.)

*Environmental Analysis and Programming (ANP)*. ANP develops capabilities to analyze and program environmental and human factors as preconditions for architectural design. These studies are concerned with the existing and emerging methods used by the profession to evaluate and analyze. A variety of courses on computer utilization is included in this area.

#### ARCHITECTURAL ADMINISTRATION AND MANAGEMENT (AAD)

##### AAD 551 Architectural Management I. (3) S

Organizational, human performance, and market influences on architecture firms and projects. Readings, case studies, and analysis of managerial problems and solutions. Lecture, discussion. Prerequisite: graduate-level standing. Corequisite: ADE 522.

##### AAD 552 Architectural Management II. (3) F

Design delivery, coordination of construction documents, cost estimating, bidding and negotiations, construction observation, and post-construction services. Case studies. Lecture, discussion. Prerequisite: AAD 551. Corequisite: ADE 621.

##### AAD 553 Advanced Architectural Management. (3) A

Current issues in the business and practice of architecture. Financial management, project management, and design delivery strategies. Includes case studies. Lecture, discussion. Prerequisite: AAD 551 or instructor approval.

**AAD 554 Advanced Construction Contract Administration.** (3) N  
Advanced topics and problems in construction contract administration. Prerequisite: AAD 552 or instructor approval.

##### AAD 555 Architect as Developer. (3) A

Development building, real estate, construction funding, land acquisition, and the sources for capital. Prerequisite: instructor approval.

##### AAD 558 Advanced Specifications and Cost Analysis. (3) N

Coordination of working drawings, construction specifications, and cost estimates. Emphasis on methods, office procedures, contract conditions, bonds, and bidding procedures. Prerequisite: instructor approval.

##### AAD 560 Contemporary Architectural Practice. (3) A

Advanced issues and directions in design delivery, firm and project management, global markets and expanding cultural responsibilities. Includes case studies. Seminar. Prerequisite: instructor approval.

##### AAD 681 Professional Seminar: Capstone. (3) S

Examination of ethical, political, social, economic, ecological, and cultural issues confronting the practice of architecture. Readings and case studies. Seminar. Prerequisite: AAD 552. Corequisite: ADE 622.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

#### ARCHITECTURAL DESIGN AND TECHNOLOGY STUDIOS (ADE)

##### ADE 510 Foundation Architectural Studio. (6) SS

Fundamentals of architectural design, methodology, visualization, and representation. Lecture, studio, field trips. Prerequisite: admission to graduate program.

##### ADE 511 Core Architectural Studio I. (6) F

Application of design fundamentals in architectural problems, including construction, technology, programmatic and environmental determinants. Lecture, studio, field trips. Prerequisites: ADE 510; APH 200, 509. Corequisite: ATE 353.

##### ADE 512 Core Architectural Studio II. (6) S

Application of architectural design fundamentals to increasingly complex problems, including specific sites and activities. Lecture, studio, field trips. Prerequisite: ADE 511.

##### ADE 521 Advanced Architectural Studio I. (5) F

Design problems emphasizing theory, aesthetics, and tectonics as influences on architectural form. Lecture, studio, field trips. Prerequisite: admission to graduate program.

##### ADE 522 Advanced Architectural Studio II. (5) S

Design problems emphasizing the comprehensive integration of building systems and technologies as influences on architectural form. Lecture, studio, field trips. Corequisites: AAD 551; ADE 521.

##### ADE 621 Advanced Architectural Studio III. (5) F

Design problems emphasizing the urban context, planning issues, and urban design theory as influences on architectural form. Lecture, studio, field trips. Corequisites: AAD 552; ADE 522; instructor approval.

##### ADE 622 Advanced Architectural Studio IV. (5) S

Individual, student-initiated project reflecting a culminating synthesis of architectural ideas. Studio. Prerequisites: ADE 621; ANP 681. Corequisite: AAD 681.

##### ADE 661 Bioclimatic Design Studio. (6) A

Sustainable architectural and site synthesis at a variety of scales emphasizing bioclimatic criteria and the use of passive and low-energy systems. Prerequisite: professional degree or instructor approval. Corequisite: ATE 558.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

#### ENVIRONMENTAL ANALYSIS AND PROGRAMMING (ANP)

##### ANP 530 Computer Graphics in Architecture. (3) A

Fundamentals of computer graphics programming in architecture, including graphics hardware, device independent packages, 2- and 3-dimensional transformations, and data structures. 2 hours lecture, 3 hours lab. Prerequisite: ANP 475 or instructor approval.

##### ANP 561 Architectural Information Processing Systems. (3) A

Applications of information processing systems to architectural problems. Analysis of computing tools with respect to assumptions and theories. Lecture, lab. Prerequisites: graduate standing; instructor approval.

##### ANP 562 Information Systems for Facilities Management. (3) N

Introduction to database design and implementation. Assessment of facility management problems from information system points of view. Seminar, lab. Prerequisites: ANP 477 or (561); graduate standing.

##### ANP 576 Community Housing. (3) N

History, practices, trends, and forms of housing; includes growth of public programs, national and local programs, zoning law, housing distribution, planning principles and policies, design review, standards, and private development practice.

##### ANP 577 Housing Environments. (3) A

Contemporary housing environments, housing types, and life styles as determined by user preference, density, development and property standards, cost, community and privacy, security, identity, movement, and the need for open space.

##### ANP 581 Urban Structure and Design. (3) F

The nature and dynamics of urbanization and its relationship to architecture and urban design, including growth, decay, socialization, planning processes, and visual perception. Case studies. Prerequisite: professional-level standing.

##### ANP 681 Project Development. (3) F 2000

Definition and elaboration of major ideas for implementation in ADE 622 Advanced Architectural Studio IV in relation to contemporary theory and practice. Seminar. Prerequisite: ADE 522.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

#### ARCHITECTURAL PHILOSOPHY AND HISTORY (APH)

##### APH 505 Foundation Theory Seminar. (3) F

Foundation of conceptual architectural inquiry, stressing the reciprocal and interdependent relationship between design and theory. Lecture, seminar.

##### APH 509 Foundation Seminar. (3) SS

Historical, technical, theoretical, environmental, and professional issues in architecture. Lecture, seminar, field trips. Prerequisite: ADE 510.

##### APH 511 Energy Environment Theory. (3) F

Solar and other energy sources in designed and natural environments; architectural, urban, and regional implications of strategies using other renewable resources.

##### APH 515 Current Issues and Topics. (3) S

Critical examination of current architectural issues, topics, and discourse. Prerequisite: APH 505.

##### APH 681 Architectural Theory. (3) S

Examination of architectural theory. Emphasis on application of theory to practice. Seminar. Prerequisite: instructor approval.

**APH 682 Architectural Criticism.** (3) F

Examination of architectural criticism, emphasizing specific methods of criticism and their application for aesthetic judgment. Seminar. Prerequisite: instructor approval.

**APH 683 Critical Regionalism.** (3) N

Critical inquiry in cultural grounding the definition of place in architectural theory and practice. Lecture, field studies. Prerequisite: APH 446 or 447.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**ARCHITECTURAL TECHNOLOGY (ATE)****ATE 501 Introduction to Solar Energy.** (3) N

Introduction to theoretical and practical aspects of use of solar radiation and nocturnal cooling for control of building environments.

**ATE 521 Building Environmental Science.** (3) F

Scientific principles relating to comfort and environmental control. Heat and moisture transfer. Solar/natural energies for heating, cooling, and lighting. Lecture, lab. Prerequisite: MAT 290 or equivalent.

**ATE 522 Desert Habitation Technology.** (3) N

Analysis of habitation approaches in nontechnological and technological societies arising from the nature of desert areas.

**ATE 530 Daylighting Design.** (3) S

Daylight analysis, availability, design sky measurements, modeling and simulation. Integration with passive heating, cooling, building design, and energy considerations. Lecture, lab.

**ATE 533 Building Performance Simulation and Visualization.** (3) S

Simulating, analyzing, and evaluating building energy, lighting, and acoustic systems using computer software packages. Lecture, lab.

**ATE 534 Earth Sheltering.** (3) S

Fundamentals of earth-atmosphere interaction, thermal and moisture effects, soil appraisal, underground passive techniques, comfort and energy efficiency. Lecture, lab.

**ATE 550 Passive Cooling and Heating I.** (3) S

Theory, analysis, and application of passive and low-energy systems for thermal comfort in buildings emphasizing heating. Prerequisite: ATE 521.

**ATE 551 Passive Cooling and Heating II.** (3) F

Theory, analysis, and application of passive and low-energy heating systems for thermal comfort in buildings emphasizing cooling. Prerequisite: ATE 550.

**ATE 552 Energy Parameters in Buildings.** (3) N

Advanced modeling. Transient and multidimensional analysis of thermal and daylight performance using variable weather data. Prerequisite: ATE 551 or instructor approval.

**ATE 553 Building Systems III.** (3) F

Design and integration of building systems, including mechanical, electrical, plumbing, security, communications, fire protection, and transportation. Prerequisite: admission to upper division or instructor approval.

**ATE 554 Building Energy Efficiency.** (3) S

Impact of building design on energy performance. Climate responsiveness, operations dynamics, and subsystems integration in thermal comfort and efficiency. Prerequisite: ATE 452.

**ATE 556 Building Development.** (3) F

Comprehensive design development through the understanding and integration of building materials and systems. Lecture, seminar. Prerequisites: AAD 551; ATE 462, 553; level AutoCAD proficiency.

**ATE 557 Construction Documents I.** (3) S

Production of architectural working drawings; legal status, organization, layout, site survey plans, sections, elevations, details, schedules, and coordination. Lecture, lab. Prerequisite: admission to upper division.

**ATE 558 Bioclimatic Parameters.** (3) S

Theory, analysis, and application of energy-related parameters of site, climate, human comfort, and building program for design synthesis.

**ATE 560 Building Energy Analysis.** (3) F

Computer simulation of building thermal behavior. Software review. Detailed study of selected simulation models using case study projects. Lab. Prerequisites: ANP 475 (or 477); ATE 582.

**ATE 561 Energy Analysis Techniques.** (3) F

Mathematical models of building envelope and comfort conditioning systems as bases for optimization techniques. Prerequisite: ATE 560.

**ATE 562 Experimental Evaluation.** (3) A

Instrumentation, measurement and computational techniques for analysis of building components, and assessment of thermal and luminous performance. Prerequisite: ATE 521.

**ATE 563 Building Structures III.** (3) F

Analysis, design, and detailing of steel buildings and frames. Lateral analysis of small rigid and braced frame systems. Lecture, lab. Prerequisite: ATE 462 or equivalent.

**ATE 564 Advanced Structures: Concrete.** (3) A

Analysis, design, and detailing of concrete systems, considering continuity, multistory frames and shear walls, and lateral analysis. Computer application. Prerequisite: ATE 563 or instructor approval.

**ATE 565 Advanced Structures: High Rise.** (3) A

Developments in high-rise construction. Effects of wind and seismic forces. Preliminary analysis, design, and detailing considering code requirements. Lecture, lab. Prerequisite: ATE 563 or instructor approval.

**ATE 582 Environmental Control Systems.** (3) A

Heating, ventilation, and air-conditioning systems. Loads, psychrometrics, refrigeration cycle, air/water distribution, controls, energy performance standards, and utility rates. 2 hours lecture, 3 hours lab, field trips. Prerequisite: ATE 451 or 521.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**ARCHITECTURE PROFESSIONAL STUDIES (ARP)****ARP 584 Clinical Internship.** (1–12) SS

Structured practical experience following a contract or plan, supervised by faculty and practitioners.

**ARP 684 Professional Internship.** (2–6) S

Field experience in an architectural firm specializing in an area directly related to the student's advanced study. Integration of theory and state-of-the-art practices. Credit/no credit. Prerequisite: instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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**Art****Julie F. Codell***Director***(ART 102) 480/965-3468****gradart@asuvm.inre.asu.edu****www.asu.edu/cfa/art**

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**PROFESSORS**

ALQUIST, BRITTON, CODELL, COLLINS, ECKERT, ERICKSON, FAHLMAN, FRONSKE, GASOWSKI, GILLINGWATER, JAY, KAIDA, LOVELESS, MAGENTA, MEISSINGER, PILE, PIMENTEL, RISSEEUW, SCHMIDT, SHARER, STOKROCKI, SWEENEY, TAYLOR, WEISER, WHITE, YOUNG

**ASSOCIATE PROFESSORS**

COCKE, de MATTIES, DUNCAN, GULLY, HAJICEK, JENKINS, KRONENGOLD, MARC, MAXWELL, PITTSLEY, SCHLEIF, SCHOEBEL, SCHUTTE, SERWINT, UMBERGER, VERSTEGEN

**ASSISTANT PROFESSORS**

BROWN, McIVER, PESSLER, WOLFTHAL

The faculty in the School of Art offer a program with a major in Art leading to the M.A. degree with concentrations in art education and art history.

Students admitted to the Master of Education degree program with a major in Secondary Education may also elect art as the subject matter field.

A Doctor of Education degree program option, with a concentration in art education, is available. The Ed.D. is offered and administered through the College of Education. See "Doctor of Education," page 175, for program description.

A Ph.D. degree in History and Theory of Art is offered jointly with the University of Arizona. For more information, contact the School of Art at 480/965-3468.

## MASTER OF ARTS

### Art Education

**Admission.** An applicant must have a bachelor's degree from an accredited college or university with a major of not less than 45 semester hours of art, including 12 hours of art history and six hours of art education. Additional hours may be required by the school.

An applicant must have a GPA of at least 3.00 in undergraduate course work during the junior and senior years. Applicants who do not meet these requirements must submit scores from the Miller Analogies Test or the Graduate Record Examination. Applicants should submit a formal art education research paper for review.

**Program of Study.** The degree program requires a minimum of 30 semester hours of credit in art education, including 18 hours of core courses, six hours of special topics on research related to integrating the teaching of studio art, art history, and criticism or aesthetics, and six hours of research and thesis.

To meet the core requirements, students must take the following core courses:

ARE 510 Art Education Colloquium .....	3
ARE 520 Issues in Teaching Art History .....	3
ARE 525 Research on Teaching Art History .....	3
ARE 530 Issues in Teaching Studio Art.....	3
ARE 535 Research on Teaching Studio Art.....	3
ARE 540 Teaching Art in Cultural Contexts .....	3

Before the end of the first semester of course work (six or more semester hours), a program of study must be submitted to the Graduate College. Additional program requirements are indicated in the *Guidelines for the M.A. in Art Education*.

**Qualifying Research Paper.** A qualifying research paper must be submitted at the end of the semester in which the student completes the first 15 hours of course work. This paper must be judged satisfactory by the art education faculty before the start of the following semester, or the student is put on probation. During the semester following the qualifying research paper review, the student on probation may not enroll in more than nine semester hours of course work (these may not be thesis hours). To continue in the program, the student must submit a satisfactory research paper before the end of that semester.

**Thesis Requirements.** A written thesis is required.

**Final Examinations.** A final oral examination in defense of the thesis is required.

### Art History

**Admission.** An applicant must have a bachelor's degree with an undergraduate major or minor in art history, or at least four upper-division art history courses, in which an average GPA of 3.00 was maintained. Graduate Record Examination (aptitude test) scores must be submitted in support of the application, along with three letters of recommendation. Applicants should submit one formal research paper for review and a one-page statement of intent indicating their objectives for graduate study. The application deadline is February 1.

**Program of Study.** The degree program requires 33 semester hours of credit including a minimum of 21 hours in art history, with at least 12 of these earned in 500-level seminars. At least one course must be taken in each of the four core areas: non-Western, ancient/medieval, renaissance/baroque, and modern. Satisfactory completion of ARS 501 Methodologies and Art History is required during the first semester of residence. The remaining hours include ARS 599 Thesis, approved electives, and other courses specified by the faculty.

For more information, a student should request a copy of the *Procedural Guidelines for the M.A. Program in Art History* from the School of Art.

**Foreign Language Requirements.** Demonstration of a reading knowledge of one foreign language (French, German, or with faculty approval, another language appropriate to the field of study) is required. Depending upon the student's chosen area of study, reading knowledge of an additional language may be required.

**Qualifying Research Paper.** In order for the student to continue graduate study, a qualifying research paper, submitted in the semester in which 15 hours will be completed, must be judged satisfactory by the faculty.

**Thesis Requirements.** A written thesis is required.

**Final Examinations.** A final oral examination in defense of the thesis is required.

## MASTER OF FINE ARTS

### Art

The Master of Fine Arts degree in Art requires a minimum of 60 semester hours of graduate work beyond the bachelor's degree. The objective of this degree is to provide advanced study in one or more of the following concentrations: ceramics, drawing, fibers, intermedia, metals, painting, photographic studies, photography, printmaking, sculpture, or wood.

**Admission.** A bachelor's degree from a college or university recognized by ASU is required. All students applying for the M.F.A. degree must submit to the chair of the Graduate Studio Committee a portfolio of 20 slides of their work with a return envelope and postage. Three letters of recommendation and a statement of intent pertaining to the student's educational objectives are also required. Because each area of specialization may have unique requirements, students are advised to contact the School of Art for additional information.

**Selection Procedures.** Faculty review committees appointed by the Graduate Studio Committee make the recommendations for regular or provisional admission or the denial of admission. All aspects of the application are evaluated with the purpose of selecting for the available openings those students who have the most reasonable prospect for success in the proposed programs of study. The application deadline is January 15 for the following fall semester. Each student whose application is complete by the deadline date should be advised of admission status within six weeks of the deadline. Qualified students submitting applications after the deadline may be admitted if openings are available.

### Review Sequence

1. All students admitted on provisional status are reviewed after completing the stipulated nine hours of graduate work.
2. All students are reviewed after completing 15 hours of graduate studio work.
3. A progress review may be called at any time during the course of the graduate program.

Following the 15-semester-hour review, the student must form a supervisory committee to direct the program through the completion of the M.F.A. exhibition and final oral examination. For more information, a student should request a copy of the *Guide to M.F.A. Procedures* from the School of Art.

**Program of Study.** A total of 60 semester hours of graduate credit subject to committee approval is required, including:

1. 27–32 graduate studio hours in the major area(s) of concentration;
2. nine hours of graduate-level art history;
3. nine hours of graduate work outside the area of concentration. These hours may be taken in art history, art auxiliary, art education, or outside the school or college. At least three hours are recommended in a studio discipline; and
4. 10–15 hours of ART 680 Practicum, resulting in an M.F.A. exhibition.

**Credit Before Admission.** Subject to the recommendation of the review committee, students with a completed M.A. degree in Studio Art may have up to 24 hours (exclusive of thesis or project) applied to the M.F.A. program. In other cases a maximum of 12 semester hours of transfer credit may be applied to the degree program. However, only nine hours of nondegree graduate credit taken before admission at ASU or another institution may be used to fill degree requirements (see “Credit Completed Before Admission,” page 99).

**Foreign Language Requirements.** None.

**Final Examination.** An oral defense of the M.F.A. exhibition (ART 680) is required.

**Time Limit.** The total program and all requirements for the degree, including transferred course work, must be completed within seven calendar years.

## RESEARCH ACTIVITY

Faculty and student research is conducted in the following areas:

*Art History.* Ancient, American, Asian, baroque, Latin American, medieval, modern, Native American, pre-Columbian, and renaissance art; as well as art criticism, critical theory, and history of photography.

*Art Education.* Teaching and learning in studio art and art history with an emphasis on elementary, secondary, and higher education settings; multicultural and cross-cultural art; curriculum and instruction; development of instructional resources; developmental studies; assessment in art; theoretical issues; historical, philosophical, and qualitative/quantitative research in art education.

*Studio Art.* Painting and drawing, intermedia, fine art printing and bookmaking, papermaking, sculpture, lithography, screenprinting, intaglio and monoprinting, computer graphics and animation, video art, fine art photography, ceramics, metalworking, wood, and fibers. Studio faculty and graduate students pursue ongoing research in various materials and techniques and investigate images and concepts in contemporary and historical art forms.

Resources for studio art research include the Pyracantha Press (typography and limited edition books). Research activities are also enhanced greatly by active programs utilizing visiting artists/scholars, guest lecturers and by the ASU Art Museum and Hayden Library, the Phoenix Art Museum, and the Heard Museum of Native American Cultures and Art.

In addition, the School of Art has three traveling fellowships that allow students to study or conduct research abroad. The Anthony Gully Travel Fellowship and the Rabiner Memorial Fellowship are for Art History students. The Nathan Cummings Travel Fellowship is for M.F.A. students.

### ART AUXILIARY (ARA)

**ARA 460 Gallery Exhibitions.** (3) F, S

Practical experience in all phases of department gallery operations and preparation of gallery publications. May be repeated for credit. Prerequisite: instructor approval.

**ARA 488 Understanding Art.** (3) F, S

Understanding art as an emergent cultural phenomenon with an emphasis on a critical examination of conceptual issues in art. Writing required. Prerequisites: ARS 101 and 102 or instructor approval. *General Studies: L2/HU.*

**Omnibus Graduate Courses:** See page 54 for omnibus graduate courses that may be offered.

### ART EDUCATION (ARE)

**ARE 450 Studio Art: Art History I.** (3) A

Art traditions before the 20th century as a basis for studio and art history instruction. 2 hours lecture, 2 hours studio. Pre- or corequisite: ARE 460.

**ARE 460 Disciplines of Art Education.** (3) A

Explorations in art education's disciplines, history, and people's art-making development at diverse age levels and abilities. Lecture, discussion. Prerequisites: ARS 101 and 102 and ART 113 and 115 or instructor approval.

**ARE 470 Art Criticism: Aesthetics.** (3) F

Traditions of aesthetics and art criticism; conceptual issues in contemporary art; education in the visual arts. 2 hours lecture, 2 hours studio. Prerequisite: ARE 460 or instructor approval.

**ARE 482 Studio Art: Art History II.** (3) S

Art traditions of the 20th century as a basis for studio and art history instruction. 2 hours lecture, 2 hours studio. Must be taken before enrollment in ARE 486. Students are recommended to take ARE 470 concurrently. Prerequisite: ARE 450.

**ARE 486 Art Education: Strategies and Applications.** (3) F

The implementation and evaluation of art instruction for K–12 population. Includes teaching of Saturday classes in the Children's Art Workshop. Prerequisite: ARE 482.

**ARE 496 Methods and Assessment of Learning in Art.** (3) S

Individual or group research on the assessment of art learning incorporating theory and practice. Prerequisites: ARE 470 and 486 or instructor approval.

**ARE 510 Art Education Colloquium.** (3) N

Historical foundations of art education and faculty presentations regarding teaching and research related to the visual arts.

**ARE 520 Issues in Teaching Art History.** (3) A

Critical examination of issues concerning teaching art history to different populations of students. Historical and philosophical foundations and emphasis on developing inquiry into historical and cultural contexts of art. Recommended to be taken before ARE 525.

**ARE 525 Research on Teaching Art History.** (3) A

Review of empirical and historical research, research methods, learning theory, and assessment of learning in art history. Pilot studies on the effects of instruction upon learning. Recommended to be taken after ARE 520.

**ARE 530 Issues in Teaching Studio Art.** (3) A

Critical examination of issues concerning teaching multicultural art to different populations of students. Historical and philosophical foundations reviewed. Recommended to be taken before ARE 535. Lecture, discussion.

**ARE 535 Research on Teaching Studio Art.** (3) A

Review of empirical and historical research methods, learning theory, and assessment of learning in studio art, including developmental studies and their limitations. Pilot studies on the effects of instruction upon learning. Recommended to be taken after ARE 530.

**ARE 540 Teaching Art in Cultural Contexts.** (3) A

Relationship of multicultural perspectives to teaching/learning art criticism, aesthetics, studio art, and art history.

**ARE 610 Issues and Trends in Art Education.** (3) N

Doctoral-level investigation of historical and contemporary issues related to teaching and research in art education.

**ARE 611 Curriculum Development in Art Education.** (3) N

Doctoral-level inquiry into the philosophical, psychological, and sociological foundations of curriculum development.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### ART HISTORY (ARS)

**ARS 400 History of Printmaking.** (3) A

History of the print as an art form and its relation to other modes and forms of artistic expression. Prerequisites: ARS 101 and 102 or instructor approval. *General Studies:* HU, H.

**ARS 410 Early Christian and Byzantine Art.** (3) A

Art and architecture of the early church and the Byzantine Empire from the 4th to the 15th century. Prerequisites: ARS 101 and 102 or instructor approval. *General Studies:* HU.

**ARS 453 Issues in Contemporary Photography.** (3) A

A discussion seminar identifying, defining, and researching the issues and ideas that influence the appearance and criticism of contemporary images. Seminars, lectures, presentations, papers. Prerequisites: ARS 450, 451.

**ARS 454 Research and Writing in Photography.** (3) A

Principles and practice of research and writing in the history and criticism of photography. Papers required. Prerequisites: ARS 450 and 451 or instructor approval; ENG 101 and 102 or equivalents.

**ARS 457 History of Art Criticism.** (3) N

Theories of criticism of the visual arts from late 18th century to present. Prerequisites: ARS 101 and 102 or instructor approval. *General Studies:* H.

**ARS 458 Critical Theories in the Visual Arts.** (3) N

Examines current critical theories through their application to all visual arts. May include new historicism, Marxism, deconstruction, post-structuralism, semiotics, Lacanian psychoanalysis, feminism, post-modernism. Lecture, discussion, student presentations. Prerequisites: ARS 101 and 102 or instructor approval. *General Studies:* HU.

**ARS 469 Mexican Art.** (3) A

Art of Mexico and related Central American cultures from the prehistoric to the contemporary schools. Meets non-Western art history requirement. Prerequisites: ARS 101 and 102 or instructor approval. *General Studies:* HU, H.

**ARS 473 Art of Japan.** (3) A

Japanese art from the Jomon period to the present. Satisfies non-Western art history requirement. Prerequisites: ARS 101 and 102 or instructor approval. *General Studies:* HU.

**ARS 485 Women in the Visual Arts.** (3) S

Historical study of art by women in various media; related social, political, educational issues; representation of women in art. Lecture, discussion. Prerequisite: ARS 101 or 102 or instructor approval. *General Studies:* L2.

**ARS 501 Methodologies and Art History.** (3) F

The history of the discipline and an exploration of various methodologies, critical theory, and bibliographies used by art historians. Seminar.

**ARS 502 Critical Studies in Egyptian Art.** (3) N

Egyptian art from pre-Dynastic to New Kingdom periods. Focus on aesthetic, philosophical, and cultural context. Research paper and readings required.

**ARS 504 Critical Approaches to Greek Art.** (3) A

Art and architecture of Aegean civilizations (Cycladic, Minoan, Mycenaean) and of Greece to end of Hellenistic period. Research paper and readings required.

**ARS 506 Critical Studies in Roman Art.** (3) A

Art and architecture of Etruria, the Roman Republic, and the Roman Empire. Research paper and/or supplemental readings required.

**ARS 514 Critical Approaches to Romanesque Art.** (3) N

Sculpture, painting, architecture, and the minor arts in western Europe, ca. 1030–1200, considered within religious, economic, and social contexts. Research paper required.

**ARS 516 Critical Approaches to Gothic Art.** (3) N

Architecture, sculpture, painting, and the minor arts in western Europe, ca. 1150–1350, considered within religious, social, and economic contexts. Research paper required.

**ARS 517 Critical Approaches to Late Gothic Art.** (3) N

Art of the late-Gothic style (ca. 1350–1525) considered within religious, social, economic, and political contexts. Research or reading project required.

**ARS 522 Sixteenth-Century Italian Art.** (3) A

Critical study of painting, sculpture, and architecture in 16th-century Italy in its religious and historical context.

**ARS 528 Eighteenth-Century Art in Europe.** (3) A

Critical study of European art from the late Baroque to the early years of Neoclassicism.

**ARS 530 Art of Spain and New Spain.** (3) A

Critical study of architecture, painting, and sculpture from 1500 to 1800. Lecture, conference.

**ARS 532 Art, Politics, and Patronage 1770–1850.** (3) F

Critical analyses of political events in Europe. Issues of patronage, art as propaganda examined. Impact of war and revolution on visual arts.

**ARS 534 Studies in Modern European Art, 1850–1914.** (3) A

Critical study of visual arts using primary source material from mid-19th century to WWI within philosophical, socio/economic contexts. Lecture, tutorial. Prerequisite: instructor approval.

**ARS 542 Critical Issues in American Painting I.** (3) A

Explores themes and social issues in American art with a critical study of American painting from the 18th century to 1850. Lecture, discussion. Prerequisites: ARS 101, 102.

**ARS 543 Critical Issues in American Painting II.** (3) A

Explores themes and social issues in American art with a critical study of American painting from 1850 to 1900. Lecture, lab. Prerequisite: instructor approval.

**ARS 544 American Modernism and Realism, 1900–1945.** (3) A

Critical study of the social, political, and artistic changes in American art during the first half of the twentieth century. Prerequisites: ARS 101 and 102 or 340.

**ARS 562 Art of Ancient Mesoamerica.** (3) F

Critical study of art and architecture of Mexico and Maya area before Spanish contact. Lecture, conference.

**ARS 565 Native Art of North America.** (3) A

A critical examination of Native American art within culture, prehistory to the present. Prerequisites: ARS 101 and 102 or instructor approval.

**ARS 574 Studies in Japanese Art.** (3) A

A critical examination of the nature and history of Japanese art, its rich heritage and its indebtedness to foreign sources. Lecture, discussion. Prerequisites: ARS 101 and 102 or instructor approval.

**ARS 575 Approaches to Chinese Painting.** (3) F

A critical history of Chinese painting from Eastern Chou to 1911. Emphasis on masters, regional developments, and conceptual underpinnings. Lecture, discussion. Prerequisites: ARS 101 and 102 or instructor approval.

**ARS 591 Seminar.** (3–6) A

Graduate seminar in topics selected from the following. Problems or criticism in:

- (a) American Art
- (b) American Indian Art
- (c) Ancient Art
- (d) Baroque Art
- (e) Chinese Art
- (f) Critical Theories in the Visual Arts
- (g) Medieval Art
- (h) Modern Art
- (i) Native American Art
- (j) Photographic History
- (k) Pre-Columbian Art
- (l) Renaissance Art

Prerequisite: instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## ART (ART)

**ART 411 Advanced Drawing.** (3) F, S

Visual and intellectual concepts through problem solving and independent study. Emphasis on the individual creative statement. 6 hours a week. May be repeated for credit. Prerequisites: ART 311; instructor approval.

**ART 414 Advanced Life Drawing.** (3) F, S

Various media and techniques on an advanced level. The human figure as an expressive vehicle in various contexts. 6 hours a week. May be repeated for credit. Prerequisite: ART 315 or instructor approval.

**ART 415 Art Anatomy.** (4) N

Study of human anatomical structures as applied to the practice of figure oriented art. 3 hours lecture, 5 hours studio a week. Prerequisite: ART 214.

**ART 423 Advanced Painting.** (3) F, S

Continuation of ART 324. 6 hours a week. May be repeated for credit. Prerequisite: ART 324.

**ART 425 Advanced Figure Painting.** (3) F, S

Continuation of ART 325. 6 hours a week. May be repeated for credit. Prerequisites: ART 315, 324, 325.

**ART 427 Advanced Watercolor.** (3) F, S

Continuation of ART 327. More advanced formal, conceptual, and technical problems in contemporary watercolor. 6 hours a week. May be repeated for credit. Prerequisite: ART 327.

**ART 439 Mixed Media.** (3) F, S

Exploring visual effects by combining traditional and nontraditional methods, techniques, and concepts. 6 hours a week. May be repeated for credit. Studio. Prerequisites: ART 113 and 115 and 6 hours additional studio requirements or instructor approval.

**ART 440 New Media Concepts.** (3) F, S

Continued experiments with new media and interdisciplinary concerns in art. 6 hours a week. May be repeated for credit. Prerequisite: ART 443. Corequisite: ART 441.

**ART 441 Video Art.** (1) F, S

Utilizing video and audio equipment essential to the production of broadcast quality video art. 2 hours a week. May be repeated for credit. Corequisite: ART 440.

**ART 442 Folk/Outsider Art.** (3) F

Exploration of ideas, attitudes, and art of contemporary "self-taught," "visionary," and "outsider" artists. Research and studio practice. Lecture, studio. Prerequisite: ART 115 or instructor approval.

**ART 443 Intermedia.** (3) F, S

Experimental, conceptual, and interdisciplinary studio art with emphasis on new media and technologies. 6 hours a week. May be repeated once for credit. Prerequisite: instructor approval.

**ART 446 Computer Art II.** (3) A

Three-dimensional modeling and animation. Emphasis on concepts and fine arts applications. Studio. Prerequisites: ART 113, 115; instructor approval. *General Studies:* N3.

**ART 449 Computer Animation II.** (3) F, S

Advanced principles and applications of 3D animation for fine arts. Studio. Prerequisite: ART 448 or instructor approval.

**ART 450 Computer Animation III.** (3) F, S

Special effects in fine arts 3D animation. Studio. Prerequisites: ART 449; instructor approval.

**ART 530 Two-Dimensional and Three-Dimensional Computer Art.** (3) A

Integration of 2D and 3D computer imaging for art. Emphasis on new directions for computer imaging which accounts for media characteristics. Studio.

**ART 540 Advanced Computer Art.** (3) A

Study of motion for 3D models, light sources, and surface effects. Course assumes students have a comprehension of complex modeling, mapping, and lighting. Studio. Prerequisite: ART 446 or instructor approval.

**ART 401 Nonsilver Photography.** (3) F, S

Recognition of the inherent characteristics of nonsilver processes and their use in communicating ideas. 6 hours a week. May be repeated for credit. Prerequisite: ART 304 or instructor approval.

**ART 403 Senior Photographic Projects.** (3) F, S

Technical and philosophical refinement of personal aesthetic with various photographic media. 6 hours a week. May be repeated for credit. Prerequisite: ART 304 or instructor approval.

**ART 404 Portraiture Photography.** (3) F, S

Photographing people. Critical discussions and slide lectures on issues in portraiture. 6 hours a week. May be repeated for credit. Prerequisite: ART 304 or instructor approval.

**ART 405 Advanced Color Photography.** (3) F, S

Intensive use of subtractive color process in photographic printing. 6 hours a week. May be repeated for credit. Prerequisite: ART 305 or instructor approval.

**ART 406 Photo Techniques.** (3) F, S

Camera and darkroom techniques with emphasis on creative control of the black and white print. 6 hours a week. Prerequisite: ART 301 or instructor approval.

**ART 407 View Camera.** (3) F, S

View camera and darkroom techniques. Studio, lab. Prerequisite: ART 301 or instructor approval.

**ART 408 Digital Photographic Images.** (3) F, S

Scanning, manipulation, refinement, and compositing of photographic images in the computer. Lab, studio. Prerequisite: ART 201.

**ART 409 Photographic Exhibition.** (3) A

Care of photographic prints, print presentation, and exhibition. Practical experience in gallery operations. 6 hours a week. May be repeated for credit. Prerequisite: ART 304 or instructor approval.

**ART 452 Advanced Lithography.** (3) F, S

Continuation of ART 352. 6 hours a week. May be repeated for credit. Prerequisite: instructor approval.

**ART 454 Advanced Screen Printing.** (3) A

Continuation of ART 354. 6 hours a week. May be repeated for credit. Prerequisite: instructor approval.

**ART 455 Advanced Photo Processes for Printmaking.** (3) A

A continued study of photomechanical techniques and applications to printmaking or photographic processes. Prerequisite: ART 355 or instructor approval.

**ART 456 Fine Printing and Bookmaking I.** (3) A

Letterpress printing and typography as fine art. Study of history, alphabets, mechanics of hand typesetting, presswork, and various forms of printed matter. Prerequisite: instructor approval.

**ART 457 Fine Printing and Bookmaking II.** (3) A

Continuation of ART 456. Bookbinding, book design and printing, advanced typography, theory, and presswork. May be repeated for credit. Prerequisites: ART 456; instructor approval.

**ART 458 Papermaking.** (3) F, S

History, theory, demonstrations, sheet forming, collage treatments, and 3-dimensional approaches. 6 hours a week. May be repeated for credit. Prerequisite: instructor approval.

**ART 459 Monoprinting.** (3) F, S

The nonmultiple printed image using a variety of technical approaches. 6 hours a week. May be repeated for credit. Prerequisites: ART 311, 323 (or any 300-level printmaking class); instructor approval.

**ART 551 Intaglio Projects.** (3) F, S

The materials and methods of Intaglio as a matrix for exploring various contemporary issues. Specifically structured to accommodate the graduate-level drawing with no printmaking background. Studio.

**ART 431 Special Problems in Sculpture.** (3) F, S

Development of a personal approach to sculpture, emphasis on form, individual problems, and related color technology. Professional practices and presentation. 6 hours a week. May be repeated for credit. Prerequisites: ART 332; instructor approval.

**ART 432 Neon Sculpture.** (3) F

Techniques for creating neon in an art context. Glass tube bending and fabrication. Construction of artworks utilizing light generating gases. 6 hours a week. May be repeated for credit. Prerequisite: instructor approval.

**ART 433 Foundry Research Methods.** (3) F, S

Research in foundry techniques. Studio. Pre- or corequisite: ART 333 or instructor approval.

**ART 436 Architectural Sculpture.** (3) N

Sculptural concepts as related to architecture and other man-made environments. Scale drawing, models, and relief sculpture. 6 hours a week. May be repeated for credit. Prerequisite: ART 332 or instructor approval.

**ART 437 Film Animation.** (3) F

Production of short 16mm films that feature articulated sculptural objects, models, dolls, puppets, and graphics through the use of single frame filming techniques. 6 hours a week. May be repeated for credit. Prerequisite: instructor approval.

**ART 438 Experimental Systems in Sculpture.** (3) S

Simple electrical and mechanical systems that can be utilized in the context of studio art and installations. Active production of studio art works required. 6 hours a week. May be repeated for credit. Prerequisite: instructor approval.

**ART 474 Advanced Wood.** (3) F, S

Extended experience and advanced techniques in the use of wood to create functional works of art. 6 hours a week. May be repeated for credit. Prerequisites: ART 374; instructor approval.

**ART 460 Ceramic Clay.** (3) S

Research into various clay body formulations, local natural materials, slip glazes, and engobes. Lecture, lab, studio. Prerequisites: ART 360 and 364 or instructor approval.

**ART 463 Ceramic Glaze.** (3) F

Glaze calculation and formulation using various glaze colors and surfaces. Lecture, lab, studio. Prerequisite: ART 460 or instructor approval.

**ART 466 Special Problems in Ceramics.** (3) F, S, SS

Emphasis on personal expression within structure of seminars, critiques, and studio work. Professional methods of presentation/documentation of work. 6 hours a week. May be repeated for credit. Prerequisite: ART 364 or instructor approval.

**ART 476 Fibers: Multiple Harness Weaving.** (3) F, S

Advanced loom techniques and computer pattern design. Emphasis on individual design and loom application. Prerequisite: ART 113 or 115 or 376 or instructor approval.

**ART 477 Printed Textiles.** (3) A

Techniques for screen printing on fabric exploring pattern as a compositional element. Various stencil methods including photographic processes. Studio. May be repeated for credit. Prerequisite: ART 377 or instructor approval.

**ART 472 Advanced Jewelry.** (3) F, S

Jewelry making with emphasis on developing personal statements and craftsmanship. 6 hours a week. May be repeated for credit. Prerequisites: ART 372; instructor approval.

**ART 473 Advanced Metalworking.** (3) A

Forging and forming techniques in individualized directions. 6 hours a week. May be repeated for credit. Prerequisites: ART 373; instructor approval.

**ART 621 Studio Problems.** (3) F, S, SS

Advanced study in the following areas:

- (a) Ceramics
- (b) Drawing
- (c) Fiber Art
- (d) Jewelry Metalworking
- (e) Metals
- (f) Painting
- (g) Photography
- (h) Printmaking
- (i) Sculpture
- (j) Studio Art
- (k) Wood

6 hours a week each section. May be repeated for credit. Prerequisite: instructor approval.

**ART 680 Practicum: M.F.A. Exhibition.** (1–15) F, S, SS

Studio work in preparation for required M.F.A. exhibition. Public exhibit to be approved by the student's supervisory committee and accompanied by a final oral examination. Photographic documentation and written statement of problem. Prerequisite: approval of the student's supervisory committee.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Bioengineering

**Eric J. Guilbeau**

*Chair*

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### PROFESSORS

GUILBEAU, TOWE

### ASSOCIATE PROFESSORS

GARCIA, HE, KIPKE, MASSIA, PIZZICONI,

SWEENEY, YAMAGUCHI

### ASSISTANT PROFESSOR

PANITCH

The Bioengineering faculty within the Department of Chemical, Bio, and Materials Engineering offer graduate programs leading to the M.S. and Ph.D. degrees in Bioengineering. Areas of study include biochemical engineering, bioelectrical engineering, biomechanical engineering, biosystems/biotransport engineering, bioinstrumentation, biomaterial engineering, and biocontrol engineering. Research topics include artificial organs, biocontrol systems, biomechanics, bioinstrumentation, biomaterials, biosystems engineering, biotechnology, cardiovascular engineering, cellular and tissue bioengineering, neural bioengineering, noninvasive imaging, and rehabilitation engineering.

**Graduate Record Examination.** Graduate Record Examination scores are required from all students.

**Transition Program.** Students applying to the Bioengineering M.S. or Ph.D. degree programs may have an undergraduate B.S. degree in a major field other than Bioengineering. The qualifications of transition students are reviewed by the department graduate committee and a special program of transition course work is designed for successful applicants. In general, transition students should have had, or be prepared to take, calculus through ordinary

differential equations, physics, inorganic chemistry, and a number of undergraduate engineering courses in order to be prepared for graduate bioengineering courses. Other course work from the undergraduate program may be required depending upon the research topic selected by the student. Transition students should contact the graduate coordinator to evaluate the undergraduate transcript.

## MASTER OF SCIENCE

See "Master's Degrees," page 98, for general requirements.

**Program of Study.** All candidates pursuing a M.S. degree in Bioengineering are required to complete an approved program of study consisting of the minimum required semester hours, including research and thesis. Special course requirements for the different areas of study are established by the faculty and are available from the Department of Chemical, Bio, and Materials Engineering. Part-time students must successfully complete a research seminar course for at least three semesters during the course of study. Candidates whose undergraduate degree was in a field other than bioengineering may be required to complete more than 30 semester hours of credit on the program of study.

**Research Seminar Requirements.** In addition to the course work and thesis requirements, all full-time master's degree students must successfully complete a research seminar course during each semester of attendance.

**Thesis Requirements.** A written thesis is required.

**Final Examinations.** A final oral examination in defense of the thesis is required.

## DOCTOR OF PHILOSOPHY

The Ph.D. degree in Bioengineering is conferred upon evidence of excellence in research resulting in a scholarly dissertation that is a contribution to knowledge.

See "Doctor of Philosophy," page 101, for general requirements.

**Program of Study.** Upon admission of the applicant with regular or provisional status, a supervisory committee (program committee) is appointed. This committee is responsible for the guidance and direction of the student's graduate program of study. The program committee is composed of a minimum of three faculty members, including a chair. Generally, the student's graduate advisor serves as chair of the program committee. The program committee advises the student in developing a program of study and assumes primary responsibility in assessing the student's progress in the program.

**Research Seminar Requirements.** In addition to the course work and dissertation requirements, all full-time doctoral students must successfully complete a research seminar course during each semester of attendance.

**Qualifying Examination.** A qualifying exam is administered to test the student's mastery of basic engineering fundamentals. The examination is usually taken early in the student's program of study (after two semesters of residence

at ASU, and no later than three semesters). A student must express in writing the intention to take the exam to the department graduate committee through the graduate coordinator.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** When the Ph.D. student has essentially completed the course work in the approved program of study, the student is given a written comprehensive examination covering the field of study. The written examination is followed by an oral examination.

**Admission to Candidacy and Appointment of Dissertation Committee.** After the student passes the comprehensive examinations, a dissertation committee composed of at least five faculty members is appointed. The dissertation committee meets to approve the student's dissertation prospectus. Generally, the prospectus should include a pertinent review of the literature, a statement of the proposed study, the hypothesis to be tested, a description of the research design, a discussion of the specific data to be collected, and a description of the means by which the data is to be analyzed. After the dissertation committee has approved the prospectus, the student applies to the Graduate College for admission to candidacy.

**Dissertation Requirements.** A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required. The dissertation is expected to reflect and contribute significantly to knowledge. It must clearly indicate mastery of research methods.

**Final Examinations.** A final oral examination in defense of the dissertation is required.

## RESEARCH ACTIVITY

*Biosystems Engineering/Biotransport.* Medical device design and development, physiological transport phenomena, mathematical simulation of physiological processes, cardiac assistance, cardiovascular engineering, and immunomodulation.

*Biomaterials.* Hard tissue fixation, development of biocompatibility indices, blood/material interactions, and tissue/material interactions. Scanning probe characterizations.

*Bioinstrumentation.* Medical diagnostic and therapeutic instrumentation, noninvasive medical imaging, biosensors, bioelectric signal processing, cardiac electrophysiology, bioelectronic device design, bioelectronics, and neurostimulation.

*Biomechanics and Biocontrol.* Optimal strategies for human movement, head and neck coordination/movement, gait analysis, control of anthropomorphic and neuroprosthetic systems, and control strategies for patients with spinal cord injuries. Rehabilitation engineering, aids for the handicapped. Orthopedic replacement devices, orthotic devices, spinal biomechanics, and sport biomechanics.

*Biotechnology.* Hybrid biosensors, biological separations, tissue engineering, membrane separation processes, and optical biomolecular devices.

*Neuroengineering.* Neuromuscular stimulation, neuroprosthesis development, and neurocontrol.



**BIOENGINEERING (BME)****BME 411 Biomedical Engineering I.** (3) A

Review of diagnostic and prosthetic methods using engineering methodology. Introduction to transport, metabolic, and autoregulatory processes in the human body. Prerequisite with a grade of "C" or higher: BME 334.

**BME 412 Biomedical Engineering II.** (3) A

Review of electrophysiology and nerve pacing applications, introduction to biomechanics and joint/limb replacement technology, cardiovascular and pulmonary fluid mechanics, and the application of mathematical modeling. Prerequisite: instructor approval.

**BME 415 Biomedical Transport Processes.** (3) A

Principles of momentum, heat, and mass transport with applications to medical and biological systems and medical device design. Prerequisites: MAT 274; PHY 131.

**BME 416 Biomechanics.** (3) F

Mechanical properties of bone, muscle, and soft tissue. Static and dynamic analysis of human movement tasks such as locomotion. Prerequisite with a grade of "C" or higher: BME 318.

**BME 417 Biomedical Engineering Capstone Design I.** (3) F

Technical, regulatory, economic, legal, social, and ethical aspects of medical device systems engineering design. Lecture, field trips. Prerequisites with a grade of "C" or higher: BME 318, 334.

**BME 419 Biocontrol Systems.** (3) F

Application of linear and nonlinear control systems techniques toward analysis of neuromusculoskeletal, cardiovascular, thermal, and mass transfer systems of the body. Prerequisites: ECE 301; MAT 274.

**BME 435 Physiology for Engineers.** (4) F

Physiology of the nervous, muscular, cardiovascular, endocrine, renal, and respiratory systems. Emphasizes use of quantitative methods in understanding physiological systems. Lecture, lab. Prerequisites: BIO 181 and CHM 116 and PHY 131 or instructor approval.

**BME 470 Microcomputer Applications in Bioengineering.** (4) S

Use of microcomputers for real-time data collection, analysis, and control of experiments involving actual and simulated physiological systems. Lecture, lab. Prerequisites: ECE 100, 334. Prerequisite with a grade of "C" or higher: BME 435.

**BME 511 Biomedical Engineering.** (3) A

Diagnostic and prosthetic methods using engineering methodology. Transport, metabolic, and autoregulatory processes in the body.

**BME 512 Biomedical Engineering II.** (3) A

Electrophysiology and nerve pacing applications, introduction to biomechanics and joint/limb replacement, technology, cardiovascular and pulmonary fluid mechanics, and mathematical modeling.

**BME 513 Biomedical Instrumentation I.** (3) F

Principles of medical instrumentation. Studies of medical diagnostic instruments and techniques for the measurement of physiologic variables in living systems.

**BME 514 Advanced Biomedical Instrumentation.** (3) N

Principles of applied biophysical measurements using bioelectric and radiological approach. Prerequisites: ECE 334; MAT 274 (or equivalent).

**BME 515 Biomedical Transport Processes.** (3) N

Principles of momentum, heat, and mass transport with applications to medical and biological systems and medical device design. Prerequisite: instructor approval.

**BME 516 Topics in Biomechanics.** (3) F

Mechanical properties of bone, muscle, and soft tissue. Static and dynamic analysis of human movement tasks, including in-depth project. Prerequisite: instructor approval.

**BME 518 Introduction to Biomaterials.** (3) S

Topics include structure property relationships for synthetic and natural biomaterials, biocompatibility, and uses of materials to replace body parts. Prerequisite: ECE 350 or equivalent or instructor approval.

**BME 519 Topics in Biocontrol Systems.** (3) F

Linear and nonlinear control systems analysis of neuromusculoskeletal, cardiovascular, thermal, and mass transfer systems of the body, including in-depth project. Prerequisites: ECE 301 and MAT 274 or instructor approval.

**BME 520 Bioelectric Phenomena.** (3) N

Study of the origin, propagation, and interactions of bioelectricity in living things; volume conductor problem, mathematical analysis of bioelectric interactions, and uses in medical diagnostics.

**BME 521 Neuromuscular Control Systems.** (3) S

Overview of sensorimotor brain structures. Application of nonlinear, adaptive, optimal, and supervisory control theory to eye-head-hand coordination and locomotion.

**BME 522 Biosensor Design and Application.** (3) A

Theory and principles of biosensor design and application in medicine and biology. Principles of measurements with biosensors. Prerequisite: instructor approval.

**BME 523 Physiological Instrumentation Lab.** (1) F

Laboratory experience with problems, concepts, and techniques of biomedical instrumentation in static and dynamic environments. Lab. Pre- or corequisites: AGB/BME 435; BME 413; ECE 334.

**BME 524 Fundamentals of Applied Neural Control.** (3) A

Fundamental concepts of electrical stimulation and recording in the nervous system with the goal of functional control restoration. Pre- or corequisite: BME 435 or instructor approval.

**BME 525 Surgical Techniques.** (2) S

Principles of surgical techniques, standard operative procedures, federal regulations, guidelines, and state-of-the-art methods. Lecture, lab.

**BME 532 Prosthetic and Rehabilitation Engineering.** (3) A

Analysis and critical assessment of design and control strategies for state-of-the-art medical devices used in rehabilitation engineering. Pre- or corequisite: BME 416 or 516 or EPE 610.

**BME 533 Transport Processes I.** (3) F

Unified treatment of momentum, heat, and mass transfer from molecular theory, and continuum points of view. Continuum equations of microscopic and macroscopic systems and multicomponent and multiphase systems. Cross-listed as CHE 533. Credit is allowed for only BME 533 or CHE 533.

**BME 534 Transport Processes II.** (3) S

Continuation of BME/CHE 533, emphasizing mass transfer. Cross-listed as CHE 534. Credit is allowed for only BME 534 or CHE 534. Prerequisite: BME/CHE 533.

**BME 543 Thermodynamics of Chemical Systems.** (3) F

Classical and statistical thermodynamics of nonideal physicochemical systems and processes; prediction of optimum operating conditions. Cross-listed as CHE 543. Credit is allowed for only BME 543 or CHE 543.

**BME 544 Chemical Reactor Engineering.** (3) S

Reaction rates, thermodynamics, and transport principles applied to the design and operation of chemical reactors. Cross-listed as CHE 544. Credit is allowed for only BME 544 or CHE 544. Prerequisite: BME/CHE 543.

**BME 551 Movement Biomechanics.** (3) S

Mechanics applied to the analysis and modeling of physiological movements. Computational modeling of muscles, tendons, joints, and the skeletal system with application to sports and rehabilitation. Prerequisite: BME 416 or 516 or instructor approval.

**BME 566 Medical Imaging Instrumentation.** (3) N

Design and analysis of imaging systems and nuclear devices for medical diagnosis, therapy, and research. Laboratory experiments using diagnostic radiology, fluoroscopy, ultrasound, and CAT scanning. Lecture, lab. Prerequisite: instructor approval.

**BME 568 Medical Imaging.** (3) N

CT, SPECT, PET, and MRI. 3-dimensional *in vivo* measurements. Instrument design, physiological modeling, clinical protocols, reconstruction algorithms, and quantitation issues. Prerequisite: instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Biology

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### REGENTS' PROFESSORS

ALCOCK, MARKOW

### PROFESSORS

CAPCO, CHANDLER, CHURCH, COLLINS, FAETH,  
 FISHER, HAZEL, HEDRICK, LAWSON, MAIENSCHIN,  
 McGAUGHEY, MINCKLEY, MOORE, OHMART, RISSING,  
 RUTOWSKI, SATTERLIE, A. SMITH, WALSBURG

### ASSOCIATE PROFESSORS

CARROLL, DEVICHE, DOWLING, ELSER, FOUQUETTE,  
 GOLDSTEIN, GRIMM, HARRISON, G. SMITH

### ASSISTANT PROFESSORS

DENARDO, FAGAN, FEWELL, KINZIG, KUMAR, NEWFELD,  
 ORCHINIK, RAWLS, STRICK

### RESEARCH PROFESSOR

PEARSON

### RESEARCH ASSOCIATE PROFESSOR

DAVIDSON

### RESEARCH ASSISTANT PROFESSOR

WILSON-RAWLS

### ACADEMIC PROFESSIONAL

DOUGLAS

The faculty in the Department of Biology offer programs leading to the M.S. and Ph.D. degrees in Biology. A concentration in ecology is available, among other areas of study.

The faculty collaborate with the Departments of Microbiology and Plant Biology in offering the program leading to the Master of Natural Science degree when one of the concentrations is biology (see "Master of Natural Science," page 257).

Students admitted to the Master of Education degree program with a major in Secondary Education may also elect biology as the subject matter field.

These programs are designed to prepare students for careers in teaching and research in educational, medical, industrial, and governmental institutions.

**Graduate Record Examination.** Submission of scores on the verbal, quantitative, analytical, and advanced sections of the Graduate Record Examination is required for admission to the M.S. and Ph.D. degree programs.

**Application Deadline.** Completed college and departmental application materials should be received by December 15 for admission in the fall semester.

### MASTER OF SCIENCE

The program of each student is prepared in consultation with the supervisory committee, consisting of a major professor and two additional faculty members. A minimum of

30 semester hours is required. The program must include six hours of thesis, one hour of seminar, and may include a maximum of eight additional hours in various special graduate courses such as research and reading and conference. A final oral examination covering the thesis and related subject matter is administered by the supervisory committee.

### DOCTOR OF PHILOSOPHY

The Ph.D. program in the Department of Biology allows the student to acquire high research competency in one or more specialized areas while receiving a broad, solid grounding in biological sciences.

See "Doctor of Philosophy," page 101, for general requirements.

**Program of Study.** The program of study is planned by the student and the supervisory committee, consisting of a major professor and four additional faculty members. The program is tailored to the needs of the individual student.

**Foreign Language Requirements.** None are required by the department. However, each student's supervisory committee may specify a reading proficiency in one or more foreign languages if appropriate to the student's educational objectives.

**Comprehensive Examinations.** The comprehensive examination consists of a written and oral component. To advance to candidacy for the Ph.D., the student must successfully complete three graduate seminars in areas different from the major area of emphasis; one of these must be a two-semester-hour writing seminar completed by the end of the third semester (see topics outlines under "Research Activity"). The seminars include evaluation of synthetic writing skills. A synthetic, detailed research proposal must be completed by the fourth semester. The student must defend the proposal orally to the supervisory committee within three weeks after successful completion of the written research proposal.

**Dissertation Requirements.** A dissertation based on original research is required. (See "Doctoral Dissertations," page 100.)

**Final Examinations.** A final defense of the dissertation is required (see "Open Dissertation Defenses," page 100). The defense consists of a public seminar followed by an oral examination administered by the student's supervisory committee.

### RESEARCH ACTIVITY

Research of faculty and graduate students includes a wide range of biological topics. Current research interests within the department include:

*Cell and Molecular Biology.* Protein synthesis; cytoskeleton assembly; localization of RNA in oocytes and embryos; regulation of exocytosis and endocytosis; cell division; cell-cell interaction; electron microscopy; recombinant DNA; gene mapping; analysis of cloned developmentally regulated genes; regulation of gene expression in eukaryotes; mechanisms of interferon action.

*Developmental Biology.* Cell and organ differentiation; regulation; development of synapses; developmental genetics; control of oogenesis; in vitro fertilization.

**Genetics.** Molecular and developmental genetics; genetic regulatory mechanisms of cellular differentiation; chromosomal ultrastructure and function; behavioral genetics; variation in natural populations; human population genetics; molecular evolutionary genetics.

**Physiology.** Membrane metabolism and function, thermal adaptation, regulation, and ion transport; tissue, epithelial, and cuticular function; comparative endocrinology; neurophysiology; environmental physiology especially related to desert adaptations.

**Evolution.** Population genetics, molecular evolution, systematics, speciation, evolution of behavior, morphological diversification.

**Behavior.** Reproductive behavior; sexual selection; communication; neural and hormonal mechanisms of behavior; behavioral ecology; behavioral genetics.

**Ecology.** Life histories, dispersal, and foraging; plant-animal interactions; community structure; biogeography; physiological ecology; ecosystems structure and functioning; wildlife fisheries management. Research in terrestrial and aquatic desert habitats reflects the unique location of ASU.

**History and Philosophy of Biology.** The nature of biological science and the way science changes; who does biology and why; what assumptions do biologists make and how they influence the research done; questions about funding, institutions, and the social context for biology.

**Biology Education.** Student reasoning patterns and alternative conceptual frameworks; the nature of scientific reasoning; learning styles, instructional techniques, and issues in curriculum development.

**Facilities.** The modern Life Science Center houses well-equipped research laboratories and teaching facilities. The W. M. Keck Bioimaging Laboratory includes a laser-equipped scanning confocal microscope and an LFO high resolution scanning electronic microscope. The Life Sciences Electron Microscopy Laboratory includes both scanning and transmission electron microscopes as well as a freeze-fracture unit. Housing of laboratory animals and maintenance of breeding colonies are provided by the Animal Research Center. Arizona fauna is well represented in departmental collections. Desert, montane, riparian, and lacustrine habitats are within driving distance; species diversity is high.

## BIOLOGY (BIO)

- BIO 406 Computer Applications in Biology.** (3) F  
Computer analysis techniques in biology emphasizing data entry, management and analysis, and graphic portrayal. Employs mainframe and microcomputers. 2 hours lecture, 3 hours lab. Cross-listed as PLB 432. Credit is allowed for only BIO 406 or PLB 432. Prerequisites: BIO 182 and MAT 117 (or 210) or instructor approval. *General Studies: N3.*
- BIO 410 Techniques in Wildlife Conservation Biology.** (3) F  
Field and analytical techniques used in evaluating population structure, viability and environmental impacts. Lecture, lab. Prerequisites: BIO 317 and 320 or instructor approval. *General Studies: L2.*
- BIO 411 Advanced Conservation Biology I.** (3) F  
Principles of conservation science; biology of threatened species; management principles that meet conservation goals; emphasizing North American ecosystems. Prerequisites: BIO 317, 320.
- BIO 412 Advanced Conservation Biology II.** (3) F  
Global biodiversity patterns, processes and conservation; global environmental change; sustainable use of natural resources; emphasizing international approaches to conservation biology. Prerequisites: BIO 317, 320.

- BIO 415 Biometry.** (4) F  
Statistical methods applied to biological problems, design of experiments, estimation, significance, analysis of variance, regression, correlation, chi square, and bioassay; the use of computers. Does not satisfy laboratory requirements for the liberal arts general studies program. 3 hours lecture, 3 hours lab. Prerequisite: MAT 210 or equivalent. *General Studies: N2.*
- BIO 416 Professional Values in Science.** (2–3) A  
Considers issues related to values in science such as collaboration, finances, legal issues, media, mentoring, ownership of ideas, scientific integrity. Discussion, student projects. Cross-listed as HPS 410. Credit is allowed for only BIO 416 or HPS 410. *General Studies: L2.*
- BIO 423 Population and Community Ecology.** (3) N  
Organization and dynamics of population and communities, emphasizing animals. Theoretical and empirical approaches. Prerequisite: BIO 320 or instructor approval.
- BIO 425 Animal Ecology.** (3) N  
Physiological and behavioral adaptations of individual animals to both abiotic and biotic environments. Prerequisite: BIO 320.
- BIO 426 Limnology.** (4) S  
Structure and function of aquatic ecosystems, with emphasis on freshwater lakes and streams. 3 hours lecture, 3 hours lab or field trip. Prerequisite: BIO 320 or instructor approval. *General Studies: L2.*
- BIO 428 Biogeography.** (3) F  
Environmental and historical processes determining distributional patterns of animals and plants, emphasizing terrestrial life. Prerequisites: BIO 182 (or equivalent); junior standing. *General Studies: L2.*
- BIO 435 Research Techniques in Animal Behavior.** (3) N  
Experimental and field studies of animal behavior; description and quantification of animal behavior and interpretation of behavior within an evolutionary framework. 1 hour lecture, 6 hours lab. Prerequisite: BIO 331. *General Studies: L2.*
- BIO 441 Cytogenetics.** (3) F  
Chromosomal basis of inheritance. Cross-listed as PLB 412. Credit is allowed for only BIO 441 or PLB 412. Prerequisite: BIO 340.
- BIO 442 Cytogenetics Laboratory.** (2) F  
Microscopic analysis of meiosis, mitosis, and aberrant cell division. 6 hours lab. Cross-listed as PLB 413. Credit is allowed for only BIO 442 or PLB 413. Pre- or corequisite: BIO 441 or PLB 412.
- BIO 445 Organic Evolution.** (3) F  
Processes of adaptive change and speciation in sexual populations. Prerequisite: BIO 241 or 340.
- BIO 446 Principles of Human Genetics.** (3) A  
Genetics in human populations, including medical aspects. Prerequisite: BIO 340. *General Studies: L2.*
- BIO 450 Advanced Developmental Biology.** (3) S  
Current concepts and experimental methods involving differentiation and biosynthetic activities of cells and organisms, with examples from microorganisms, plants, and animals. Prerequisite: BIO 351.
- BIO 453 Animal Histology.** (4) S  
Microscopic study of animal tissues. 3 hours lecture, 3 hours lab. Prerequisite: BIO 182 or instructor approval.
- BIO 454 Aquatic Insects.** (3) N  
Systematics and ecology of aquatic insects. Prerequisite: BIO 386.
- BIO 464 Photobiology.** (3) F 2000  
Principles underlying the effects of light on growth, development, and behavior of plants, animals, and microorganisms. Cross-listed as PLB 440. Credit is allowed for only BIO 464 or PLB 440. Prerequisites: CHM 231 (or 331); 12 hours of courses in life sciences.
- BIO 465 Neurophysiology.** (3) S  
Detailed treatment of cellular and organismal neurophysiology and nervous system function. Prerequisite: BIO 360.
- BIO 466 Neurophysiology Laboratory.** (2) S  
Intracellular and extracellular electrophysiological recording techniques, histological preparations, and dye-filling techniques. 6 hours lab. Pre- or corequisite: BIO 465.
- BIO 470 Systematic Zoology.** (4) S 2001  
Philosophy, theory, practice of interpreting animal diversity, including species concepts speciation, nomenclature, and evolutionary and phylogenetic classification emphasizing phylogenetics. 3 hours lecture, 3 hours lab. Prerequisites: junior standing; 18 hours in life sciences. *General Studies: L2.*
- BIO 471 Ornithology.** (3) S  
The biology of birds. 2 hours lecture, 3 hours lab, weekend field trips. Prerequisite: BIO 370 or instructor approval.

**BIO 472 Mammalogy.** (4) F 2000

Classification, structure, habits, ecology, and distribution of mammals, emphasizing North American forms. 3 hours lecture, 3 hours lab or field trip, weekend field trips. Prerequisite: BIO 370 or instructor approval.

**BIO 473 Ichthyology.** (3) S 2001

Systematics and biology of recent and extinct fishes. 2 hours lecture, 3 hours lab or field trip, weekend field trips required. Prerequisites: BIO 370 and 425 or instructor approval.

**BIO 474 Herpetology.** (3) S 2000

Systematics and biology of recent and extinct reptiles and amphibians. 2 hours lecture, 3 hours lab or field trip. Prerequisite: BIO 370.

**BIO 480 Methods of Teaching Biology.** (3) S

Methods of instruction, experimentation, organization, and presentation of appropriate content in biology. Prerequisite: 20 hours in the biological sciences.

**BIO 495 Undergraduate Thesis.** (3) F, S, SS

Guided research culminating in the preparation of an undergraduate thesis based on supervised research done in this and previous semesters. Prerequisites: at least 3 hours of BIO 310 (or 499); formal conference with instructor; instructor and department chair approval.

**BIO 502 Transmission Electron Microscopy.** (3) F

Theory, use, and methods of preparing biological materials for transmission electron microscopy. Materials fee. Lecture, lab. Prerequisite: instructor approval.

**BIO 505 Scanning Electron Microscopy.** (3) S

Theory, use, and methods of preparing biological materials for scanning electron microscopy. Materials fee. 2 hours lecture, 3 hours lab. Prerequisite: instructor approval.

**BIO 508 Scientific Data Presentation.** (2) S

Techniques necessary for presentation of scientific data used in journal publications, grant proposals, and visual presentations. Lecture, lab. Prerequisite: instructor approval.

**BIO 520 Biology of the Desert.** (2) N

Factors affecting plant and animal life in the desert regions and adaptations of the organisms to these factors. Prerequisite: 10 hours of biological sciences or instructor approval.

**BIO 522 Populations: Evolutionary Ecology.** (3) S

Principles of population biology and community ecology within an evolutionary framework. 2 hours lecture, 2 hours recitation. Prerequisites: BIO 320, 415 (or MAT 210), 545.

**BIO 524 Ecosystems.** (3) F 1999

Structure and function of terrestrial and aquatic ecosystems, with emphasis on productivity, energetics, biogeochemical cycling, and systems integration. Prerequisite: BIO 320 or equivalent.

**BIO 526 Quantitative Ecology.** (3) N

Sampling strategies, spatial pattern analysis, species diversity, classification, and applications of multivariate techniques to ecology. 2 hours lecture, 3 hours lab. Prerequisites: BIO 415 (or equivalent); a course in ecology.

**BIO 529 Advanced Limnology.** (3) N

Recent literature, developments, methods, and limnological theory; field and lab application to some particular topic in limnology. Prerequisite: BIO 426.

**BIO 543 Molecular Genetics.** (3) F

Nature and function of the gene; emphasis on the molecular basis of inheritance and gene expression in prokaryotes and eucaryotes. Prerequisites: BIO 340; a course in organic chemistry.

**BIO 545 Populations: Evolutionary Genetics.** (3) F

Mathematical models in the description and analysis of the genetics of populations. Prerequisites: BIO 320 and 415 and 445 or instructor approval.

**BIO 547 Techniques in Evolutionary Genetics.** (4) S

Practical experience in modern techniques for the study of evolution. Lecture, lab. Prerequisites: BIO 340, 445; instructor approval.

**BIO 550 Advanced Cell Biology.** (3) S

Applications of contemporary electron microscopic and biochemical/molecular techniques for studying eukaryotic cell functions. Mechanisms of intracellular protein trafficking. Prerequisites: BIO 353 (or 360 or equivalent or PLB 360); CHM 231 (or 331 or equivalent).

**BIO 551 Biomembranes.** (3) N

Structure and function of biological membranes, emphasizing synthesis, fluidity, exocytosis, endocytosis, and cell responses to hormones and neurotransmitters. Prerequisites: BIO 353 (or equivalent); CHM 231 (or 331 or equivalent).

**BIO 552 Developmental Genetics.** (3) S 2000

Genetic approaches to the analysis of development during the life cycle of eukaryotic organisms, and the role of genes in the unfolding of the differentiated phenotype. Prerequisite: BIO 340.

**BIO 560 Comparative Physiology.** (3) N

The analysis of function in invertebrates and vertebrates, emphasizing evolutionary trends in physiological systems. Prerequisite: BIO 360 or equivalent.

**BIO 566 Environmental Physiology.** (3) N

Physiological responses and adaptations of animals to various aspects of the physical environment. Prerequisites: BIO 320, 360.

**BIO 568 Mammalian Physiology.** (3) N

Detailed treatment of mammalian organ system functions emphasizing integrative mechanisms. Prerequisite: BIO 360 or equivalent.

**BIO 569 Cellular Physiology.** (3) N

Emphasizing the molecular basis for cell structure and function. Prerequisites: BIO 360; organic chemistry.

**BIO 584 Internship.** (1–12) F, S**BIO 591 Seminar.** (1–3) F, S

Topics such as the following are offered:

- (a) Adaptations
- (b) Behavior
- (c) Cell Biology
- (d) Ecology
- (e) Evolution
- (f) Genetic Engineering
- (g) Genetics
- (h) Physiology

May be repeated for credit.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Building Design

**Ron McCoy**

*Director*

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[www.asu.edu/caed/Architecture/degrees\\_admissions/degrees\\_admissions\\_main.html](http://www.asu.edu/caed/Architecture/degrees_admissions/degrees_admissions_main.html)

### REGENTS' PROFESSOR

COOK

### PROFESSORS

BOYLE, McCOY, MEUNIER, RAPP,

SCHEATZLE, UNDERHILL

### ASSOCIATE PROFESSORS

HARTMAN, KROLOFF, KUPPER, LOOPE, McINTOSH,

OZEL, SHEYDAYI, UNDERWOOD, ZYGAS

### ASSISTANT PROFESSORS

ELLIN, HAHN, MURFF, PETRUCCI, SOROKA, VAN DUZER

### RESEARCH PROFESSOR

JONES

The faculty in the School of Architecture offer a graduate program leading to the M.S. degree in Building Design. Concentrations are available in computer-aided design, energy performance and climate-responsive architecture, and facilities development and management. The program provides advanced study at the postprofessional level for architects, and at the specialist level for nonarchitects who have a degree in a related area such as engineering, business, computer science, and the physical and environmental

sciences. The purpose of the program is the development of knowledge useful to the arts and sciences of building design and the integration of that knowledge in the design process. Within this context, the program emphasizes (1) the ecological importance of energy-conscious design and construction, as well as the high social value placed on buildings in which natural forces and systems are utilized rather than suppressed, and (2) the development of research, information systems and management processes suited to the planning and design of complex buildings in urban settings.

The faculty in the school also participate in offering the Ph.D. in Environmental Design and Planning. See "Environmental Design and Planning," page 192, for information on the Ph.D. degree program.

**MASTER OF SCIENCE**

**Admission Requirements**

Applicants considered for admission to the program must hold a baccalaureate or graduate degree from a college or university recognized by ASU and meet the minimum GPA and requirements for admission established by the Graduate College.

It is preferred that applicants have at least one year of professional employment or comparable field/research experience in building design in addition to their academic experiences. Applicants are accepted on a space-availability basis, and must specify an area of research concentration upon application. International applicants whose native language is not English must submit a Test of English as a Foreign Language score of 550 or higher. International students should write the Graduate Admissions Office at least one year prior to the date they plan to begin study.

**Application Procedures.** Applicants must submit separate application materials to the Graduate College and the School of Architecture.

**Application Deadline.** Priority consideration is given to completed applications received on or before February 15. All fellowships and scholarship allocations for entering students are normally made from applicants in this group. Applications for admission received after February 15 can be considered only for remaining vacancies and "alternate" placement.

**School of Architecture.** In addition to the Graduate College admission requirements, applicants must file all of the following admission materials with

GRADUATE SECRETARY,  
 MASTER OF SCIENCE IN BUILDING DESIGN  
 SCHOOL OF ARCHITECTURE  
 ARIZONA STATE UNIVERSITY  
 TEMPE, AZ 85287-1605

Applicants are encouraged to contact the graduate secretary to ascertain that all materials have been received, at 480/965-2507.

*Statement of Intent.* A personal narrative (maximum 600 words or two pages typed) indicating the applicant's interest, previous academic and practical background, and personal and professional educational objectives must be submitted.

*Letters of Recommendation.* A minimum of three letters of recommendation in support of the applicant must be mailed

directly to the Graduate Admissions Committee, School of Architecture. The references should be from professionals or educators familiar with the applicant's experience and capability for graduate work.

*Portfolio.* Applicants must submit a folio documenting projects, papers, creative endeavors, and, if appropriate, work experience (maximum size 9" x 12").

The portfolio is returned after final admission procedures, *provided* the applicant encloses a self-addressed return mailer with sufficient prepaid postage, or if the applicant appears in person to claim the materials within one year of submission. Unclaimed portfolios are retained for only one year. The School of Architecture assumes no liability for lost or damaged materials. Students must have their name clearly visible on all parts of application, portfolio, statement of intent, etc.

*Research/Teaching Statement.* Students wishing to be considered for teaching or research assistantships should include an additional statement outlining areas in which they feel competent to serve as a teaching or research assistant. International students who wish to be considered for a teaching assistantship and whose native language is not English are required to pass the Test of Spoken English administered by the American English and Culture Program at ASU.

**Program of Study.** The program requires a minimum of 30 semester hours of approved course work at the advanced level, including six hours of thesis credit.

The M.S. degree in Building Design is based on concepts of research and decision-making emphasized by the College of Architecture and Environmental Design.

Students admitted to the program are required to take a research methods core, certain courses in their area of concentration, additional elective course work as approved and directed by the supervisory committee, and write and defend a thesis. While the minimum requirement is 30 semester hours, most students require at least four semesters of course work and work on their thesis to successfully complete this degree program.

The concentrations include the following: computer-aided design, energy performance and climate-responsive architecture, and facilities development and management.

**Computer-Aided Design Concentration**

Research/Thesis.....	12
Area of concentration requirements .....	12
Approved electives .....	6
Minimum total.....	30

The *computer-aided design* concentration features investigations of computer-aided design methods and techniques and their application to problem-solving issues in the built environment. The goal of the program is to provide a fundamental understanding of computer-aided design methods and to explore critically the application and potential of these techniques in practice. Topics studied include computer graphics, geometric modeling, design databases, interactive graphic environments for design, comprehensive computer-aided design systems, databases for facilities planning, and computer applications in urban design and building construction. The computer-aided design requirements (12 semester hours) consist of ANP 590 RC: Computer Programming in Architecture, ANP 561 Architectural

Information Systems, ANP 530 Computer Graphics in Architecture, and ANP 598 ST: Computer-Aided Design Methods.

**Energy Performance and Climate-Responsive Architecture Concentration**

Research/Thesis .....	10
Area of concentration requirements.....	15
Approved electives.....	5
Minimum total .....	30

The energy performance and climate-responsive architecture concentration is concerned with the relationships among climate and site, thermal and visual comfort, and energy demand and consumption. Courses in this concentration establish a basic core of knowledge on the principles of the natural energies available at the building boundary due to climate and site; thermal and optical behavior of building materials and components; passive and low-energy architectural systems for heating, cooling, and lighting; and appropriate integration with mechanical systems. Additional courses are available to support advanced study and research in a variety of related specialties.

Examples of the areas of advanced study that are available are climate-responsive architecture and analysis of building energy performance. In climate-responsive architecture, a student applies the principles of "bioclimatic" building design in a studio setting to maximize the use of renewable energy resources in particular locations and building programs. In analysis of building energy performance, a student applies physical and economic analysis, computer simulation, and/or measurement as tools in determining component or whole-building performance relative to energy, climate, and cost-efficiency. The student is concerned with climate responsive, low-energy building design through resource-efficient building concepts, materials, components, and systems such as daylighting, passive solar heating, passive cooling, and earth sheltering.

Most students address these problems with an emphasis on either a design-oriented approach in a studio setting or with an emphasis on an analysis-oriented approach through the application of the most current building energy simulation and analysis tools. Some students want to combine these approaches in their thesis problem. The energy performance and climate responsive architecture requirements include ATE 511 Energy Environmental Theory, ATE 521 Building Environmental Science, ATE 582 Environmental Control Systems, ATE 550 Passive Cooling and Heating I, and ATE 551 Passive Cooling and Heating II.

**Facilities, Development, and Management Concentration**

Research/Thesis .....	12
Area of concentration requirements .....	6
Approved electives .....	12
Minimum total .....	30

The *facilities development and management* concentration is concerned with the decision-making processes in building development and design firm management. The goal of the program is the advancement of knowledge about the interactions between design and managerial processes. This concentration addresses the following topics: spatial decision models, building development processes and financing, market structure and strategy, pricing and cost

control, design automation and group decision-making, architectural programming and post-occupancy evaluation, and professional ethics. The program benefits from ties to various professional groups and other academic units concerned with business and facilities management. The facilities development and management requirements (six semester hours) consist of AAD 552 Architectural Management II and AAD 555 Architect as Developer.

**Foreign Language Requirements.** None.

**Thesis Requirements.** A thesis is required. Each candidate devotes research effort of six semester hours of thesis/research credit in preparation of a thesis. The thesis must conform to School policies and meet Graduate College format requirements.

**Final Examinations.** A final oral examination in defense of the thesis is required.

**RESEARCH ACTIVITY**

Faculty and students in the graduate programs of the School of Architecture may be involved in the following areas of research: solar architecture design, energy performance in buildings, computer-aided design and graphics, facilities development and management, environments for aging, housing, urban design, building technology, environmental analysis and programming, passive cooling and heating, ecotechniques, arid region building and systems design, and architectural history.

The College of Architecture and Environmental Design maintains 1,500-square feet of rooftop testing laboratory for solar research.

The college's Research and Service Foundation provides facilities for basic research and community service activities in energy technology, design, and planning.

**BUILDING DESIGN COURSES**

*For courses supporting the Building Design major, see courses in "Architecture," beginning on page 115.*

**Business Administration**

The faculty in the College of Business offer a Ph.D. degree in Business Administration, a Master of Business Administration (M.B.A.) degree, and an M.B.A. for Executives program.

Other professional master's degrees offered through the College of Business are described in this catalog under their respective degree program headings.

**MASTER OF BUSINESS ADMINISTRATION**

The central theme of the program is to build and strengthen capabilities in knowledge and analysis of the functional areas of business, basic skills, and managerial abilities. Knowledge involves textbook and case materials. Basic skills include computing, writing and critical thinking, presentation and speaking, team and group work, interpersonal relations, and time management. There is a strong team emphasis throughout the ASU curriculum.

The M.B.A. program is supported by each of the eight academic units within the College of Business.

**Admission.** See “Admission to the Graduate College,” page 89. All students applying to graduate business administration programs (except those applying to the M.S. degree in Economics) are required to take the GMAT. The TOEFL is required of all international applicants whose native language is not English or who are not graduates of an institution located in the United States. These applicants are also required to submit scores from the TSE. For more information on testing, call 609/771-7330 or write

EDUCATIONAL TESTING SERVICE  
PO BOX CN 6103  
PRINCETON NJ 08541-6103

Students applying to the M.B.A. program are required to have at least two years of full-time work experience and to submit a statement of personal objectives for the degree program addressing commitment, goals, qualifications, and reasons for interest in the program. Applicants are to provide letters of recommendation commenting on the student’s motivation, commitment, achievements, work experience, and opportunity for success in the program. In addition to the above data, students are to communicate their interest for either the day, evening, or executive program.

**Registration.** Registration in courses numbered 502 and above is limited to students who have been admitted to a graduate degree program, have the approval of the M.B.A. program office, and have the prerequisites of calculus and computer literacy.

**Structure of the M.B.A. Program.** M.B.A. courses are open only to students admitted to the M.B.A. program.

**Program Requirements.** Before beginning the M.B.A. program, students must have demonstrated computer proficiency in the use of a spreadsheet package and word processing package and must demonstrate strong quantitative ability. Completion of advanced courses in mathematics (e.g., calculus) or statistics or an above average performance on the quantitative section of the GMAT is also required. The program consists of a minimum of 48 hours and is to be completed in two years. Students are admitted to the fall semester only and, generally, enter and graduate as a class.

The core courses are designed to provide a foundation in business knowledge and skills and must be taken in the prescribed sequence.

Elective courses build upon the business core and focus on the further development of an area of study.

The College of Business does not accept credits earned while students are in nondegree status; moreover, graduate business courses are not open to nondegree students.

**Foreign Language Requirements.** None.

**Thesis Requirements.** None.

**Comprehensive Examinations.** All students must successfully complete the comprehensive requirement established by the College of Business and Graduate College for the M.B.A. degree. The comprehensive exam is integrated with MGT 589 Strategic Management. Students passing this course with a grade of “A” or “B” satisfy the comprehensive exam requirement.

**Dual/Concurrent Degree Programs.** See “Dual/Concurrent Degree Programs,” page 78.

## DOCTOR OF PHILOSOPHY

The Ph.D. degree in Business Administration prepares candidates for scholarly careers at leading educational institutions and for positions in business and government organizations where advanced research and analytical capabilities are required. Major emphasis is placed upon the development of expertise in a chosen subject area, a disciplined and inquiring mind, competence in research methodology, and skill in effectively communicating advanced business concepts.

Students are encouraged to work closely with the faculty from the beginning of their programs. A ratio of resident doctoral students to faculty of less than one to one ensures that faculty may serve effectively as mentors for doctoral students.

**Admission.** A completed application for admission to the Ph.D. in Business Administration degree program includes

1. application for admission to the Graduate College,
2. undergraduate and postgraduate transcripts,
3. Graduate Management Admission Test score or scores from the Graduate Record Examination,
4. applicant’s letter of personal career objectives and rationale for pursuing the Ph.D. program,
5. three letters of recommendation,
6. Test of Spoken English score for applicants whose native language is not English, and
7. Test of English as a Foreign Language score for applicants whose native language is not English and who have not completed a degree from a U.S. college or university.

Admission is granted for fall semesters only. The deadline for receipt of all required application materials is February 1.

**Areas of Concentration.** The Ph.D. student may choose from among seven areas of concentration: accountancy, finance, health services research, information management, management, marketing, and supply chain management. The accountancy specialization area includes financial accounting, managerial accounting, tax policy, auditing, and information systems. Research activities in information management encompass areas of theory and application in computer information systems. Research interests of the finance faculty offering the finance concentration focus on corporate finance, investments, financial markets, and banking. Health services research focuses on organization, delivery and financing of health services, and on the relationships of structures and processes of health services to outcomes such as quality of care and health status changes. The management concentration requires three core courses: organizational theory, organizational behavior, and research methodology. In addition to these core courses, students choose one of two specialty tracks: strategic management or human resource management. Research conducted by the marketing faculty offering the marketing concentration is focused in several areas: advertising, buyer behavior, distribution channels, services marketing, and other dimensions of marketing, including sales management, industrial

marketing, and public-policy implications of marketing. The supply chain management faculty in the Department of Business Administration offer the supply chain management concentration and are actively involved in the input-conversion-output process.

**Program of Study.** See "Doctor of Philosophy," page 101, for general requirements. The Ph.D. degree program requires mathematical competence through linear algebra and calculus and computer skills. The program of study includes graduate study in economics, behavioral sciences, and quantitative/statistical analysis. The advanced program is composed of an area of concentration and supporting course work that best prepares students for conducting scholarly work in their areas of interest.

**Comprehensive Examinations.** A written comprehensive examination, designed to ascertain the candidate's knowledge and orientation in the major field of study and fitness to proceed to the completion of a dissertation, is required at the end of course work. An additional written comprehensive examination on a candidate's supporting course work is a departmental option. An oral examination after completion of written examinations is also a departmental option.

**Dissertation Requirements.** The candidate must present an acceptable dissertation based on original investigation. The dissertation must represent a significant contribution to knowledge, be written in a scholarly manner, and demonstrate the ability of the candidate to do independent research of high quality.

**Final Examinations.** A final oral examination in defense of the dissertation is required. The examination covers the subject matter of the dissertation and the field most nearly corresponding with that of the dissertation.

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## School of Accountancy and Information Management

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For faculty, research activity, and courses, see "Accountancy and Information Systems," page 103.

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## Department of Economics

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For faculty, research activity, and courses, see "Economics," page 171.

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## Department of Finance

**Herbert M. Kaufman**  
*Chair*  
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 asufin@asu.edu  
 www.cob.asu.edu/fin

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### PROFESSORS

BESSEMBINDER, BOOTH, COLES, JOEHNK, KAUFMAN, POE, SUSHKA

### ASSOCIATE PROFESSORS

CESTA, GALLINGER, HERTZEL, HOFFMEISTER, MARTIN, WILT

### ASSISTANT PROFESSORS

GRIFFIN, LEMMON, PERRY

### LECTURER

OAKES

### RESEARCH ACTIVITY

The Department of Finance has a strong commitment to academic and professional research. This emphasis on quality research, both empirical and theoretical, is evidenced by the many ongoing and recently completed studies in the areas of corporate finance, investments, and banking. Topics of some recent studies that are representative of department published research include: bid-ask spreads in the interbank foreign exchange markets; cross-exchange comparison of execution costs and information flow for New York Stock Exchange (NYSE)-listed stocks; extracting the value of intangible assets from the unit assessment method; the profitability of technical trading rules in the Asian stock markets; intraday bid-ask spread pattern in the stock and option market; on equilibrium pricing under parameter uncertainty; mean reversion in equilibrium asset prices: evidence from the futures term structure; ownership dispersion, costly information, and IPO underpricing; factors determining the number of outside directorships held by CEOs; causality test of short sales on the NYSE; the degree of price resolution and equity trading costs; the valuation impact of common errors in calculating the weighted average cost of capital; why option prices lag stock prices: a trading-based explanation; contract costs, bank loans and the cross-monitoring hypothesis; the intraday relationship between index arbitrage and market volatility; the implications of equity issuance announcements within a parent-subsidiary governance structure; leadership structure: separating the positions of CEO and chairman of the board; an empirical analysis of antitrust legal disputes; empirical examination of information, differences of opinion, and trading activity; causality tests of the real stock return-real activity hypothesis; cost of equity models that meet the needs of the ad-valorem tax analyst; the industry effects of interfirm lawsuits; market discounts and shareholder gains for placing equity privately; quotations, trading costs, and volatility for NYSE and NASDAQ-listed stocks; return autocorrelations around nontrading days; a comparison of the information conveyed by equity carve-outs, spin-offs, and asset sell-offs; is there



news in the prime rate?; seasoned common stock issues following an IPO.

These studies use a number of databases including Compustat, CRSP, Citibank, Extel, DRI and TAQ. The databases are available for research by faculty and students. The studies represent the strong commitment to research and the generation of new knowledge by the Department of Finance, indicative of the department's goal of becoming an outstanding research department.

### FINANCE (FIN)

**FIN 456 International Financial Management.** (3) A  
Exchange rate determination, financial markets, managing multinational corporations, capital budgeting, and hedging currency risk exposure from an international perspective. Prerequisite: professional program business student. Prerequisites with a grade of "C" or higher: ACC 315; FIN 331, 361. *General Studies: G.*

**FIN 502 Managerial Finance.** (3) A  
Theory and practice of financial decision making, including risk analysis, valuation, capital budgeting, cost of capital, and working capital management. Prerequisites: ACC 502; ECN 502; QBA 502.

**FIN 521 Investment Management.** (3) A  
Valuation of equities, fixed incomes, and options/financial futures in an individual security and portfolio context; mathematical asset allocation approaches. Lecture, discussion. Prerequisite: FIN 502.

**FIN 527 Derivative Financial Securities.** (3) A  
Analysis of forwards, futures, and option contracts on bonds, commodities, equities, and foreign exchange. Design of speculative and hedging strategies. Lecture, discussion. Prerequisites: FIN 502, 521.

**FIN 531 Capital Markets and Institutions.** (3) A  
Recent theoretical and operational developments in economic sectors affecting capital markets and institutions. Lecture, discussion. Prerequisite: FIN 502.

**FIN 551 Financial Statement Analysis.** (3) A  
Analysis of corporations' financial statements to ascertain their financial strength and default risk. Emphasis is on studying cash flows. Lecture, cases. Prerequisites: ACC 502; FIN 502.

**FIN 556 International Financial Management.** (3) A  
Behavior of real and nominal currency exchange rates, management of international investment portfolios, corporate exchange exposure, and hedging exchange risk. Lecture, discussion. Prerequisite: FIN 502.

**FIN 561 Financial Management Cases.** (3) A  
Case-oriented course in applications of finance theory to management issues. Acquisition, allocation, and management of funds within the business enterprise. Working capital management, capital budgeting, capital structure, and financial strategy. Lecture, discussion, presentation. Prerequisite: FIN 502.

**FIN 581 Applied Corporate Finance.** (3) A  
Application of theories in corporate finance. Market efficiency, capital structure, "principal-agent" theory, corporate control, dividend policy, and capital budgeting. Prerequisite: FIN 502.

**FIN 781 Theory of Finance.** (3) A  
Fundamental tools of financial economics; asset pricing, arbitrage, option pricing, capital structure, dividend policy, asymmetric information, and transaction-cost economics. Prerequisites: FIN 502, 521, 531.

- FIN 791 Doctoral Seminar in Finance.** (3) A
- Financial Institutions and Markets.  
Economic and monetary theory applied to financial markets and institutions; implications of financial structure for market performance and efficiency. Prerequisite: FIN 781.
  - Financial Management.  
Financial theory pertaining to capital structure, dividend policy, valuation, cost of capital, and capital budgeting. Prerequisite: FIN 781.
  - Investments.  
Investments and market theory; efficient markets hypothesis; option and commodity markets. Prerequisite: FIN 781.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## School of Health Administration and Policy

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For faculty, research activity, and courses, see "Health Services Administration," page 212.

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## Department of Management

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www.cob.asu.edu/mgt

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### PROFESSORS

ASHFORTH, BOHLANDER, CARDY, DOOLEY, GLICK,  
GOMEZ-MEJIA, HERSHAUER, HOM, KINICKI, KIRKWOOD,  
KULIK, PENLEY, REIF, RUCH

### ASSOCIATE PROFESSORS

BOYD, BRENNSTUHL, BROOKS, CALLARMAN,  
CHOI, COOK, KEATS, KEEFER, KELLER, MOORHEAD,  
OLIVAS, OSTROFF, ROBERSON, D. SMITH-DANIELS,  
V. SMITH-DANIELS, VAN HOOK, VERDINI

### ASSISTANT PROFESSORS

BLANCERO, LANE, RUNGTUSANATHAM

### SENIOR LECTURERS

CALCATERRA, DORAN, KREITNER, LEA

### LECTURERS

DAVILA, SACK

## MASTER'S DEGREE PROGRAM

The faculty in the Department of Management participate in offering the High Technology M.B.A., Executive M.B.A., Evening M.B.A., and Day M.B.A. programs. These programs are administered by the College of Business. For more information see "College of Business," page 63. Areas of study offered to High Technology, Evening, and Executive M.B.A. students include: process management in high technology organizations; globalization and diversity management; entrepreneurship and small business development; and management consulting.

## PH.D. DEGREE PROGRAM

The faculty in the department offer students the opportunity to obtain a Ph.D. degree in Business Administration with a concentration in management. The doctoral program places primary emphasis on the development of research competence and emphasizes teaching as a vehicle to academic professionalism. The mission of the program is to provide an environment that is conducive to the development of scholars who are prepared to assume the diverse responsibilities of positions at leading research universities.

The goal is to prepare students for research careers in the academic community.

Doctoral students are encouraged to design an individually meaningful course of study within the larger context of the management field. Opportunities for doing this are available through course work, individual work with faculty members, and independent research and study. Students in the Ph.D. program select a series of Ph.D. course modules within the department and several supporting courses from other departments on campus. Students develop additional focus and expertise through collaboration on major papers with individual faculty members.

The faculty in the Department of Management cover the areas of human resource management, management science, operations management, organizational behavior, organizational theory, and strategic management. The faculty's research and teaching emphasizes high tech management, quality, process and project management, decision analysis, globalization, diversity, small business and entrepreneurship, change management, stress, job loss, organizational identity, corporate governance, and human resource management practices. The faculty has distinguished itself with research and publications in premier journals. The department ranks 12<sup>th</sup> internationally for its rate of publication in premier academic journals. The department also ranks sixth internationally in premier journal articles that impact practice in operations and management science.

Further information, links to courses, current faculty, and updates on the Department of Management areas of study for the M.B.A. programs can be found at the Web site above.

General information on the M.B.A. programs can be found at [www.cob.asu.edu/mba](http://www.cob.asu.edu/mba).

Further information, application procedures, links to current faculty, and updates on the Ph.D. program in Business with a concentration in management can be found at [www.cob.asu.edu/mgt/degree/PhDMainPg.htm](http://www.cob.asu.edu/mgt/degree/PhDMainPg.htm).

## MANAGEMENT (MGT)

### **MGT 413 Compensation Management.** (3) F, S

Establishing base and incentive pay with job analysis, job evaluation, and wage surveys; performance appraisal; conformance to compensation laws. Prerequisites: MGT 311; professional program business student.

### **MGT 422 Training and Development.** (3) F, S

Learning theory, orientation and basic level training, management development, resource materials and methods. Prerequisites: MGT 311; professional program business student.

### **MGT 423 Employee-Management Relations.** (3) F, S

Employment relationship in union/nonunion setting. Employee-management rights/responsibilities, complaint administration, negotiations, union structure, and mock government negotiations.

### **MGT 424 Employee Selection and Appraisal.** (3) F, S

Concepts and methods of personnel selection and performance appraisal. Includes job analysis, measurement, and legal issues. Experiential exercises emphasized. Prerequisite: MGT 311.

### **MGT 433 Management Decision Analysis.** (3) F, S

Decision-making concepts and methods in the private and public sectors and their application to organizational problems. Understanding of individual and group decision making. Prerequisites: MGT 301; professional program business student.

**MGT 434 Social Responsibility of Management.** (3) F, S, SS  
Relationship of business to the social system and its environment. Criteria for appraising management decisions. Managers as change agents. Prerequisites: MGT 301; professional program business student.

**MGT 440 Small Business and Entrepreneurship.** (3) F, S, SS  
Opportunities, risks, and problems associated with small business development and operation.

### **MGT 441 Venture Design and Development.** (3) N

Analysis, design, and development of a business plan for a new venture. Prerequisite: ACC 240.

### **MGT 442 Small Business Management.** (3) N

Students, acting as management consultants, apply business principles and make recommendations to small businesses while learning to manage small firms. Prerequisite: business core except MGT 463.

### **MGT 445 Business Plan Development.** (3) F, S

Develops a complete strategic business plan emphasizing the planning process undertaken by successful small business owners and entrepreneurs. Lecture, experiential exercise.

### **MGT 459 International Management.** (3) F, S, SS

Concepts and practices of multinational and foreign firms. Objectives, strategies, policies, and organizational structures for operating in various environments. Prerequisite: MGT 301.

### **MGT 463 Strategic Management.** (3) F, S, SS

Strategic formulation and administration of the total organization, including integrative analysis and strategic planning. To be taken last semester of senior year. Prerequisites: completion of 108 hours, including all other business administration core requirements; professional program business student. *General Studies: L2.*

### **MGT 468 Management Systems.** (3) F, S

Systems theory and practice applied to organization process and research. Organizations seen as open systems interacting with changing environments. Prerequisite: MGT 301.

### **MGT 480 Team Management Skills.** (3) F, S

A cooperative education class teaching team skills in active listening, conflict resolution, decision making, effective meetings, norming, and team roles. Cooperative learning.

### **MGT 494 ST: Special Topics.** (3) N

Current topics in management, primarily designed for business majors. See the *Schedule of Classes* for current offerings. Some of the following may be offered:

- (a) International Management
- (b) Small Business Planning

(c) Total Quality Management and Human Resource Management  
Note that students may not get credit for both Small Business Planning and MGT 445 Business Plan Development.

### **MGT 502 Organization Theory and Behavior.** (3) A

Important concepts and applications in management, including communication, decision making, group dynamics, leadership, motivation, organization change, and organization design. Prerequisites: computer literacy; graduate degree program student.

### **MGT 589 Strategic Management.** (3) F, S

Formulation of strategy and policy in the organization, emphasizing the integration of decisions in the functional areas. Prerequisite: completion or concurrent enrollment in all other core courses in the M.B.A. program.

### **MGT 591 Seminar.** (3) N

Topics such as the following are offered:

- (a) Business Plan Competition
- (b) Entrepreneurship
- (c) Human Resource Activity and the Management of Diversity
- (d) International Management
- (e) Management Consulting
- (f) Organizational Change and Business Process Consulting

### **MGT 593 Applied Projects.** (3) A

Cross-functional teams initiate (possibly implement) organizational change within a local firm. Lecture, discussion, experiential learning. Prerequisite: completion or concurrent enrollment in all core courses in the M.B.A. program.

### **MGT 598 ST: Special Topics.** (3) N

Graduate special topics chosen from human resources, strategic management, and international management including special topics in international management in Asia or Europe. Prerequisite: instructor approval.

**MGT 791 Seminar: Doctoral Seminar in Management.** (1) A

Short module seminars such as:

- (a) Causal Modeling
- (b) Change and Coping
- (c) Cognition: Micro and Macro Perspectives
- (d) Economic Theories of the Firm
- (e) Motivation and Attitudes
- (f) Organizational Identity and Identification
- (g) Organizational Learning and Organizational Identity
- (h) Organizational Performance and Reward Systems
- (i) Organizational Strategy and Culture
- (j) Organizational Structure, Technology, and Information Systems
- (k) Organizational Withdrawal
- (l) Performance Appraisal
- (m) Power and Organizational Change
- (n) Selection
- (o) Teams, Groups, and Leadership
- (p) The Craft of Research

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**OPERATIONS AND PRODUCTION MANAGEMENT (OPM)****OPM 502 Operations Management.** (3) A

Contemporary management issues, including environmental, project, and supply chain management; new product development; quality control; TQM. Prerequisites: computer literacy; graduate degree program student.

**OPM 540 Quality and Productivity Management.** (3) N

Organizational factors influencing quality and productivity in the production of goods and services. Quality and productivity strategies, improvement programs, and measurement systems. Prerequisite: OPM 502 or instructor approval.

**OPM 582 Capacity Management and Scheduling.** (3) A

Decisions regarding management of technology for manufacturing and service firms. Facilities location, layout, process design and selection, and manufacturing strategy. Prerequisite: QBA 561 or instructor approval.

**OPM 585 Facilities Design and Management of Technology.** (3) A

Decisions regarding management of facilities and technology for manufacturing and service firms. Facilities location, layout, process design, and selection. Prerequisite: QBA 561.

**OPM 587 Project Management.** (3) A

Planning, scheduling and controlling of projects in R & D, manufacturing, construction and services. Project selection, financial considerations, and resource management. Prerequisite: QBA 502.

**OPM 591 Seminar.** (3) A

Topics such as the following offered:

- (a) High Performance Management Systems
- (b) Manufacturing Strategy
- (c) New Product and Process Development

**OPM 593 Applied Projects.** (3) A

Cross-functional teams initiate (possibly implement) organizational change within a local firm. Lecture, discussion, experiential learning. Prerequisite: completion or concurrent enrollment in all core courses in the M.B.A. program.

**OPM 791 Doctoral Seminars in Operations and Production Management.** (1) N

Short module seminars such as:

- (a) Management of Technology
- (b) Manufacturing Strategy
- (c) Operations Management
- (d) Project Management

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**QUANTITATIVE BUSINESS ANALYSIS (QBA)****Department of Management****QBA 450 Operations and Process Analysis.** (3) A

Implementation of quantitative techniques for the analysis of quality problems related to operations and process analysis. Prerequisites: OPM 301; QBA 221. *General Studies: L2.*

**QBA 502 Managerial Decision Analysis.** (3) F, S

Fundamentals of quantitative analysis to aid management decision making under uncertainty. Prerequisites: MAT 210; computer literacy; graduate degree program student.

**QBA 505 Management Science.** (3) N

Quantitative approaches to decision making, including linear programming and simulation, with an emphasis on business applications. Prerequisites: MAT 210; QBA 502.

**QBA 550 Intermediate Decision Analysis.** (3) N

Quantitative decision analysis methods for business decision making under uncertainty, including decision diagrams, subjective probabilities, and preference assessment. Prerequisites: MAT 210; QBA 502.

**QBA 552 Statistical Decision Theory.** (3) N

Statistical decision methods for business decision making under uncertainty, including Bayesian inference, optimal statistical decisions, and value of information assessment. Prerequisites: MAT 210; QBA 550.

**QBA 560 Probabilistic Models.** (3) N

Development and application of probabilistic models for quantitative business analysis. Prerequisites: MAT 210; QBA 502.

**QBA 561 Mathematical Programming.** (3) N

Techniques for solving mathematical programming models of business problems. Prerequisites: MAT 210, 242.

**QBA 562 Network Flow Models.** (3) N

Introduction to network structure, applications, and algorithms; development of data structures for network algorithms applied to business problems. Prerequisites: QBA 561 (or MAT 242) and QBA 505.

**QBA 564 Nonlinear Optimization.** (3) N

Basic properties of solutions and algorithms for constrained and unconstrained minimization, basic descent methods, and barrier methods. Prerequisites: QBA 561 (or MAT 242) and QBA 505.

**QBA 591 Seminar.** (3) F, S

Current topics in Quantitative Business Analysis primarily designed for technology, evening, and executive M.B.A. students. Elective courses for these programs may include:

- (a) Decision Models
- (b) Management Problem Solving
- (c) Product and Service Innovation
- (d) Strategic Decision Analysis

**QBA 791 Doctoral Seminars in Quantitative Business Analysis.**

(1) N

The Department of Management has adopted a modular approach to Ph.D. education. Topics such as the following may be offered:

- (a) Chaos Theory
- (b) Risk Analysis
- (c) Strategic Decision Making
- (d) Systems Dynamics

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Department of Marketing

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### PROFESSORS

BITNER, BROWN, HUTT, JACKSON, KUMAR,  
 LASTOVICKA, MOKWA, L. OSTROM, REINGEN,  
 SCHLACTER, WARD

### ASSOCIATE PROFESSORS

BLASKO, SINHA, STEPHENS, WALKER

### ASSISTANT PROFESSORS

NOWLIS, A. OSTROM, ROUNDTREE

## RESEARCH ACTIVITY

The Department of Marketing has a significant research orientation that spans a broad scope of topics, including strategic marketing management, consumer behavior, selling and sales management, advertising, channels management, international marketing, business to business marketing, product development, and services marketing. Many research projects involve faculty and doctoral student collaboration. Some specific projects published recently have focused on evaluation of service encounters, relationship quality in selling, channel responsiveness, salesperson motivation, influence patterns in strategic decision making, consumption symbolism, marketing competencies and organizational performance, social network influences on consumer behavior, innovation in industrial markets, the effects of relationship marketing, and effective cross-functional relationships.

## MARKETING (MKT)

- MKT 411 Sales Management.** (3) N, F, S  
 Application of management concepts to the administration of the sales operation. Prerequisite: MKT 302.
- MKT 412 Promotion Management.** (3) A  
 Integration of the promotional activities of the firm including advertising, personal selling, public relations, and sales promotion. Prerequisite: MKT 302.
- MKT 424 Retail Management.** (3) A  
 Role of retailing in marketing. Problems and functions of retail managers within various retail institutions. Prerequisite: MKT 300.
- MKT 430 Marketing For Service Industries.** (3) A  
 Concepts and strategies for addressing distinctive marketing problems and opportunities in service industries. Current issues and trends in the service sector. Prerequisites: MKT 300, professional program business student.

- MKT 434 Industrial Marketing.** (3) A  
 Strategies for marketing products and services to industrial, commercial, and governmental markets. Changing industry and market structures. Prerequisite: MKT 302 or instructor approval.
- MKT 435 International Marketing.** (3) A  
 Analysis of marketing strategies developed by international firms to enter foreign markets and to adapt to changing international environments. Prerequisites: MKT 302 or instructor approval; professional program business student.
- MKT 451 Marketing Research.** (3) F, S  
 Integrated treatment of methods of market research and analysis of market factors affecting decisions in the organization. Prerequisites with a grade of "C" or higher: MKT 302 and QBA 221.
- MKT 460 Strategic Marketing.** (3) F, S  
 Policy formulation and decision making by the marketing executive. Integration of marketing programs and consideration of contemporary marketing issues. Prerequisite: professional program business student. Prerequisites with a grade of "C" or higher: MKT 302, 304, 451. *General Studies: L2.*
- MKT 494 ST: Special Topics.** (1-4) F, S, SS  
 Chosen from topics in the marketing and international marketing arenas to include seminars in international marketing in Europe and Asia.
- MKT 499 Individualized Instruction.** (1-3) F, S, SS  
 Topics of special interest chosen by students and agreed to by the departments to do independent studies with a professor acting as a guide.
- MKT 502 Marketing Management.** (3) F, S, SS  
 Managing the marketing function; market and environmental analysis; marketing planning, strategy, and control concepts. Development and management of marketing programs. Prerequisite: ECN 502.
- MKT 520 Strategic Perspectives of Buyer Behavior.** (3) N  
 Concepts and theories from the behavioral sciences as they relate to marketing strategy formulation. Prerequisite: MKT 502 or equivalent or instructor approval.
- MKT 522 Marketing Information.** (3) N  
 Marketing research, marketing information systems, and modern statistical techniques in marketing decision making. Prerequisite: MKT 502.
- MKT 524 Services Marketing.** (3) A  
 Strategies for marketing services emphasizing the distinctive challenges and approaches that make marketing of services different from marketing manufactured goods. Prerequisite: MKT 502 or equivalent.
- MKT 563 Marketing Strategy.** (3) N  
 Planning and control concepts and methods for developing and evaluating strategic policy from a marketing perspective. Prerequisite: MKT 502.
- MKT 584 Internship.** (3) F, S, SS
- MKT 591 Seminar.** (3) A  
 Topics such as the following are offered in conjunction with the M.B.A. concentration in services marketing and management (see M.B.A. program section):
- Business-to-Business Marketing
  - Competitive Strategy for Services
  - Consumer Behavior and Market Strategy
  - Customer Satisfaction/Service Quality Measurement
  - International Marketing
  - Marketing in the Information Age
  - New Product and Service Development
- Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Department of Supply Chain Management

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### PROFESSORS

J. CARTER, P. CARTER, GUNTERMANN, HENDRICK,  
 JENNINGS, METCALF, PEARSON, SMELTZER

### ASSOCIATE PROFESSORS

ARANDA, BOHLMAN, BUTLER, CHOI, DAVIS, DUNDAS,  
 ELLRAM, LEONARD, LOCK, LYNCH, MURRANKA, SIFERD

### ASSISTANT PROFESSORS

AMUNDSON, MALTZ

### SENIOR LECTURER

FLYNN

### RESEARCH ACTIVITY

The faculty in the Department of Supply Chain Management have a strong commitment to scholarly research in a wide variety of areas. Although the faculty have published in a number of business and interdisciplinary journals, the research can generally be divided into four areas: business law, management communication, supply chain management, and real estate.

The business law faculty have been conducting research on antitrust and labor disputes in the sports industry, standards of disclosure, strategic legal planning, and commercial contract negotiations. The relationship between business law and business ethics is a major focus of this group. Collaborative writing, negotiations, and patterns of strategies for communicating organizational change are some of the areas in which management communication faculty are conducting research.

The research conducted by supply chain management faculty includes purchasing performance, forecasting, vendor evaluation, contract negotiation, materials management and acquisition, transportation regulation and policy, in addition to other related areas. In the area of real estate, research topics include the impact of discount points on housing value, a rational expectations model of housing price, the time on the market, inflation, interest rates, and cost of housing.

### BUSINESS ADMINISTRATION (BUS)

**BUS 431 Business Report Writing.** (3) N  
 Organization and preparation of reports incorporating electronic databases, word processing, and graphics. Prerequisite: BUS 301.

**BUS 451 Business Research Methods.** (3) N  
 Methods of collecting information pertinent to business problem solving, including design, collection, analysis, interpretation, and presentation of primary and secondary data. *General Studies: L2.*

**BUS 502 Managerial Communication.** (1–3) F, S  
 Analysis of various business problems, situations, and development of appropriate communication strategies. Prerequisite: MGT 502.

**BUS 504 Professional Report Writing.** (3) A  
 Preparation and presentation of professional reports.

**BUS 507 Business Research Methods.** (3) N  
 Techniques for gathering information for business decision making. Selection, design, and completion of a business-oriented research project.

**BUS 591 Seminar.** (3) N  
 Selected managerial communication topics.

**BUS 594 Study Conference or Workshop.** (3) N

**BUS 700 Research Methods.** (3) N

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### LEGAL AND ETHICAL STUDIES (LES)

**LES 411 Real Estate Law.** (3) A  
 Legal and ethical aspects of land ownerships, interests, transfer, finance development and regulations of the real estate industry.

**LES 532 Negotiation Agreements.** (3) F, S  
 Course develops negotiation competencies to build partnerships and create lasting agreements with internal/external customers, suppliers, work teams, and external constituencies. Lecture and substantial student interaction through team exercises.

**LES 579 Legal and Ethical Issues for Business.** (3) F, S  
 Study of legal and ethical components of business decisions; self-regulation and social responsibility as strategies. Prerequisites: ACC 503; FIN 502; MGT 502; MKT 502.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### REAL ESTATE (REA)

**REA 401 Real Estate Appraisal.** (3) A  
 Factors affecting the value of real estate. Theory and practice of appraising and preparation of the appraisal report. Appraisal techniques. Prerequisites: REA 300; professional program business student.

**REA 441 Real Estate Land Development.** (3) A  
 Neighborhood and city growth. Municipal planning and zoning. Development of residential, commercial, industrial, and special purpose properties. Prerequisites: REA 300; professional program business student.

**REA 456 Real Estate Investments.** (3) A  
 Analysis of investment decisions for various property types. Cash flow and rate of return analysis. Prerequisites: FIN 300; professional program business student.

**REA 461 Current Real Estate Topics.** (3) N  
 Current real estate topics of interest are discussed and analyzed. Prerequisites: REA 300; professional program business student.

**REA 591 Seminar in Selected Real Estate Topics.** (3) N

Topics may be selected from the following:

- (a) Real Estate Development.  
 Development process covering feasibility, site selection, planning, design, financing, and construction. Relationship of land use controls and regulations to the private sector.
- (b) Real Estate Finance and Investments.  
 Basic techniques for analyzing the financial feasibility of real estate investments. Includes cash flow, yield and risk analysis; taxation, form of ownership, and management.
- (c) Real Estate Market Analysis.  
 Analytical techniques used in performing market research to assess the feasibility of proposed residential, retail, office, and other developments.
- (d) Real Estate Research.  
 Reviews current research in areas such as market studies, mortgage securement, valuation, development, investments, and government regulation.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## SUPPLY CHAIN MANAGEMENT (SCM)

### SCM 405 Urban Transportation. (3) N

Economic, social, political, and business aspects of passenger transportation. Public policy and government aid to urban transportation development. Prerequisite: upper-division standing or instructor approval.

### SCM 432 Materials Management. (3) F, S

Study of managing the productive flow of materials in organizations, including MRPII, JIT, quality, facility planning, and job design. Prerequisites: OPM 301; professional program business student.

### SCM 440 Productivity and Quality Management. (3) F, S

Productivity concepts at the national, organizational, and individual levels. Quality management and its relationship to productivity in all organizations. Prerequisite: professional program business student.

### SCM 455 Research and Negotiation. (3) F, S

Current philosophy, methods, and techniques used to conduct both strategic and operations supply chain management research and negotiation. Includes negotiation simulations. Prerequisites: SCM 355; professional program business student. *General Studies: L2.*

### SCM 460 Carrier Management. (3) N

Analysis of carrier economics, regulation, management, and rate-making practice; evaluation of public policy issues related to carrier transportation. Prerequisite: upper-division standing or instructor approval.

### SCM 463 International Transportation and Logistics. (3) A

Logistics activities in international business with special emphasis on transportation, global sourcing, customs issues, and facility location in international environment. Prerequisite: SCM 345 or instructor approval.

### SCM 479 Supply Chain Strategy. (3) F, S

Synthesis of purchasing, production, transportation to provide a systems perspective of materials management. Development of strategies. Prerequisites: SCM 345, 432; professional program business student. Prerequisite with a grade of "C" or higher: SCM 355.

### SCM 532 Supply Chain Design and Development Strategies. (3) F

A strategic orientation toward the design and development of the supply chain for purchasing, materials, and logistics systems.

### SCM 541 Supply Chain Management and Control. (3) S

Management and control of purchasing and logistics management systems. Total Quality Management to assess and assure customer satisfaction. Global strategies.

### SCM 545 Supply Chain Continuous Improvement Strategies. (3) S

Leading edge strategies such as reengineering high-performance teams and expert systems for continuous improvement of the supply chain. Seminar.

### SCM 591 Seminar. (3) N

Topics such as the following are offered:

- (a) Logistics and Transportation
- (b) Purchasing

### SCM 791 Doctoral Seminar. (3) A

Topics may be selected from the following:

- (a) Logistics, Transportation, and Physical Distribution Management
- (b) Purchasing and Materials Management

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Chemical Engineering

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*Chair*

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### REGENTS' PROFESSOR

MAYER

### PROFESSORS

BERMAN, GUILBEAU, KRAUSE, RAUPP, SATER

### ASSOCIATE PROFESSORS

ADAMS, ALFORD, BECKMAN, BELLAMY, BURROWS, DEY, GARCIA, RIVERA, TORREST

### ASSISTANT PROFESSOR

BEAUDOIN

The faculty in the Department of Chemical, Bio, and Materials Engineering offer graduate programs leading to the M.S., Master of Science in Engineering, and the Ph.D. degrees in Chemical Engineering. Areas of concentration include biomedical and clinical engineering, chemical process engineering, chemical reactor engineering, energy and materials conversion, environmental control, solid state processing, and transport phenomena. For students interested in the Bioengineering major, see "Bioengineering," page 121, for program description. Within the Engineering Science major, students may select materials science and engineering as the area of study (see "Engineering Science," page 187, for program description).

The faculty also participate in offering the interdisciplinary program leading to the Doctor of Philosophy degree with a major in Science and Engineering of Materials (see "Science and Engineering of Materials," page 281, for program description). A *Graduate Student Handbook*, detailing information on graduate studies in Chemical Engineering, is available to admitted students. Students should contact the department.

**Graduate Record Examination.** Graduate Record Examination scores are required from all students.

### MASTER OF SCIENCE

See "Master's Degrees," page 98, for general requirements.

**Transition Program.** Students applying for the program leading to a master's degree with a major in Chemical Engineering, or in the area of study of materials science and engineering under the Engineering Science major, may have an undergraduate B.S. degree in a major field other than chemical engineering or materials science. The qualifications of transition students are reviewed by the department graduate committee, and a special program is designed for successful applicants. In general, applicants should have had, or should be prepared to take, calculus through differential equations and physics. Transition students are expected to complete the essential courses in their area of

study from the undergraduate program in order to be prepared for the graduate courses. Other course work from the undergraduate program may be required depending upon the area of study selected by the student.

Transition students should contact the graduate coordinator for an evaluation of the undergraduate transcript.

**Program of Study.** All candidates for the Master of Science in Engineering or M.S. degree in Chemical Engineering, or in the area of study of materials science and engineering under the Engineering Science major, are required to complete an approved program of study consisting of the minimum required semester hours, including research report (M.S.E.) or thesis (M.S.). Special course requirements for the different areas of study are established by the faculty and are available from the departmental graduate coordinator. In addition to the course/thesis requirements, all full-time graduate students must successfully complete the seminar course during each semester of attendance; part-time students must enroll in the seminar course at least three times during the course of study. Candidates whose undergraduate degree was in a field other than chemical engineering or materials science may be required to complete more than 30 semester hours.

**Thesis Requirements.** A thesis or equivalent is required.

**Final Examinations.** A final oral examination is required in defense of the thesis or equivalent.

## MASTER OF SCIENCE IN ENGINEERING

See "Master of Science in Engineering," page 186, for information on the Master of Science in Engineering degree.

## DOCTOR OF PHILOSOPHY

The Ph.D. degree in Chemical Engineering, or in the area of study of materials science and engineering under the Engineering Science major, is conferred upon evidence of excellence in research resulting in a scholarly dissertation that is a contribution to existing knowledge.

See "Doctor of Philosophy," page 101, for general requirements.

**Doctoral Program.** Upon successful completion of the qualifying examination, a research supervisory committee is formed and the doctoral student is required to submit a research proposal. Following the acceptance of the research proposal, the student is given a comprehensive examination to determine initiative, originality, breadth, and high level of professional commitment to the problem selected for investigation. Upon successful completion of the comprehensive examination, the student applies for admission to candidacy.

**Master's Degree in Passing.** Students who are enrolled in the Ph.D. degree program in Chemical Engineering, but who do not hold a previously earned master's degree in chemical engineering, can obtain the M.S.E. degree (the "Master's in Passing") upon completion of course requirements, the Ph.D. Qualifying Examination, the Dissertation, Prospectus, and the Comprehensive Examination.

As this degree is only available to students who are enrolled as regular students in the Ph.D. program in Chemical Engineering, all of the above requirements (including course work) can be applied toward the Ph.D. requirements.

**Foreign Language Requirements.** Candidates in the program leading to the Ph.D. degree in Chemical Engineering, or in the area of study materials science and engineering under the Engineering Science major, normally are not required to pass an examination showing reading competency of a foreign language. However, the supervisory committee may establish such a requirement in special cases depending upon the research interests of the candidate. If the foreign language is required, the student must successfully fulfill the requirement before taking the comprehensive examination.

**Dissertation Requirements.** A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required.

**Final Examinations.** A final oral examination in defense of the dissertation is required.

## RESEARCH ACTIVITY

*Biochemical Engineering.* Biochemical separations, biomaterials engineering, scanning probe microscopy, and affinity chromatography.

*Biomedical Engineering.* Body processes, wearable artificial kidneys, improved blood oxygenators, noninvasive techniques, biophysical property correlations, cardiovascular prosthesis and biomaterials, computer analysis of clinical data, optimization of health delivery systems, biomechanics, biocontrol, analysis of human motion, bioelectronics, medical imaging, and development of physiological sensors.

*Chemical Process Control.* Advanced process identification and control, continuous process diagnostics, batch supervisory control, statistical process control, expert systems, neural networks, and artificial intelligence. Applications to industrial processes.

*Chemical Process Engineering.* Chemical process design fundamentals, chemical instrumentation for process control, optimization techniques and applications, process modeling, simulation, dynamics and control, and applied statistics.

*Chemical Reactor Engineering.* Reactor analysis and design, high temperature reaction kinetics, atmospheric reactions, catalysis, biochemical processes, and semiconductor materials processing.

*Energy and Materials Conversion and Conservation.* Materials and resource recovery from urban, forest and agricultural wastes, biomass conversion to transportable and conveniently useful fuels, energy storage, coal gasification, and separation and purification system.

*Environmental Analysis and Control.* Energy and environmental design considerations, purification of exhaust streams, reduction of emissions from storage tanks, analysis of air and water pollution, modeling of pollution systems, and recycling for pollution control.

*Materials Science and Engineering.* Semiconductor processing and characterization, polymeric and ceramic composites, materials for high critical temperature superconductor applications, ferritic thin films for capacitor and memory applications, high temperature materials for space applications, mechanical behavior of high strength Al-Li alloys, environmentally influenced mechanical effects, and microbiologically influenced corrosion reactions.

*Solid-State Chemistry Concentration.* Adsorption, catalysis, solid state materials processing for control of properties, semiconductor materials processing, chemical vapor deposition, surface reactions, electrochemical reactions, optimization of electroplating processing, and surface analyses.

*Transport Processes.* Fluid mechanics of small particles, applications of laser Doppler velocimeter, interfacial transport and membrane separations, phase equilibria, and incorporation in process design.

### CHEMICAL ENGINEERING (CHE)

**CHE 458 Semiconductor Material Processing.** (3) N  
Introduction to the processing and characterization of electronic materials for semiconductor applications. Prerequisites: CHE 333, 342.

**CHE 475 Biochemical Engineering.** (3) N  
Application of chemical engineering methods, mass transfer, thermodynamics, and transport phenomena to industrial biotechnology. Prerequisite: instructor approval.

**CHE 476 Bioreaction Engineering.** (3) N  
Principles of analysis and design of reactors for processing with cells and other biologically active materials; applications of reaction engineering in biotechnology. Prerequisite: instructor approval.

**CHE 477 Bioseparation Processes.** (3) N  
Principles of separation of biologically active chemicals; the application, scaleup, and design of separation processes in biotechnology. Prerequisite: instructor approval.

**CHE 501 Introduction to Transport Phenomena.** (3) F, S  
Transport phenomena, with emphasis on fluid systems. Prerequisite: transition student with instructor approval.

**CHE 502 Introduction to Energy Transport.** (3) F, S  
Continuation of transport principles, with emphasis on energy transport in stationary and fluid systems. Prerequisite: transition student with instructor approval.

**CHE 503 Introduction to Mass Transport.** (3) F, S  
The application of transport phenomena to mass transfer. The design of mass transfer equipment, including staged processes. Prerequisite: transition student with instructor approval.

**CHE 504 Introduction to Chemical Thermodynamics.** (3) F, S  
Energy relations and equilibrium conversions based on chemical potentials and phase equilibria. Prerequisite: transition student with instructor approval.

**CHE 505 Introduction to Chemical Reactor Design.** (3) F, S  
Application of kinetics to chemical reactor design. Prerequisite: transition student with instructor approval.

**CHE 527 Advanced Applied Mathematical Analysis in Chemical Engineering.** (3) F  
Formulation and solution of complex mathematical relationships resulting from the description of physical problems in mass, energy, and momentum transfer and chemical kinetics.

**CHE 528 Process Optimization Techniques.** (3) S  
Method for optimizing engineering processes. Experimental design and analysis; linear and nonlinear regression methods; classical, search, and dynamic programming algorithms.

**CHE 533 Transport Processes I.** (3) F  
Unified treatment of momentum, heat, and mass transfer from molecular theory, and continuum points of view. Continuum equations of microscopic and macroscopic systems and multicomponent and multiphase systems. Cross-listed as BME 533. Credit is allowed for only BME 533 or CHE 533.

**CHE 534 Transport Processes II.** (3) S  
Continuation of CHE/BME 533, emphasizing mass transfer. Cross-listed as BME 534. Credit is allowed for only BME 534 or CHE 534. Prerequisite: BME/CHE 533.

**CHE 536 Convective Mass Transfer.** (3) N  
Turbulent flow for multicomponent systems, including chemical reactions with applications in separations and air pollution. Prerequisite: CHE 533 or MAE 571.

**CHE 543 Thermodynamics of Chemical Systems.** (3) F  
Classical and statistical thermodynamics of nonideal physicochemical systems and processes; prediction of optimum operating conditions. Cross-listed as BME 543. Credit is allowed for only BME 543 or CHE 543.

**CHE 544 Chemical Reactor Engineering.** (3) S  
Reaction rates, thermodynamics, and transport principles applied to the design and operation of chemical reactors. Cross-listed as BME 544. Credit is allowed for only BME 544 or CHE 544. Prerequisite: BME/CHE 543.

**CHE 548 Topics in Catalysis.** (3) N  
Engineering catalysis, emphasizing adsorption, kinetics, characterization, diffusional considerations, and reactor design. Other topics include mechanisms, surface analyses, and electronic structure.

**CHE 552 Industrial Water Quality Engineering.** (3) N  
Water pollutants, quality criteria and control, chemical treatment processing, and system design. Case studies. Prerequisite: CHE 331 or equivalent.

**CHE 553 Air Quality Control.** (3) N  
Air pollutant origins, effects, and control. Physical and chemical processes, including dispersion, combustion, sampling, control equipment design, and special topics. Prerequisite: CHE 331 or equivalent.

**CHE 554 New Energy Technology.** (3) N  
Gasification, liquefaction pyrolysis, and combustion processes for coal, wastes, and other raw materials. In-situ processes for coal, oil, shale, and geothermal energy. Environmental quality issues.

**CHE 556 Separation Processes.** (3) N  
Topics in binary/multicomponent separation, rate governed and equilibrium processes, mass transfer criteria, energy requirements, separating agents and devices, and staged operations.

**CHE 558 Electronic Materials.** (3) N  
Processing and characterization of electronic materials for semiconductor type uses. Thermodynamics and transport phenomena, phase equilibria and structure, mass transfer, and diffusion and thermal properties.

**CHE 561 Advanced Process Control.** (3) S  
Dynamic process representation, linear optimal control, optimal state reconstruction, and parameter and state estimation techniques for continuous and discrete time systems.

**CHE 563 Chemical Engineering Design.** (3) N  
Computational methods; the design of chemical plants and processes.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### MATERIALS SCIENCE AND ENGINEERING (MSE)

**MSE 421 Physical Metallurgy Laboratory.** (1) S  
Focuses on analysis of microstructure of metals and alloys and includes correlation with mechanical properties to some extent. Lab. Pre- or corequisite: MSE 420.

**MSE 453 Experiments in Materials Synthesis and Processing II.** (2) F  
A continuation of MSE 354, with emphasis on characterization. Small groups complete three experiments supervised by selected faculty members. Lab. Prerequisites: MSE 353 and 354 or equivalents.

**MSE 454 Advanced Materials Processing and Synthesis.** (3) S  
Case studies from published literature of current techniques in materials processing and synthesis. Student participation in classroom presentations. Lecture, recitation. Prerequisites: MSE 353 and 354 or equivalents.

**MSE 510 X-ray and Electron Diffraction.** (3) F  
Fundamentals of X-ray diffraction, transmission electron microscopy, and scanning electron microscopy. Techniques for studying surfaces, internal microstructures, and fluorescence. Lecture, demonstrations. Prerequisite: transition student with instructor approval.

**MSE 511 Corrosion and Corrosion Control.** (3) S  
Introduction to corrosion mechanisms and methods of preventing corrosion. Topics include the following: electrochemistry, polarization, corrosion rates, oxidation, coatings, and cathodic protection. Prerequisite: transition student with instructor approval.

**MSE 512 Analysis of Material Failures.** (3) S  
Identification of types of failures. Analytical techniques. Fractography, SEM, nondestructive inspection, and metallography. Mechanical and electronic components. Prerequisite: transition student with instructor approval.



**MSE 513 Polymers and Composites.** (3) F

Relationship between chemistry, structure, and properties of engineering polymers. Design, properties, and behavior of fiber composite systems.

**MSE 514 Physical Metallurgy.** (3) S

Crystal structure and defects. Phase diagrams, metallography, solidification and casting, and deformation and annealing. Prerequisite: transition student with instructor approval.

**MSE 515 Thermodynamics of Materials.** (3) N

Principles of statistical mechanics, statistical thermodynamics of single crystals, solutions, phase equilibrium, free energy of reactions, free electron theory, and thermodynamics of defects. Prerequisite: transition student with instructor approval.

**MSE 516 Mechanical Properties of Solids.** (3) S

Effects of environmental and microstructural variables of mechanical properties, including plastic deformation, fatigue, creep, brittle fracture, and internal friction. Prerequisite: transition student with instructor approval.

**MSE 517 Introduction to Ceramics.** (3) F

Principles of structure, property relations in ceramic materials. Processing techniques. Applications in mechanical, electronic, and superconducting systems. Prerequisite: transition student with instructor approval.

**MSE 518 Integrated Circuits Materials Science.** (3) N

Principles of materials science applied to semiconductor processing and fabrication in metals, ceramics, polymers, and semiconductors. Prerequisite: transition student with instructor approval.

**MSE 520 Theory of Crystalline Solids.** (3) F

Anisotropic properties of crystals; tensor treatment of elastic, magnetic, electric and thermal properties, and crystallography of Martensitic transformations.

**MSE 521 Defects in Crystalline Solids.** (3) S

Introduction to the geometry, interaction, and equilibrium between dislocations and point defects. Relations between defects and properties will be discussed. Prerequisite: ECE 350 or instructor approval.

**MSE 530 Materials Thermodynamics and Kinetics.** (3) S

Thermodynamics of alloy systems, diffusion in solids, kinetics of precipitation, and phase transformations in solids. Prerequisites: ECE 340, 350.

**MSE 540 Fracture, Fatigue, and Creep.** (3) F

Relationship between microstructure and fracture; fatigue and creep properties of materials. Environmental effects and recent developments. Current theories and experimental results. Prerequisite: MSE 440 or equivalent.

**MSE 550 Advanced Materials Characterization.** (3) N

Analytical instrumentation for characterization of materials; SEM, SIMS, Auger, analytical TEM, and other advanced research techniques.

**MSE 556 Electron Microscopy Laboratory.** (3) F

Lab support for MSE 558. Cross-listed as SEM 556. Credit is allowed for only MSE 556 or SEM 556. Pre- or corequisite: MSE/SEM 558.

**MSE 557 Electron Microscopy Laboratory.** (3) S

Lab support for MSE 559. Cross-listed as SEM 557. Credit is allowed for only MSE 557 or SEM 557. Pre- or corequisite: MSE/SEM 559.

**MSE 558 Electron Microscopy I.** (3) F

Microanalysis of the structure and composition of materials using images, diffraction and X-ray, and energy loss spectroscopy. Knowledge of elementary crystallography, reciprocal lattice, stereographic projections, and complex variables is required. Cross-listed as SEM 558. Credit is allowed for only MSE 558 or SEM 558. Prerequisite: instructor approval.

**MSE 559 Electron Microscopy II.** (3) S

Microanalysis of the structure and composition of materials using images, diffraction and X-ray, and energy loss spectroscopy. Knowledge of elementary crystallography, reciprocal lattice, stereographic projections, and complex variables is required. Cross-listed as SEM 559. Credit is allowed for only MSE 559 or SEM 559. Prerequisite: instructor approval.

**MSE 560 Strengthening Mechanisms.** (3) S

Deformation of crystalline materials. Properties of dislocations. Theories of strain hardening, solid solution, precipitation, and transformation strengthening. Prerequisite: ECE 350 or equivalent.

**MSE 561 Phase Transformation in Solids.** (3) N

Heterogeneous and homogeneous precipitation reactions, shear displacive reactions, and order-disorder transformation.

**MSE 562 Ion Implantation.** (3) S

Includes defect production and annealing. Generalized treatment, including ion implantation, neutron irradiation damage, and the interaction of other incident beams. Prerequisite: MSE 450.

**MSE 570 Polymer Structure and Properties.** (3) F

Relationships between structure and properties of synthetic polymers, including glass transition, molecular relaxations, crystalline state viscoelasticity, morphological characterization, and processing.

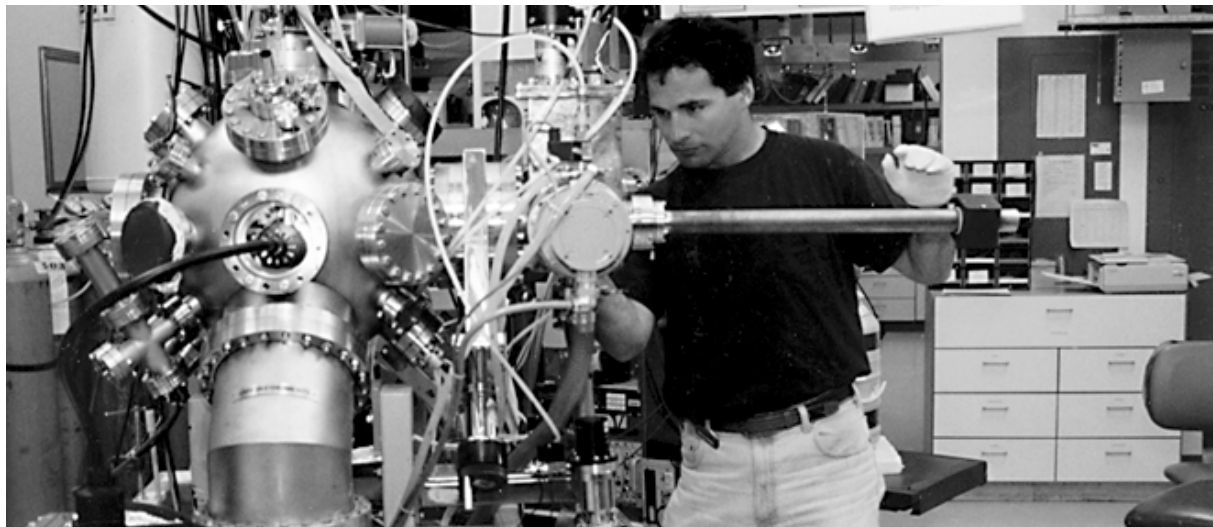
**MSE 571 Ceramics.** (3) A

Includes ceramic processing, casting, molding, firing, sintering, crystal defects, and mechanical, electronic, and physical properties. Prerequisites: MSE 521, 561.

**MSE 573 Magnetic Materials.** (3) A

Emphasis on ferromagnetic and ferrimagnetic phenomena. Domains, magnetic anisotropy, and magnetostriction. Study of commercial magnetic materials. Prerequisite: MSE 520 or equivalent.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.



Professor Robert Culbertson investigates surfaces and thin films at the Facility for Ion Beam Analysis of Materials, where he serves as director.

Tim Trumble photo

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## Chemistry

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### REGENTS' PROFESSORS

ANGELL, BUSECK, C. MOORE, O'KEEFFE, PETTIT

### PROFESSORS

BALASUBRAMANIAN, BIEBER, BIRK, BLANKENSHIP,  
 BROWN, FUCHS, GLAUNSINGER, GUST, HOLLOWAY,  
 LOHR, McMILLAN, A. MOORE, T. MOORE, MUNK,  
 PETUSKEY, ROSE, SKIBO, STEIMLE,  
 WILLIAMS, WOODBURY

### ASSOCIATE PROFESSORS

ALLEN, KOUVETAKIS, WOLF, YAGHI

### ASSISTANT PROFESSORS

BLOOM, BOOKSH, CAUDLE, GOULD, HAYES

The faculty in the Department of Chemistry and Biochemistry offer programs leading to the M.S. and the Ph.D. degrees in Chemistry. Areas of concentration include analytical chemistry, biochemistry, geochemistry, inorganic chemistry, organic chemistry, physical chemistry, and solid-state chemistry.

The faculty also participate in offering programs leading to the Master of Natural Science degree when one of the concentrations is chemistry (see "Master of Natural Science," page 257), and the interdisciplinary programs, leading to the Ph.D. degrees with majors in Exercise Science (see "Master of Physical Education," page 261) and the Science and Engineering of Materials (see "Science and Engineering of Materials," page 281).

Students admitted to the Master of Education degree program with a major in Secondary Education may also elect chemistry as the subject matter field.

The graduate programs offered by the faculty in the Department of Chemistry and Biochemistry prepare students for professional careers in chemistry and related fields in industry, government, and educational institutions. All students applying for admission to one of these programs must submit scores for the Graduate Record Examination.

### MASTER OF SCIENCE

See "Master's Degrees," page 98, for general requirements.

**Program of Study.** A minimum of 30 semester hours of credit is required, including a mandatory core course. A thesis carrying six semester hours is also included in the total. The remaining courses are selected by the student in consultation with the supervisory committee.

**Thesis Requirements.** A thesis is required.

**Final Examinations.** A general oral examination is required of all candidates for the master's degree. A written examination may also be required.

### DOCTOR OF PHILOSOPHY

See "Doctor of Philosophy," page 101, for general requirements.

**Program of Study.** A minimum of 84 semester hours, including dissertation, is required. Approximately 20–30 hours of this total is formal course work, including a mandatory core course. The remaining courses, including research and dissertation, are selected by the student in consultation with the supervisory committee.

**Cumulative Examinations.** Written examinations are required. In addition, an oral examination is required which includes material of a general nature, and the presentation and defense of current research and an original research proposal prepared by the student.

**Foreign Language Requirements.** There is no departmental foreign language requirement, but the student's supervisory committee may specify a reading proficiency in one or more foreign languages.

**Dissertation Requirements.** A dissertation based on original work of high quality and demonstrating proficiency in the student's special field is required. (See "Research and Dissertation Requirements," page 102.)

**Final Examinations.** The final oral examination is a defense of the dissertation, during which the candidate presents a summary of the dissertation research. Evidence of a publishable contribution of original research must be presented.

### RESEARCH ACTIVITY

Current research in the department is reflected in the following list of subjects: chemical bonding; atomic spectroscopy; transition elements; organometallic chemistry; meteorite chemistry; electrical properties of titanium oxides; X-ray and neutron crystallography; X-ray crystallography of membrane proteins; photobiology; electronic structure and mechanisms involved in pigment systems; artificial photosynthesis; bacterial photosynthesis; chemical applications of nuclear magnetic resonance spectroscopy; organic mass spectrometry including field ionization kinetics; biochemical pharmacology; structure of biopolymers; metalloproteins; molecular biology; site-directed mutagenesis; quantitative analysis with electron beam instruments; enzymes of purine metabolism; toxic proteins from Mojave rattlesnake venom; purine and pyrimidine chemistry; design of potential antitumor agents; design and synthesis of imaging agents of malignant tissues; redox chemistry of quinones; rate processes and molecular spectroscopy; nature and origin of organic compounds in carbonaceous meteorites; computer-assisted structure elucidation; cycloaddition and cycloreversion reactions; magnetic; chemisorption; and catalytic behavior of small metallic particles; structure and

properties of metal-ammonia systems; solid-state geochemistry; nucleic acid chemistry and electron microscopy; separations and chromatographic detectors; electron microprobe analysis of air-pollutants; metal complexes of macrocyclic chelating agents; structure analysis of metal complexes having a high coordination number; molecular orbital calculations; infrared and Raman spectroscopy; ceramics; laser spectroscopy; ultrafast kinetics; microwave spectroscopy.

In addition, interdisciplinary research is actively pursued in several areas, e.g., biochemistry, geochemistry, solid-state science, and materials science. Magnetic and magnetism resonance studies involve faculty and students from the Departments of Physics and Astronomy and Chemistry and Biochemistry in a well-equipped magnetism facility. Approximately 35 faculty members from the Departments of Chemistry and Biochemistry, Physics and Astronomy, Geology and the College of Engineering and Applied Sciences are associated with the Center for Solid-State Science. The center includes a number of specialized facilities such as electron microscopy and crystal-growing laboratories. Eleven faculty members from the Departments of Chemistry and Biochemistry and Plant Biology are associated with the Center for the Study of Early Events in Photosynthesis. This center has unique instrumentation for studying the earliest energy storing reactions of photosynthesis. The Center for Meteorite Studies and the Cancer Research Institute also foster interdisciplinary research efforts. Faculty in the Department of Chemistry and Biochemistry also participate in collaborative programs in the science and engineering of materials and in molecular and cellular biology.

### CHEMISTRY (CHM)

#### CHM 421 Instrumental Analysis. (3) S

Principles of instrumental methods in chemical analysis. Electroanalytical and optical techniques. Prerequisites: CHM 325, 326. Pre- or corequisite: CHM 442.

#### CHM 424 Separation Science. (3) N

Basic theory and practical aspects of gas, liquid, ion-exchange, and gel-permeation chromatographies, and other important industrial and research techniques. 2 hours lecture, 4 hours lab. Prerequisite: CHM 318 or 332 or 442 or instructor approval.

#### CHM 431 Qualitative Organic Analysis. (3) S

Systematic identification of organic compounds. 1 hour lecture, 6 hours lab. Prerequisites: CHM 118 (or 326) and 320 (or 336) or instructor approval.

#### CHM 441 General Physical Chemistry. (3) F

Laws of thermodynamics and their applications, properties of gases, solids, liquids and solutions, reaction kinetics, wave mechanics, molecular spectroscopy, and statistical thermodynamics. Credit is allowed for *only* CHM 341 or 441. Prerequisites: MAT 272 (or 291); PHY 241. Corequisite: MAT 274.

#### CHM 442 General Physical Chemistry. (3) S

Continuation of CHM 441. Prerequisites: CHM 441; MAT 274.

#### CHM 452 Inorganic Chemistry Laboratory. (1–2) S

Preparation and characterization of typical inorganic substances, emphasizing methods and techniques. 1 conference, 5 hours lab. Prerequisite: instructor approval. *General Studies: L2 (if credit also earned in CHM 444).*

#### CHM 453 Inorganic Chemistry. (3) S

Principles and applications of inorganic chemistry. Prerequisite: CHM 341 or 441.

#### CHM 461 General Biochemistry. (3) F

Structure, chemistry, and metabolism of biomolecules and their role in the biochemical processes of living organisms. Credit is allowed for only CHM 361 or 461. Prerequisites: CHM 318 (or 332) and 341 (or 441) or instructor approval.

#### CHM 462 General Biochemistry. (3) S

Continuation of CHM 461. Prerequisite: CHM 461 or instructor approval.

#### CHM 463 Biophysical Chemistry. (3) S

Principles of physical chemistry as applied to biological systems. Prerequisite: CHM 341 or 441.

#### CHM 467 General Biochemistry Laboratory. (2) S

The application of modern chemical and physical methods to biochemical problems; purification and characterization of biological macromolecules; quantitative measurement of enzyme activity and properties; evaluation of metabolic processes. 1 conference, 5 hours lab. Prerequisite: CHM 461. *General Studies: L2 (if credit also earned in CHM 464).*

#### CHM 471 Solid-State Chemistry. (3) F

Crystal chemistry, thermodynamics and electrochemistry of solids, nonstoichiometric compounds, diffusion and solid-state reactions, crystal growth, and selected topics. Pre- or corequisite: CHM 441 or instructor approval.

#### CHM 480 Methods of Teaching Chemistry. (3) S

Organization and presentation of appropriate content of chemistry; preparation of reagents, experiments, and demonstrations; organization of stock rooms and laboratories; experience in problem solving. Prerequisite: instructor approval.

#### CHM 481 Geochemistry. (3) F

Origin and distribution of the chemical elements. Geochemical cycles operating in the earth's atmosphere, hydrosphere, and lithosphere. Cross-listed as GLG 481. Credit is allowed for only CHM 481 or GLG 481. Prerequisite: CHM 341 (or 441) or GLG 321.

#### CHM 485 Meteorites and Cosmochemistry. (3) N

Chemistry of meteorites and their relationship to the origin of the earth, solar system, and universe. Cross-listed as GLG 485. Credit is allowed for only CHM 485 or GLG 485.

#### CHM 501 Current Topics in Chemistry. (1) F, S

May be repeated for credit. Prerequisite: instructor approval.

#### CHM 521 Computer Enhanced Analytical Chemistry. (3) N

Overview of chemometric tools in analytical chemistry, including multivariate calibration, spectral deconvolution, and experimental design. 2 hours lecture, 4 hours lab.

#### CHM 523 Advanced Analytical Chemistry. (3) A

Theoretical principles of analytical instrumentation and measurements. Prerequisites: CHM 325 and 442 or instructor approval.

#### CHM 525 Spectrochemical Methods of Analysis. (4) N

Theoretical and practical considerations involving the use of optical instruments for chemical analyses. Emphasis on state of the art trends. 3 hours lecture, 3 hours lab. Prerequisite: CHM 442 or instructor approval.

#### CHM 526 X-ray Methods of Analysis. (4) N

Theoretical and practical considerations involving the use of X-ray diffraction and spectroscopy for chemical and structural analyses. 3 hours lecture, 3 hours lab. Prerequisite: CHM 442.

#### CHM 527 Electrical Methods of Chemical Analysis. (4) N

Theoretical and practical considerations of polarographic, potentiometric, amperometric techniques, including modern electrochemical methods. 2 hours lecture, 6 hours lab. Prerequisite: CHM 442.

#### CHM 531 Advanced Organic Chemistry I. (3) F

Reaction mechanisms, reaction kinetics, linear free energy relationships, transition state theory, molecular orbital theory, and Woodward-Hoffmann rules. Prerequisites: CHM 318 (or 332), 442.

#### CHM 532 Advanced Organic Chemistry II. (2) S

Continuation of CHM 531. Prerequisite: CHM 531.

#### CHM 537 Organic Reactions. (3) S

Important synthetic reactions of organic chemistry emphasizing recently discovered reactions of preparative value. Prerequisite: CHM 531.

#### CHM 541 Advanced Thermodynamics. (3) F

Equilibrium thermodynamics, chemical reactions, and phase equilibria. Introduction to statistical thermodynamics, critical phenomena, and kinetics. Prerequisite: CHM 442.

#### CHM 545 Quantum Chemistry I. (3) F

Basic quantum theory, chemical bonding, and molecular structure. Prerequisite: CHM 442.

**CHM 546 Quantum Chemistry II.** (3) S

Quantum theory of rate processes. Principles of spectroscopy and nonlinear optics. Prerequisite: CHM 545.

**CHM 548 Chemical Kinetics.** (2) N

Kinetic theory and rate processes. Prerequisite: CHM 545.

**CHM 553 Advanced Inorganic Chemistry.** (3) S

Principles of modern inorganic chemistry and their applications over the entire periodic system. Prerequisites: CHM 442 and 453 or equivalents.

**CHM 556 Topics in Inorganic Chemistry.** (3) N

May be repeated for credit. Prerequisites: CHM 553; instructor approval.

**CHM 563 Biophysical Chemistry.** (3) N

Physical chemistry of macromolecules, especially proteins, nucleic acids, and polysaccharides. Thermodynamics, hydrodynamics, and spectroscopy of and their relation to structure. Prerequisites: CHM 442, 462.

**CHM 568 Molecular Mechanisms of Photosynthesis.** (3) S

Structure and function of photosynthetic complexes; mechanism of energy conversion in plants, bacteria, and model systems. Cross-listed as PLB 558. Credit is allowed for only CHM 568 or PLB 558. Prerequisite: instructor approval.

**CHM 579 Topics in Solid-State Chemistry.** (3) N

May be repeated for credit. Prerequisite: instructor approval.

**CHM 582 Topics in Geochemistry and Cosmochemistry.** (3) N

Topics of current interest for students in chemistry and other fields. Sampling of data and thought concerning phase equilibria, element distribution, meteorites, the Earth, and other planets. May be repeated for credit. Prerequisite: instructor approval.

**CHM 583 Phase Equilibria and Geochemical Systems.** (3) N

Natural reactions at high temperatures and pressures; silicate, sulfide, and oxide equilibria. Cross-listed as GLG 583. Credit is allowed for only CHM 583 or GLG 583.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Civil Engineering

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*Chair*

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### PROFESSORS

S. HOUSTON, W. HOUSTON, MAMLOUK, MATTHIAS,  
MAYS, RAJAN, SINGHAL, UPCHURCH

### ASSOCIATE PROFESSORS

DUFFY, FAFITIS, FOX, HINKS, JOHNSON

### ASSISTANT PROFESSORS

BAKER, MOBASHER, MUCCINO, OWUSU-ANTWI,  
WESTERHOFF, ZHU

The faculty in the Department of Civil and Environmental Engineering offer graduate programs leading to the M.S., the Master of Science in Engineering, and the Ph.D. degrees in Civil Engineering.

**Graduate Record Examination.** Submission of Graduate Record Examination (GRE) scores, general test, is required for all degree-seeking applicants.

**TOEFL Examination.** International applicants, whose native language is not English, are required to have taken the Test of English as a Foreign Language (TOEFL), and achieved a minimum score of 550.

### MASTER OF SCIENCE

See "Master's Degrees," page 98, for general requirements.

### MASTER OF SCIENCE IN ENGINEERING

See "Master of Science in Engineering," page 186.

### DOCTOR OF PHILOSOPHY

The Ph.D. degree is conferred upon students based on evidence of excellence in research leading to a scholarly dissertation that is a contribution to knowledge in the field of civil engineering.

See "Doctor of Philosophy," page 101, for general requirements.

**Letters of Recommendation.** Submission of three letters of recommendation is required for those applying for admission to the Ph.D. degree program. One letter must be from the chair or advisor of the applicant's previous degree program.

**Program of Study.** The program of study must be prepared soon after the student has been admitted to the program, the supervisory committee has been formed, and a preliminary examination (if required by the supervisory committee) has been taken.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Written and oral comprehensive examinations are required. The examinations are administered by the supervisory committee. Students should request permission from the Graduate College to take the comprehensive examinations when they have essentially completed the course work in their approved program of study.

**Dissertation Requirements.** A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required.

**Final Examinations.** A final oral examination in defense of the dissertation is required.

### RESEARCH ACTIVITY

A broad range of theoretical and experimental research programs have been established in civil and environmental engineering to prepare graduate students for careers in professional practice and research. The faculty pursue research topics related to the advancement of knowledge in civil and environmental engineering.

Experimental and theoretical investigations by civil and environmental engineering faculty and students are carried out in the specialized areas of environmental engineering, geotechnical/geoenvironmental engineering, structures/materials engineering, transportation/materials engineering, and water resources engineering.

**CIVIL AND ENVIRONMENTAL ENGINEERING (CEE)****CEE 423 Structural Design.** (3) F

Analysis and design of reinforced concrete steel, masonry, and timber structures. Lecture, lab. Prerequisite: CEE 323.

**CEE 440 Engineering Hydrology.** (3) F

Descriptive hydrology; hydrologic cycle, models, and systems. Rain-runoff models. Hydrologic design. Concepts, properties, and basic equations of groundwater flow. Prerequisite: CEE 341.

**CEE 486 Integrated Civil Engineering Design.** (3) F, S

Students are required to complete a civil engineering design in a simulated practicing engineering environment. Lecture, team learning. Limited to undergraduates in their final semester. Prerequisites: CEE 321, 341, 351, 361, 372. *General Studies: L2.*

**CEE 512 Pavement Performance and Management.** (3) S

Pavement management systems, including data collection, evaluation, optimization, economic analysis, and computer applications for highway and airport design. Prerequisite: instructor approval.

**CEE 514 Bituminous Materials and Mixture.** (3) F

Types of bituminous materials used in pavement mixtures. Chemical composition, physical properties, desirable aggregate characteristics, optimum asphalt contents, superpave asphalt binder, mixture design. Lecture, lab. Prerequisite: ECE 351.

**CEE 515 Properties of Concrete.** (3) S

Materials science of concrete. Cement chemistry, mechanisms of hydration, interrelationships among micro and macro properties of cement-based materials. Mechanical properties, failure theories, fracture mechanics of concrete materials. Cement-based composite materials and the durability aspects. Lecture, lab. Prerequisite: ECE 350 or 351.

**CEE 521 Stress Analysis.** (3) F

Advanced topics in the analytical determination of stress and strain. Prerequisite: CEE 321.

**CEE 524 Advanced Steel Structures.** (3) F

Strength properties of steel and their effects on structural behavior. Elastic design of steel structures. Plastic analysis and design of beams, frames, and bents. Plastic deflections. Plastic design requirements. Multistory buildings. Prerequisite: CEE 322.

**CEE 526 Finite Element Methods in Civil Engineering.** (3) F

Finite element formulation for solutions of structural, geotechnical, and hydraulic problems. Prerequisite: CEE 432.

**CEE 527 Advanced Concrete Structures.** (3) S

Ultimate strength design. Combined shear and torsion. Serviceability. Plastic analysis. Special systems. Prerequisite: CEE 323.

**CEE 530 Prestressed Concrete.** (3) N

Materials and methods of prestressing. Analysis and design for flexure, shear, and torsion. Prestress losses due to friction, creep, shrinkage, and anchorage set. Statically indeterminate structures. Design of flat slabs, bridges, and composite beams. Prerequisite: CEE 323.

**CEE 533 Structural Optimization.** (3) N

Linear and nonlinear programming. Problem formulation. Constrained and unconstrained optimization. Sensitivity analysis. Approximate techniques. FEM-based optimal design of mechanical and aerospace structures. Cross-listed as MAE 521. Credit is allowed for only CEE 533 or MAE 521. Prerequisite: instructor approval.

**CEE 536 Structural Dynamics.** (3) S

Structures and structural members subjected to dynamic loadings, response spectra theory applications to bridges and power plants, investigations of the responses of multidegree of freedom structures, and matrix and numerical methods of analysis. Lecture, recitation. Prerequisites: CEE 321; instructor approval.

**CEE 537 Topics in Structural Engineering.** (1–3) F, S

Advanced topics, including nonlinear structural analysis, experimental stress analysis, advanced finite elements, plasticity and viscoelasticity, composites, and damage mechanics. Prerequisite: instructor approval.

**CEE 540 Groundwater Hydrology.** (3) F

Physical properties of aquifers, well pumping, subsurface flow modeling, unsaturated flow, numerical methods, land subsidence, and groundwater pollution. Prerequisite: CEE 440 or instructor approval.

**CEE 541 Surface Water Hydrology.** (3) S

Hydrologic cycle and mechanisms, including precipitation, evaporation, and transpiration; hydrograph analysis; flood routing; statistical methods in hydrology and hydrologic design. Prerequisite: CEE 440 or instructor approval.

**CEE 542 Water Resources Systems Planning.** (3) S

Philosophy of water resources planning; economic, social, and engineering interaction; introduction to the theory and application of quantitative planning methodologies in water resources planning. Guest lecturers, case studies. Prerequisite: instructor approval.

**CEE 543 Water Resources Systems.** (3) F

Theory and application of quantitative planning methodologies for the design and operation of water resources systems; class projects using a computer; case studies.

**CEE 545 Foundations of Hydraulic Engineering.** (3) F

Review of incompressible fluid dynamics. Flow in pipes and channels; unsteady and varied flows; wave motion. Prerequisite: CEE 341.

**CEE 546 Free Surface Hydraulics.** (3) S

Derivation of 1-dimensional equations used in open channel flow analysis; computations for uniform and nonuniform flows, unsteady flow, and flood routing. Mathematical and physical models. Prerequisite: CEE 341.

**CEE 547 Principles of River Engineering.** (3) N

Uses of rivers, study of watershed, and channel processes. Sediment sources, yield, and control; hydrologic analysis. Case studies. Prerequisite: CEE 341 or instructor approval.

**CEE 548 Sedimentation Engineering.** (3) N

Introduction to the transportation of granular sedimentary materials by moving fluids. Degradation, aggregation, and local scour in alluvial channels. Mathematical and physical models. Prerequisite: CEE 547 or instructor approval.

**CEE 550 Soil Behavior.** (3) S

Physicochemical aspects of soil behavior, stabilization of soils, and engineering properties of soils. Prerequisite: CEE 351.

**CEE 551 Advanced Geotechnical Testing.** (3) S

Odometer, triaxial (static and cyclic) back pressure saturated and unsaturated samples, pore pressure measurements, closed-loop computer-controlled testing, in-situ testing, and sampling. Lecture, lab. Prerequisite: CEE 351.

**CEE 552 Geological Engineering.** (3) F

Geological investigations for engineering purposes, case histories, geologic structure, weathering, remote sensing, geophysics, and air photo interpretation for engineering site locations. Lecture, field trips. Prerequisite: CEE 351.

**CEE 553 Advanced Soil Mechanics.** (3) N

Application of theories of elasticity and plasticity to soils, theories of consolidation, failure theories, and response to static and dynamic loading. Prerequisite: CEE 351.

**CEE 554 Shear Strength and Slope Stability.** (3) F

Shear strength of saturated and unsaturated soils strength-deformation relationships, time-dependent strength parameters, effects of sampling, and advanced slope stability. Prerequisite: CEE 351.

**CEE 555 Advanced Foundations.** (3) N

Deep foundations, braced excavations, anchored bulkheads, reinforced earth, and underpinning. Prerequisite: CEE 351.

**CEE 556 Seepage and Earth Dams.** (3) N

Transient and steady state fluid flow through soil, confined and unconfined flow, pore water pressures, and application to earth dams. Prerequisite: CEE 351.

**CEE 557 Hazardous Waste: Site Assessment and Mitigation Measures.** (3) S

Techniques for hazardous waste site assessment and mitigation. Case histories presented by instructor and guest speakers. Prerequisites: graduate standing; instructor approval.

**CEE 559 Earthquake Engineering.** (3) F

Characteristics of earthquake motions, selection of design earthquakes, site response analyses, seismic slope stability, and liquefaction. Prerequisite: CEE 351.

**CEE 560 Soil and Groundwater Remediation.** (3) F

Techniques for remediation of contaminated soils and groundwaters are presented with basic engineering principles. Prerequisite: instructor approval.

**CEE 561 Physical-Chemical Treatment of Water and Waste.** (3) F  
Theory and design of physical and chemical processes for the treatment of water and waste waters. Prerequisite: CEE 361.

**CEE 562 Environmental Biochemistry and Waste Treatment.** (3) S  
Theory and design of biological waste treatment systems. Pollution and environmental assimilation of wastes. Prerequisite: CEE 362.

**CEE 563 Environmental Chemistry Laboratory.** (3) F  
Analysis of water, domestic and industrial wastes, laboratory procedures for pollution evaluation, and the control of water and waste treatment processes. Lecture, lab. Prerequisite: CEE 361.

**CEE 565 Modeling and Assessment of Aquatic Systems.** (3) S  
Development of predictive models of water quality; methods to assess environmental impacts; applications to water quality management. Prerequisite: CEE 361 or instructor approval.

**CEE 566 Industrial/Hazardous Waste Treatment.** (3) N  
Emphasis on treatment of local industrial/hazardous waste problems, including solvent recovery and metals. Lecture, project. Prerequisites: CEE 561, 563.

**CEE 573 Traffic Engineering.** (3) N  
Driver, vehicle, and roadway characteristics, laws and ordinances, traffic control devices, traffic engineering studies, and Transportation System Management measures. Prerequisite: CEE 372.

**CEE 574 Highway Capacity.** (3) N  
Highway capacity for all functional classes of highways. Traffic signalization, including traffic studies, warrants, cycle length, timing, phasing, and coordination. Prerequisite: CEE 372.

**CEE 575 Traffic Flow Theory and Safety Analysis.** (3) N  
Traffic flow theory; distributions, queuing, delay models, and car-following. Highway safety; accident records systems, accident analysis, identifying problem locations, and accident countermeasures. Prerequisite: CEE 573 or 574.

**CEE 576 Airport Engineering.** (3) N  
Planning and design of airport facilities. Effect of aircraft characteristics, air traffic control procedures and aircraft demand for runway and passenger handling facilities, on-site selection, runway configuration, and terminal design. Prerequisite: CEE 372.

**CEE 577 Urban Transportation Planning.** (3) N  
Application of land use parameters traffic generation theory, traffic distribution and assignment models, transit analysis, and economic factors to the solution of the urban transportation problem. Prerequisite: CEE 372.

*Students enrolled in CEE 580, 590, 592, 599, 792, and 799 are required to attend graduate student seminars at the times shown in the Schedule of Classes. Each semester, every graduate student enrolled for more than eight semester hours is to enroll for at least one semester hour of CEE 592, 599, 792, or 799.*

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Communication

### Master's Program

**Kristin B. Valentine**  
*Director of Graduate Studies*  
**(STAUF A412) 480/965-5096**  
**Kristin.Valentine@asu.edu**  
**[www.asu.edu/copp/communication/academic/masters.html](http://www.asu.edu/copp/communication/academic/masters.html)**

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### PROFESSORS

ARNOLD, BANTZ, JAIN, KASTENBAUM,  
PETRONIO, VALENTINE

### ASSOCIATE PROFESSORS

ALBERTS, BULEY, CARLSON, COREY, CORMAN,  
CRAWFORD, DAVEY, GUERRERO, MARTIN, MAYER,  
McPHEE, NAKAYAMA, TROST

### ASSISTANT PROFESSORS

DAVIS, TRETHERWEY

### INSTRUCTIONAL PROFESSIONAL OLSON

The Department of Communication strives to advance the understanding of message-related human behavior, for the purpose of improving communicative interactions. Teaching, research, and service are directed to the continued development of knowledge and application of the principles of communication. Courses of study are designed to provide students with relevant programs adapted to individual academic and professional goals.

### MASTER OF ARTS

Faculty in the Department of Communication offer a program leading to the M.A. degree in Communication. Current areas of study within the major are intercultural communication, interpersonal communication, performance studies, organizational communication, and rhetoric/public address.

**Admission Requirements.** Admission is competitive, based upon evidence of the applicant's scholarly and research abilities. A completed application for admission and two transcripts of all undergraduate and graduate work must be submitted to the Graduate Admissions Office. See "Admission to the Graduate College," page 89, for Graduate College general requirements. All applicants must submit the following:

1. a Graduate College application, completed either online or on paper, along with official undergraduate and graduate transcripts;
2. a statement of professional goals (approximately 300 words);
3. Graduate Record Examination scores (verbal, quantitative, analytical) taken within the past five years, plus other relevant test data provided by the applicant;

4. three letters of recommendation prepared within the preceding 12 months;
5. an optional writing sample; and
6. all applicants whose native language is not English must submit scores from the Test of English as a Foreign Language (TOEFL). Minimum scores are 550 on the paper and pencil version of this test or 213 on the computer version of this test. The Department of Communication also requires a minimum score of 230 on the Test of Spoken English.

All application materials must be received by February 1.

**Program of Study.** The program consists of a minimum of 30 semester hours of graduate course work, which includes six semester hours of thesis credit. All students must successfully complete the following:

1. COM 501 Research Methods in Communication with a minimum grade of "B";
2. COM 504 Theories and Models in Communication with a minimum grade of "B";
3. at least one of the following three courses: COM 508 Quantitative Research Methods in Communication, COM 509 Qualitative Research Methods in Communication, or COM 521 Rhetorical Criticism of Public Discourse with a minimum grade of "B";
4. at least three content seminars;
5. a written comprehensive examination on theory and methodology, and an area of study (an oral examination may be required); and
6. a thesis, which is an account of original research, and an oral examination in defense of the thesis.

Applicants with undergraduate deficiencies must remove such deficiencies, and these courses do not count toward the master's degree. The student's program of study is the mutual responsibility of the student and the supervisory committee. A foreign language is not required, but is encouraged as appropriate. Descriptions of current program options and requirements are available from the Department of Communication, STAUF A412.

## RESEARCH ACTIVITY

Faculty members in the Department of Communication are dedicated to conducting and reporting quality research. The Communication Research Consortium assists faculty and graduate students in planning and conducting independent and interdisciplinary research. Typical research topics studied by members of the faculty include the following: communication and culture, messages as organizational products, privacy rules in interpersonal communication, the role of attitude and cultural similarity in the development of interpersonal relationships, the role of communication in intimate relationships, the performance of culture, the communication of oral traditions, the development of critical theory, the development of communication networks, intercultural communication competence, communication in small groups, communication with aging populations, discourse in organizational settings, and the influence of rhetorical discourse upon social issues.

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## Communication

### Interdisciplinary Doctoral Program

**Sandra Petronio**

*Director*

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sandra.petronio@asu.edu

[www.asu.edu/copp/communication/academic/doctorate.html](http://www.asu.edu/copp/communication/academic/doctorate.html)

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### Business Administration

Professor: Smeltzer

### Communication

Professors: Arnold, Bantz, Jain, Kastenbaum, Petronio, Valentine;

Associate Professors: Alberts, Buley, Carlson, Corey, Corman, Davey, Guerrero, Martin, Mayer, McPhee, Nakayama, Trost;

Assistant Professors: Davis, Trethewey

### Educational Leadership and Policy Studies

Assistant Professor: Margolis

### English

Professor: Roen;

Associate Professor: Miller

### Family Resources and Human Development

Professors: Christopher, Fabes

### Industrial Management Systems Engineering

Professor: Dooley

### Journalism and Telecommunications

Professor: Godfrey

### Justice Studies

Regents' Professor: Altheide;

Professors: Goldberg, Johnson

### Recreation Management and Tourism

Professor: Allison

### Sociology

Professors: Nagasawa, Snow

### Speech and Hearing Science

Professor: LaPointe

### Supply Chain Management

Professor: Metcalf

## DOCTOR OF PHILOSOPHY

The Committee of Faculty offers an interdisciplinary graduate program leading to the Ph.D. degree in Communication. Concentrations are available in communicative development, intercultural communication, and organizational communication.

The program is designed to prepare scholars for research-oriented careers in universities and in the public or private sectors. Students are provided training in communication theory, research methodology, and a specialization in one or more areas of concentration. The goal of the program is to meet the needs of students whose interests transcend traditional disciplinary boundaries.

See “Doctor of Philosophy,” page 101, for general requirements.

**Admission Requirements.** Admission to the program is competitive. Applications are considered once a year for fall admission. Applicants must have earned either a bachelor’s or master’s degree and must present evidence of scholarly writing (e.g., an undergraduate honors thesis, a master’s thesis, or their equivalent). All applicants should be knowledgeable in the basic principles of both qualitative and quantitative methods of research, social statistics, and communication theory. If course work in these areas has not been completed, admitted students are required to successfully complete COM 501 Research Methods in Communication, COM 504 Theories and Models in Communication, and a relevant graduate-level statistics course (plus any other courses stipulated by the admissions committee) before enrolling in the required theory and methodology sequence. In addition to meeting the minimum Graduate College admission requirements, the applicant’s scholastic and professional record must indicate special interest in and aptitude for systematic research in communication. All applicants must submit the following:

1. a completed Graduate College application and official undergraduate and graduate transcripts;
2. a formal *curriculum vitae*, including a statement of career goals and the relevance of this degree program to those goals;
3. Graduate Record Examination (GRE) scores (verbal, quantitative, and analytical) taken within the past five years, plus other relevant test data volunteered by the applicant;
4. three letters of recommendation prepared within the preceding 12 months, including at least one letter from a previous faculty member;
5. a sample of writing (e.g., master’s thesis, course paper); and
6. A minimum score of 600 on the Test of English as a Foreign Language and a minimum score of 230 on the Test of Spoken English for all applicants whose native language is not English.

All application materials must be in the program office by January 10 to be considered. Late applications are not processed.

**Supervisory/Dissertation Committee.** This committee consists of a chair and at least two other members appointed by the dean of the Graduate College based upon the director’s recommendation. The chair of the committee, who serves as the student’s advisor, must be knowledgeable in the student’s area of concentration, have an active research agenda, publish regularly in appropriate refereed academic journals, and be experienced in graduate education. Members of the committee must represent more than one academic discipline. The purpose of the committee is to guide the student through the completion of the program of study, the comprehensive examinations, and the dissertation research.

**Areas of Concentration.** Students admitted to the program select a formal area of concentration in any of the three broad areas of communicative development, intercultural communication, and organizational communication. How-

ever, the interdisciplinary nature of the program and breadth of its faculty allow students to design individual programs of study geared toward more specialized topics in human communication. As a rule, these cut across the formal areas of concentration and generally follow the areas of expertise of program faculty. Program graduates study areas such as: interpersonal communication, organizational communication, performance studies, rhetoric, critical/cultural studies, relational communication, and information technology. Contact the director for an up-to-date list of program faculty and their areas of interest.

*Communicative Development.* This area of concentration includes the study of communicative behaviors and functions as they evolve and change over time. Students in this area study the role of communication in interpersonal processes such as interpersonal relational and family development, aging, persuasion, and issues of identity. Students selecting this area of concentration may also focus on issues relevant to performance studies and rhetoric.

*Intercultural Communication.* The theoretical relationship between culture and communication is the focus of this area of concentration. Students in this area study the effects of cultural/ethnic differences and similarities on a wide range of communication processes. Students may also explore the communication of culture and ethnicity.

*Organizational Communication.* This area of concentration examines the role of communicative processes and systems in public and private organizations with an emphasis on the interaction between organizational participants and organizational structures, practices, informational channels, networks, and message forms.

Because of the interdisciplinary nature of the Ph.D. program, students may explore relevant course work in disciplines such as communication, social and development psychology, family studies, educational psychology, cultural anthropology, comparative sociology, linguistics, justice studies, industrial psychology, management, and public administration, among others.

**Program of Study.** If the student has completed an appropriate master’s degree, the Ph.D. requires a minimum of 60 hours beyond the master’s degree. Course work for a typical program of study is distributed as follows: required core courses (12 semester hours), area of concentration (24 semester hours), dissertation (COM 799) and research (COM 792) (24 semester hours) for a total of 60 hours (minimum). Four interdisciplinary theory and methodology courses, taken in sequence, are required of all students entering the program. The required theory course is COM 604 Theory Construction in Communication. Students are also required to take COM 680 Practicum: Research in Communication. In addition, students must take two of the three methods courses, which consist of COM 607 Contemporary Rhetorical Methods, COM 608 Multivariate Statistical Analysis of Data in Communication, and COM 609 Advanced Qualitative Research Methods in Communication.

In addition to successfully completing the required courses, each student is required to participate in a research colloquium during each semester of residence to present their COM 792 products. Students are required to conduct research leading to an outcome for each COM 792 course.



The student is also required to demonstrate proficiency in research methods (statistics, computer languages, content analysis methods, participant observation, etc.) which, in the judgment of the supervisory committee, is needed for the student's dissertation research. Evidence of required proficiency may be demonstrated by established university examination procedures or by successful completion of a sequence of courses designated by the student's program committee.

For students who have completed only the bachelor's degree before admission to the Ph.D. program, a minimum of 84 hours of interdisciplinary graduate work is required for the program, with the same 60-hour requirement for students with the master's degree. The initial course work for students admitted with only a bachelor's degree is similar to the M.A. degree requirements in Communication, except that no thesis is required. These requirements include a general overview of research in communication (COM 501), an overview of theories and models of communication (COM 504), a statistics course (COM 508), and electives from communication or other disciplines to total 24 hours of course work. The methods, theory, and statistics courses must be completed before beginning the required theory and methodology sequence for the Ph.D. (i.e., they are prerequisites for the required courses).

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Upon completion of course work and before the formal approval of the dissertation proposal, the student is examined in the relevant area of concentration and research methods. The examination consists of both written and oral components designed to test the student's interdisciplinary knowledge in the field and chosen area of concentration and the student's readiness to undertake interdisciplinary dissertation research. The examination is conducted by the student's supervisory committee.

**Admission to Candidacy.** After the student has passed both the written and oral portions of the comprehensive examination and the student's dissertation topic has been approved, the student may apply to the Graduate College for admission to candidacy. No dissertation hours (COM 799) may be taken before admission to candidacy, but six hours of research (COM 792) may be taken before admission to candidacy. Students must enroll for 12 hours of research (COM 792)/dissertation (COM 799) credit following the semester in which they are advanced to candidacy.

**Dissertation Proposal.** Before conducting the research for the dissertation, each student must submit a dissertation proposal that is defended orally and approved by the student's dissertation committee.

**Research and Dissertation.** The dissertation consists of a fully documented written analysis of a problem that extends the knowledge and/or theoretical framework of the field and reflects the student's creativity and competence in independent, interdisciplinary research using an appropriate research methodology.

**Final Examinations.** An oral examination in defense of the dissertation, conducted by the dissertation committee, is required.

## RESEARCH ACTIVITY

Members of the Committee of Faculty are engaged in a variety of research activities. Among others, the following represent research interests of the faculty approved to direct dissertations: the role of communication in creating organizational cultures, the process of social influence, explaining communication in interpersonal and intergroup encounters, the development of interpersonal relationships, the role of subjective culture in the attribution of meaning, the development of communication competencies, privacy regulation, cross-cultural variations in interpersonal communication, identity-validation in intergroup encounters, communication networks, the impact of newer information technologies in organizations, the role of communication in response to disasters, and communication in multinational corporations.

### COMMUNICATION (COM)

- COM 400 CIP: Communication in Professions.** (3) F, S, SS  
Specialized study of communication processes in professional and organizational settings. May be repeated for credit. Lecture, discussion. Prerequisites: COM 100 and 225 or COM 259.
- COM 404 Research Apprenticeship.** (3) F, S  
Direct research experience on faculty projects. Student/faculty match based on interests. Lecture, apprenticeship. Prerequisite: COM 308 or instructor approval.
- COM 407 Advanced Critical Methods in Communication.** (3) S  
Examination of critical approaches relevant to communication, including textuality, social theory, cultural studies, and ethnography. Lecture, discussion. Prerequisite: COM 308.
- COM 408 Quantitative Research Methods in Communication.** (3) F, S  
Advanced designs, measurement techniques, and methods of data analysis of communication research. Prerequisites: COM 308 and General Studies N2 (EDP 454 or POS 401 or PSY 230 or QBA 221 or SOC 395 or STP 226) or instructor approval.
- COM 410 Interpersonal Communication Theory and Research.** (3) F, S, SS  
Survey and analysis of major research topics, paradigms, and theories dealing with message exchanges between and among social peers. Prerequisites: COM 110 (or 310) and 308 or instructor approval. *General Studies: SB.*
- COM 411 Communication in the Family.** (3) A  
A broad overview of communication issues found in marriage and family life, focusing on current topics concerning communication in the family. Prerequisites: COM 110 (or 310) and 207 or instructor approval. *General Studies: SB.*
- COM 414 Crisis Communication.** (3) N  
Role of communication in crisis development and intervention.
- COM 417 Communication and Aging.** (3) N  
Critical study of changes in human communicative patterns through the later adult years, with attention on intergenerational relationships and self-concept functions.
- COM 421 Rhetoric of Social Issues.** (3) F, S  
Critical rhetorical study of significant speakers and speeches on social issues of the past and present. Prerequisites: COM 308 and 321 or instructor approval. *General Studies: HU.*
- COM 422 Advanced Argumentation.** (3) N  
Advanced study of argumentation theories and research as applied to public forum, adversary, scholarly, and legal settings. Prerequisite: COM 222 or instructor approval.
- COM 426 Political Communication.** (3) F  
Theories and criticism of political communication; including campaigns, mass persuasion, propaganda, and speeches. Emphasis on rhetorical approaches. *General Studies: SB.*
- COM 430 Leadership in Group Communication.** (3) N  
Theory and process of leadership in group communication, emphasizing philosophical foundations, contemporary research, and applications to group situations. Prerequisite: COM 230 or instructor approval.

**COM 441 Performance Studies.** (3) F, S, SS

Theory, practice, and criticism of texts in performance. Emphasis on the interaction between performer, text, audience, and context. Prerequisites: COM 241 and 308 or instructor approval. *General Studies: HU.*

**COM 445 Narrative Performance.** (3) N

Theory and practice of performing narrative texts (e.g., prose fiction, oral histories, diaries, essays, letters). Includes scripting, directing, and the rhetorical analysis of story telling. Prerequisite: COM 241 or instructor approval. *General Studies: HU.*

**COM 446 Interpretation of Literature Written by Women.** (3) N

Students explore, through performance and critical writing, literature written by women. *General Studies: HU, C.*

**COM 450 Theory and Research in Organizational Communication.** (3) F, S, SS

Critical review and analysis of the dominant theories of organizational communication and their corollary research strategies. Prerequisites: COM 250 and 308 or instructor approval. *General Studies: SB.*

**COM 453 Communication Training and Development.** (3) A

Examination of the procedures and types of communication training and development in business, industry, and government. Prerequisite: COM 250 or instructor approval.

**COM 463 Intercultural Communication Theory and Research.** (3) F, S, SS

Survey and analysis of major theories and research dealing with communication between people of different cultural backgrounds, primarily in international settings. Lecture, discussion, small group work. Prerequisites: COM 263 and 308 or instructor approval. *General Studies: SB, G.*

**COM 465 Intercultural Communication Workshop.** (3) N

Experientially based study of communication between members of different cultures designed to help students improve their intercultural communication skills. Prerequisite: instructor approval.

**COM 480 Methods of Teaching Communication.** (3) N

Analysis, organization, and presentation of textual and other classroom materials. Prerequisite: instructor approval.

**COM 494 ST: Special Topics.** (1–3) F, S, SS**COM 501 Research Methods in Communication.** (3) F

Critical analysis of systems of inquiry in communication, focusing on the identification of variables and approaches to conducting research in communication. Prerequisite: instructor approval.

**COM 504 Theories and Models in Communication.** (3) F

Theory construction, metatheoretical concerns, models, construct definition, and comparative analysis of current theories in communication. Prerequisite: instructor approval.

**COM 508 Quantitative Research Methods in Communication.** (3) F

Empirical research designs, measurements, and statistical strategies and techniques in analyzing and evaluating experimental and descriptive research in communication. Prerequisites: COM 501 and 504 or instructor approval.

**COM 509 Qualitative Research Methods in Communication.** (3) S

Qualitative research methods, including interviewing, field methods, and other nonquantitative techniques for analyzing communication. Prerequisites: COM 501 and 504 or instructor approval.

**COM 510 Interpersonal Communication Theory and Research.** (3) A

Contemporary theories and research in interpersonal communication. Prerequisites: COM 501 and 504 or instructor approval.

**COM 512 Death, Society, and Human Experience.** (3) N

Examines dying, death, bereavement, and suicide from both individual and sociocultural perspectives in terms of options for communication and action in death-related situations. Prerequisite: instructor approval.

**COM 521 Rhetorical Criticism of Public Discourse.** (3) N

History and significance of rhetorical theory and criticism in the analysis of public discourse. Prerequisites: COM 501 and 504 or instructor approval.

**COM 529 Theories of Persuasion.** (3) A

Analysis of representative theories and models of persuasive processes and their implications for communicative behavior. Prerequisites: COM 501 and 504 or instructor approval.

**COM 531 Theories of Small Group Communication.** (3) N

Theory and research in small group interaction and decision making, focusing on communicational variables which affect small group output. Prerequisites: COM 501 and 504 or instructor approval.

**COM 541 Research in Performance Studies.** (3) N

Supervised research in the historical and contemporary relationships between the performer, the text, and the audience. Prerequisites: COM 501 and 504 or instructor approval.

**COM 555 Communicative Processes in Organizations.** (3) N

Systematic analysis of communicative interactions between organizational structure, information flow, and human behaviors in the organizational setting. Prerequisites: COM 501 and 504 or instructor approval.

**COM 563 Intercultural Communication.** (3) A

Analysis of contemporary theory and research concerning the effects of a variety of cultural variables on communication between people. Prerequisites: COM 501 and 504 or instructor approval.

**COM 575 Language and Message Systems.** (3) N

Sign/symbol systems; personal, functional, and contextual aspects of message systems; measurement of "meaning." Prerequisites: COM 501 and 504 or instructor approval.

**COM 584 Communication Internship.** (1–12) F, S, SS**COM 596 Pro-Seminar in Communication.** (0) F

Discussion of research projects with the faculty. Prerequisite: admission to the graduate program.

**COM 604 Theory Construction in Communication.** (3) F

Review and analysis of philosophical problems inherent in communicative research and of metatheories designed to deal with these problems. Prerequisite: COM 504 or instructor approval.

**COM 607 Contemporary Rhetorical Methods.** (3) S

Analysis of issues in the practice of rhetorical communication research, including criticism and scholarship. Seminar.

**COM 608 Multivariate Statistical Analysis of Data in Communication.** (3) S

Statistical analysis of communication research data. Multivariate procedures used in communication research and methods of causal analysis. Prerequisites: COM 501 and 508 or equivalents.

**COM 609 Advanced Qualitative Research Methods in Communication.** (3) F

Analysis of issues in the practice of qualitative communication research, including data gathering, fieldwork issues, analysis strategies, and reporting results. Prerequisite: COM 509 or instructor approval.

**COM 680 Practicum: Research in Communication.** (3) S

Guided practice in the conduct of communication research. Topic identification; procedures, formats, and ethics of publishing. Prerequisite: COM 604.

**COM 691 Seminar.** (1–12) F, S

Seminar topics such as the following may be offered:

- (a) Current Organizational Approaches to Communication
- (b) Examination of Privacy and Disclosure
- (c) Intercultural Aspects of Communication
- (d) Interpersonal and Relational Communication
- (e) Research in Performance Studies
- (f) Rhetorical Issues
- (g) Social Influence

Prerequisite: instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Communication Disorders

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Chair

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### PROFESSORS

BACON, CASE, DORMAN, D. INGRAM, LAPOINTE,  
MOWRER, WILCOX

### ASSOCIATE PROFESSORS

LISS, SINEX

### ASSISTANT PROFESSORS

AZUMA, HADLEY, RISPOLI, SHARMA

### CLINICAL PROFESSOR

MATHY

### CLINICAL ASSOCIATE PROFESSORS

BACON, BROWN, MINTZ, REMSON

### CLINICAL ASSISTANT PROFESSORS

COOK, K. INGRAM, WEXLER

## MASTER OF SCIENCE

The faculty in the Department of Speech and Hearing Science offer a program leading to the M.S. degree in Communication Disorders. Both a thesis and nonthesis degree option is available, and students may study either speech-language pathology or audiology. The program is accredited by the Educational Standards Board of the American Speech-Language-Hearing Association.

**Admission Requirements.** Students applying for admission to this program should have their undergraduate transcripts mailed to the Graduate Admissions Office. In addition, candidates should have their Graduate Record Examination scores, a statement of professional and academic goals not to exceed 200 words, and three letters of recommendation sent to the Department of Speech and Hearing Science. All materials must be received in the department by January 15 for fall admission which is the only term in which students may begin their program of study. Candidates who have undergraduate deficiencies may need to take required prerequisite courses.

**Academic Requirements.** A student must complete a minimum of 30 or 33 semester hours of graduate course work, exclusive of credit for practicum, approved by the supervisory committee.

**Statistical Proficiency Requirements.** A student pursuing the M.S. degree must provide satisfactory evidence of competency in statistical methods appropriate to the behavioral sciences.

**Clinical Requirements.** A student in the M.S. program must complete at least 375 clock hours of supervised clinical practicum experience, of which a minimum of 250 clock hours must be obtained at the graduate level.

**Thesis Option.** Students wishing to pursue the thesis option will complete 30 semester hours of course work, six hours of which must be thesis credit, excluding practicum and internship hours. The thesis must meet requirements established by the Graduate College.

**Nonthesis Option.** Students choosing the nonthesis option will complete 33 semester hours of course work, excluding practicum and internship hours.

**Final Examinations.** For a candidate for the M.S. degree (thesis option), two final examinations are required: (1) the National Teacher Examination in speech pathology, or the National Teacher Examination in audiology, administered by Educational Testing Service and available at ASU through the University Testing Service, and (2) an oral defense of the thesis. For a candidate for the M.S. degree (nonthesis option), two final examinations are required: (1) the National Teacher Examination in speech pathology, or the National Teacher Examination in audiology, administered as described above, and (2) a four-hour comprehensive written examination administered in October and March of each year by the departmental graduate faculty.

Students should expect to spend two years completing the academic, practicum and research requirements for either degree option.

## RESEARCH ACTIVITY

The faculty and students in the Department of Speech and Hearing Science maintain active research programs. Students are encouraged to conduct research during their entire graduate program.

The department maintains the equipment and facilities for a full range of research in both speech pathology and audiology. Areas in which active research programs are under way include: oral sensory physiology; aphasia and neurogenic communication disorders; speech perception in normal and hearing-impaired populations; speech synthesis; pediatric and adult aural rehabilitation; voice disorders; phonological development and disorders; childhood language acquisition; stuttering; central auditory dysfunction; electrophysiological assessment of auditory function in infants and neurologically impaired individuals; psychoacoustics; and language disorders in infants, preschool, and school-age children.

### SPEECH AND HEARING SCIENCE (SHS)

**SHS 401 Introduction to Audiologic Evaluation.** (3) F  
Measurement of the basic audiologic test battery, including audiograms, immittance, masking, and speech recognition. Prerequisites: SHS 311 and 376 and 384 or equivalents.

**SHS 402 Modifying Communicative Behavior.** (3) S  
Principles and techniques of modifying speech and language behavior. Prerequisite: SHS 250 or equivalent.

**SHS 465 Speech and Language Acquisition.** (3) S, SS  
Speech and language development in the normal child. Prerequisite: SHS 367 or equivalent. *General Studies: SB.*

**SHS 485 Acquired Speech and Language Disorders.** (3) S  
Introduction to acquired speech and language disorders across the lifespan. Prerequisites: SHS 250, 310.

**SHS 496 Aural Rehabilitation.** (3) S  
Approaches to aural rehabilitation of children and adults. Introduction to educational audiology and assistive listening devices. Prerequisites: SHS 375 and 376 and 401 or equivalents.

**SHS 501 Introduction to Audiologic Evaluation.** (3) F

Measurement of the basic audiologic test battery, including audiograms, immittance, masking, and speech recognition. Prerequisites: SHS 311 and 376 and 384 or equivalents.

**SHS 502 Differential Diagnosis for Audiology.** (4) F

Differential diagnosis of cochlear and retrocochlear disorders, and assessment of vestibular system. 3 hours lecture, 2 hours lab. Prerequisite: SHS 401 or 501 or equivalent.

**SHS 504 Hearing Aids.** (4) S

Operation, application and fitting of amplification devices for the hearing impaired. 3 hours lecture, 2 hours lab. Prerequisite: SHS 401 or 501 or equivalent.

**SHS 505 Computers and Current Technology in Audiology and Speech-Language Pathology.** (3) F

Computer applications and current technology as applied to service administration and delivery in the fields of audiology and speech-language pathology. Lecture, lab.

**SHS 508 Pediatric Audiology.** (3) F

Audiologic assessment, screening, and development considerations for infants and young children. Prerequisite: SHS 401 or 501 or equivalent.

**SHS 510 Advanced Hearing Science.** (3) N

Anatomical, physiological, and psychophysical aspects of audition. Prerequisite: SHS 376 or instructor approval.

**SHS 511 Auditory Perception by the Hearing Impaired.** (3) F

A study of how and why sensorineural hearing loss alters the perception of sound. Prerequisite: SHS 376 or instructor approval.

**SHS 512 Medical Aspects of Speech and Hearing.** (3) F

Correlation of history and physical findings with pathologic physiology and test results in speech and hearing abnormalities.

**SHS 515 Audiologic Instrumentation and Calibration.** (3) S

Electronic instruments used to produce, modify, and measure characteristics of sound. Measurement standards and methods for calibration of audiologic equipment. Lecture, lab. Prerequisite: SHS 401 or 501 or equivalent.

**SHS 516 Auditory Evoked Potentials.** (4) S

Continuation of SHS 502, including electrophysiologic assessment of peripheral and central auditory nervous system. Lecture, lab. Prerequisite: SHS 502.

**SHS 545 Speech Perception by the Hearing Impaired.** (3) F

Speech perceptual problems of the hearing impaired including those who have cochlear implants. Prerequisite: SHS 375 or instructor approval.

**SHS 552 Otoacoustic Emissions as a Diagnostic Tool.** (3) F

Study of the types of otoacoustic emissions, their theoretical implications and application to clinical diagnostics. Lecture, discussion, lab. Prerequisite: SHS 376 or instructor approval.

**SHS 555 Cochlear Implants.** (3) S

Current status of cochlear implant research and development. Prerequisites: SHS 504 and 545 or instructor approval.

**SHS 565 Speech and Language Acquisition.** (3) S

Speech and language development in the normal child. Prerequisite: SHS 367 or equivalent.

**SHS 566 Psychology of Language.** (3) S

The psycholinguistic study of the production and comprehension of language across the lifespan.

**SHS 567 Neural Bases of Communication Disorders.** (3) F

Neuroscience and its application to matters of normal and disordered communication. Pre- or corequisite: SHS 310 or equivalent.

**SHS 570 Communication Disorders and Multicultural Populations.** (3) S

Study of racial and ethnic biases and the communication behaviors and disorders in various cultural groups.

**SHS 571 Augmentative Communication and Language Programming.** (3) S

Focus on individuals across the age span who are or who are at risk for being unable to communicate with spoken language. Lecture, lab.

**SHS 572 Language Assessment and Intervention in Early Childhood.** (3) F

Focus on the birth to 5-year-old population who are at risk for or have communication and language disabilities. Prerequisite: SHS 470 or equivalent.

**SHS 573 Language Assessment and Intervention with School-Age Populations.** (3) S

Focus on later language development, linguistic demands of academic settings, assessment and intervention strategies for older children and adolescents. Prerequisite: SHS 565 or equivalent.

**SHS 574 Fluency Disorders and Treatment.** (3) F

Phenomena, etiology, assessment, and theories of stuttering are presented, followed by various treatment procedures for children and adults who stutter. Prerequisite: SHS 431 or equivalent.

**SHS 575 Aphasia and Related Neurogenic Language Disorders.** (3) S

Assessment and treatment of acquired neurolinguistic impairment. Prerequisite: SHS 567.

**SHS 576 Neuromotor Speech Disorders.** (3) S

Evaluation and treatment of the dysarthrias and apraxia of speech. Emphasis on acquired adult disorders.

**SHS 577 Craniofacial Disorders of Communication.** (3) S, SS

Communication disorders related to anomalies of the craniofacial structures, including orofacial clefting of the lip and palate. Prerequisite: SHS 310 or equivalent.

**SHS 578 Disorders of Voice.** (3) S

Communication disorders related to dysfunction of the phonatory and resonance systems of voice production, assessment, and treatment. Prerequisite: SHS 310 or instructor approval.

**SHS 579 Feeding and Swallowing Disorders Across the Lifespan.** (3) F

Focus on individuals across the age span who have feeding and/or swallowing disorders. Assessment and treatment strategies are presented. Prerequisite: SHS 567.

**SHS 580 Clinical Practicum.** (1–6) F, S, SS

Supervised practicum in audiology or speech-language pathology. 1 hour staffing and 3 hours of client contact per week per hour of credit. May be repeated for credit. Prerequisites: instructor approval; student must not have provisional admission status.

**SHS 581 Right Hemisphere Syndrome, Traumatic Brain Injury, and Dementia.** (3) F

Study of the nature, characteristics, and clinical management of cognitive and communicative impairments accompanying right hemisphere damage, TBI, and dementia. Prerequisite: SHS 567.

**SHS 582 Differential Diagnosis of Communication Disorders.** (3) S

Procedures for assessing speech/language disorders in children and adults. 3 hours lecture, 2 hours lab. Prerequisites: SHS 250 and 310 and 465 and 567 or equivalents.

**SHS 584 Internship.** (1–6) F, S, SS

Off-campus directed experiences in audiology or speech-language pathology. May be repeated for credit. Prerequisites: SHS 580; student must consult with coordinator before registration.

**SHS 585 Articulation and Phonology: Assessment and Intervention.** (3) S

Assessment and treatment of developmental articulation and phonological disorders. Prerequisites: SHS 250 and 310 or equivalents.

**SHS 591 Seminar.** (3) F, S, SS

Selected topics regularly offered:

- (a) Autism and Pervasive Language Disorders
- (b) Multiply Handicapped Child

**SHS 596 Aural Rehabilitation.** (3) S

Approaches to aural rehabilitation in children and adults. Introduction to educational audiology and assistive listening devices. Prerequisite: SHS 401 or 501 or equivalent.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Computer Science

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### PROFESSORS

ASHCROFT, COLLOFELLO, FARIN, GOLSHANI, LEWIS,  
 NIELSON, J. URBAN, WOODFILL, YAU

### ASSOCIATE PROFESSORS

BHATTACHARYA, DASGUPTA, DIETRICH, FALTZ, GHOSH,  
 HUEY, KAMBHAMPATI, LINDQUIST, MILLER, O'GRADY,  
 PANCHANATHAN, PHEANIS, ROCKWOOD,  
 SEN, S. URBAN

### ASSISTANT PROFESSORS

BAZZI, CANDAN, CHALASANI, GANNOD,  
 RICHA, WAGNER

The faculty in the Department of Computer Science and Engineering offer graduate programs leading to the M.S. and the Ph.D. degrees in Computer Science. The faculty also offer a professional graduate program leading to the Master of Computer Science degree.

Areas of study include algorithms, software engineering, computer-aided geometric design, artificial intelligence, database and multimedia, operating systems, computer architecture, networking, and parallel and distributed systems.

### MASTER OF SCIENCE

The M.S. degree program in Computer Science stresses formal course work to provide breadth of material, and it culminates with a thesis that demonstrates depth in a particular research area.

**Admission.** See "Admission to the Graduate College," page 89, for general requirements. An applicant for the M.S. program should normally have a baccalaureate degree in computer science, computer engineering, or a closely related area. The applicant's undergraduate GPA and depth of preparation in computer science and engineering are the primary factors affecting admission. Every applicant must submit scores for the Graduate Record Examination (GRE) (verbal, quantitative, and analytical required; the subject test in computer science is optional). An international student must also submit Test of English as a Foreign Language (TOEFL) scores. The application deadline for admission in the fall semester is January 15, and the deadline for admission in the spring semester is September 15.

**Program of Study.** Each student defines a potentially unique program of study in conjunction with an advisor, subject to approval of the department and the Graduate College. The program of study must include courses in four focus areas, at least nine credit hours in a research area, and a minimum of 30 semester hours of approved graduate-level course work (including a thesis). At least 21 semester hours must be formal course work, and at least 18 hours must be

CSE 500-level credits (excluding CSE 598). The department may prescribe additional courses based on the background of the candidate. No foreign language is required.

**Final Examinations.** The student must pass a final oral examination in defense of the thesis and over the course work taken for the degree and the appropriate undergraduate prerequisites.

### MASTER OF COMPUTER SCIENCE

The faculty in the Department of Computer Science and Engineering offer a professional program leading to the Master of Computer Science (M.C.S.) degree. The M.C.S. program provides a professionally oriented, graduate-level education in computer science and engineering. The program reflects the dual nature of computer science as both a scientific and engineering discipline by allowing emphasis on theory as well as practical applications. Students can study topics such as artificial intelligence, computer-aided geometric design, computer architecture, computer graphics, computer science theory, database concepts, digital systems design, distributed systems, language processing, networking, operating systems, and software engineering.

**Admission.** See "Admission to the Graduate College," page 89. An applicant for the M.C.S. program should normally have a baccalaureate degree in computer science, computer engineering, or a closely related area. The applicant's undergraduate GPA, GRE (verbal, quantitative, and analytical) score, and depth of preparation in computer science and engineering are the primary factors affecting admission. The GRE subject test in computer science is optional. An international student must also submit the results of the TOEFL. The application deadline for admission in the fall semester is January 15, and September 15 for the spring semester.

**Program of Study.** Each student defines a potentially unique program of study subject to approval by the department and the Graduate College. The program of study must include courses in four focus areas and must contain a minimum of 30 semester hours of approved graduate-level course work. At least 18 hours must be CSE 500-level credits (excluding CSE 598), and at least 27 hours must be for formal course work. A 3-hour CSE 593 course applied project is also required. The department may prescribe additional courses based on the background of the candidate.

**Foreign Language Requirements.** None.

**Thesis Requirements.** None.

**Final Examinations.** During the last semester of work, an M.C.S. student must complete a graded final project (CSE 593) and submit a report on the project.

### DOCTOR OF PHILOSOPHY

The Ph.D. degree in Computer Science is available for students of high ability who show promise for original research.

**Admission.** See "Doctor of Philosophy," page 101, for general requirements. An applicant for the Ph.D. program should have the equivalent of a baccalaureate major in computer science, computer engineering, or a closely related area. Most applicants should have earned the master's

degree, but applicants with exceptional attainments in their baccalaureate are admitted directly into the Ph.D. program. The primary factors affecting admission include the applicant's GPA, depth of preparation in computer science and engineering, GRE (verbal, quantitative, analytical, and computer science) scores, a statement of purpose and three letters of recommendation. An international student must submit TOEFL scores. The application deadline for admission in the fall semester is March 15, and the deadline for admission in the spring semester is October 15.

**Residency.** In addition to the Graduate College's requirement for one year of full-time residency, the Department of Computer Science and Engineering stipulates one additional year of full-time residency for dissertation research.

**Program of Study.** Each student must file a program of study for approval by the supervisory committee, the department, and the Graduate College.

**Foreign Language Requirements.** None. The program committee, however, may establish a requirement depending upon the research interests of the candidate.

**Comprehensive Examinations.** A student must pass a comprehensive examination, which has a mandatory written component, before being admitted to candidacy. The exam will have both oral and written components, testing the student's general knowledge in the dissertation area as well as closely related areas. International students must achieve a passing score on the TSE/SPEAK exam prior to comprehensive examinations.

**Dissertation Requirements.** A student must complete a dissertation based on original work to demonstrate creativity in research and scholarly proficiency in the subject area.

**Final Examinations.** The student must pass a final oral examination in defense of the dissertation.

## RESEARCH ACTIVITY

The faculty of the Computer Science and Engineering Department participate in a wide variety of both theoretical and applied research projects involving many aspects of both software and hardware. Current research topics include software engineering, graphics, computer-aided geometric design, microprocessor applications, digital system design, real-time embedded systems, declarative languages, computational linguistics, compilers, operating systems, distributed operating systems, database concepts, distributed architectures, parallel architectures, data structures, artificial intelligence, strategic decision systems, algorithms, networking and network security.

The Department of Computer Science and Engineering maintains various instructional laboratories with UNIX workstations (Sun, Silicon Graphics, DEC, etc.), Pentium PCs, and Macintosh computers. These laboratories support special applications required for various computer science courses not available elsewhere on the ASU campus. The department has a VLSI design laboratory and two microprocessor laboratories for both Intel and Motorola processors. The department has various research laboratories with equipment directed to specific applications in addition to

regular computer facilities. All computers in the department are networked, with some of the research laboratories equipped with ATM and 100 Mb/s fast Ethernet. The College of Engineering and Applied Sciences provides various servers to support client/server applications and development in the department. All computers in the department are connected through networking to Information Technology at ASU. See "Computing Facilities and Services," page 32, for information concerning equipment and services provided by IT.

## COMPUTER SCIENCE AND ENGINEERING (CSE)

### CSE 408 Multimedia Information Systems. (3) F

Design, use, and applications of multimedia systems. An introduction to acquisition, compression, storage, retrieval, and presentation of data from different media such as images, text, voice, and alphanumeric. Prerequisite: CSE 310.

### CSE 412 Database Management. (3) F, S

Introduction to DBMS concepts. Data models and languages. Relational database theory. Database security/integrity and concurrency. Prerequisite: CSE 310.

### CSE 420 Computer Architecture I. (3) S

Computer architecture. Performance versus cost trade-offs. Instruction set design. Basic processor implementation and pipelining. Prerequisite: CSE 330.

### CSE 421 Microprocessor System Design I. (4) F, S

Assembly-language programming and logical hardware design of systems using 8-bit microprocessors and microcontrollers. Fundamental concepts of digital system design. Reliability and social, legal implications. Lecture, lab. Prerequisite: CSE/EEE 225.

### CSE 422 Microprocessor System Design II. (4) F, S

Design of microcomputer systems using contemporary logic and microcomputer system components. Requires assembly language programming. Prerequisite: CSE 421.

### CSE 423 Microcomputer System Hardware. (3) S

Information and techniques presented in CSE 422 are used to develop the hardware design of a multiprocessor, multiprogramming, microprocessor-based system. Prerequisite: CSE 422. *General Studies: L2.*

### CSE 428 Computer-Aided Processes. (3) A

Hardware and software considerations for computerized manufacturing systems. Specific concentration on automatic inspection, numerical control, robotics, and integrated manufacturing systems. Prerequisite: CSE 330.

### CSE 430 Operating Systems. (3) F, S

Operating system structure and services, processor scheduling, concurrent processes, synchronization techniques, memory management, virtual memory, input/output, storage management, and file systems. Prerequisites: CSE 330, 340.

### CSE 434 Computer Networks. (3) F, S

Cryptography fundamentals; data compression; error handling; flow control; multihop routing; network protocol algorithms; network reliability, timing, security; physical layer basics. Prerequisite: CSE 330.

### CSE 438 Systems Programming. (3) A

Design and implementation of systems programs, including text editors, file utilities, monitors, assemblers, relocating linking loaders, I/O handlers, and schedulers. Prerequisite: CSE 421 or instructor approval. *General Studies: L2.*

### CSE 440 Compiler Construction I. (3) F

Introduction to programming language implementation. Implementation strategies such as compilation, interpretation, and translation. Major compilation phases such as lexical analysis, semantic analysis, optimization, and code generation. Prerequisites: CSE 340, 355.

### CSE 450 Design and Analysis of Algorithms. (3) F

Design and analysis of computer algorithms using analytical and empirical methods; complexity measures, design methodologies, and survey of important algorithms. Prerequisite: CSE 310.

### CSE 457 Theory of Formal Languages. (3) A

Theory of grammar, methods of syntactic analysis and specification, types of artificial languages, relationship between formal languages, and automata. Prerequisite: CSE 355.

**CSE 459 Logic for Computing Scientists I.** (3) F

Propositional logic, syntax and semantics, proof theory versus model theory, soundness, consistency and completeness, first order logic, logical theories, automated theorem proving, ground resolution, pattern matching unification and resolution, Dijkstras logic, proof obligations, and program proving. Prerequisite: CSE 355.

**CSE 461 Software Engineering Project I.** (3) F

First of two-course software design sequence. Development planning, management; process modeling; incremental and team development using CASE tools. Lecture, lab. Prerequisite: CSE 360.

**CSE 462 Software Engineering Project II.** (3) S

Second of two-course software design sequence. Process, product assessment and improvement; incremental and team development using CASE tools. Lecture, lab. Prerequisite: CSE 461.

**CSE 470 Computer Graphics.** (3) F, S

Display devices, data structures, transformations, interactive graphics, 3-dimensional graphics, and hidden line problem. Prerequisites: CSE 310; MAT 342.

**CSE 471 Introduction to Artificial Intelligence.** (3) F, S

State space search, heuristic search, games, knowledge representation techniques, expert systems, and automated reasoning. Prerequisites: CSE 240, 310.

**CSE 473 Nonprocedural Programming Languages.** (3) S

Functional and logic programming using languages like Lucid and Prolog. Typical applications would be a Screen Editor and an Expert System. Prerequisite: CSE 355.

**CSE 476 Introduction to Natural Language Processing.** (3) F

Principles of computational linguistics, formal syntax, and semantics, as applied to the design of software with natural (human) language I/O. Prerequisite: CSE 310 or instructor approval.

**CSE 477 Introduction to Computer-Aided Geometric Design.** (3) F, S

Introduction to parametric curves and surfaces, Bezier and B-spline interpolation, and approximation techniques. Prerequisites: CSE 210, 470; MAT 342.

**CSE 507 Virtual Reality Systems.** (3) S

Computer generated 3D environments, simulation of reality, spatial presence of virtual objects, technologies of immersion, tracking systems. Lecture, lab. Prerequisite: CSE 408 or 470 or 508 or instructor approval.

**CSE 508 Digital Image Processing.** (3) S

Digital Image fundamentals, image transforms, image enhancement and restoration techniques, image encoding, and segmentation methods. Prerequisite: EEE 303 or instructor approval.

**CSE 510 Advanced Database Management.** (3) F, S

Advanced data modeling, deductive databases, object-oriented databases, distributed and multidatabase systems; emerging database technologies. Prerequisite: CSE 412.

**CSE 512 Distributed Databases.** (3) A

Fragmentation design. Query optimization. Distributed joins. Concurrency control. Distributed deadlock detection. Prerequisite: CSE 510.

**CSE 513 Deductive Databases.** (3) F

Logic as a data model. Query optimization emphasizing the top-down and bottom-up evaluation of declarative rules. Prerequisite: CSE 510.

**CSE 514 Object-Oriented Database Systems.** (3) A

Object-oriented data modeling, database and language integration, object algebras, extensibility, transactions, object managers, versioning/configuration, active data, nonstandard applications. Research seminar. Prerequisite: CSE 510.

**CSE 517 Hardware Design Languages.** (3) F

Introduction to hardware design languages. Modeling concepts for specification, simulation, and synthesis. Prerequisite: CSE 423 or EEE 425 or instructor approval.

**CSE 518 Synthesis with Hardware Design Languages.** (3) N

Modeling VLSI design in hardware design languages for synthesis. Transformation of language-based designs to physical layout. Application of synthesis tools. Prerequisite: CSE 517.

**CSE 520 Computer Architecture II.** (3) F

Computer architecture description languages, computer arithmetic, memory-hierarchy design, parallel, vector, and multiprocessors, and input/output. Prerequisites: CSE 420, 430.

**CSE 521 Microprocessor Applications.** (4) S

Microprocessor technology and its application to the design of practical digital systems. Hardware, assembly language programming, and interfacing of microprocessor-based systems. Lecture, lab. Prerequisite: CSE 421.

**CSE 523 Microcomputer Systems Software.** (3) F

Developing system software for a multiprocessor, multiprogramming, microprocessor-based system using information and techniques presented in CSE 421, 422. Prerequisite: CSE 422.

**CSE 526 Parallel Processing.** (3) N

Real and apparent concurrency. Hardware organization of multiprocessors, multiple computer systems, scientific attached processors, and other parallel systems. Prerequisite: CSE 330 or 423.

**CSE 530 Operating System Internals.** (3) F

Implementation of process management and synchronization, system call and interrupt handling, memory management, device drivers and file systems in UNIX. Prerequisites: CSE 430; knowledge of C language.

**CSE 531 Distributed and Multiprocessor Operating Systems.** (3) N

Distributed systems architecture, remote file access, message-based systems, object-based systems, client/server paradigms, distributed algorithms, replication and consistency, and multiprocessor operating systems. Prerequisite: CSE 530 or instructor approval.

**CSE 532 Advanced Operating System Internals.** (3) F

Memory, processor, process and communication management, and concurrency control in the Windows NT multiprocessor and distributed operating system kernels and servers. Prerequisite: CSE 530 or instructor approval.

**CSE 534 Advanced Computer Networks.** (3) F

Advanced network protocols and infrastructure, applications of high-performance networks to distributed systems, high-performance computing and multimedia domains, special features of networks. Prerequisite: CSE 434.

**CSE 536 Theory of Operating Systems.** (3) S

Protection. Communication and synchronization in distributed systems, distributed file systems, deadlock theory, virtual memory theory, and uniprocessor and multiprocessor thread management. Prerequisite: CSE 430.

**CSE 540 Compiler Construction II.** (3) S

Formal parsing strategies, optimization techniques, code generation, extensibility and transportability considerations, and recent developments. Prerequisite: CSE 440.

**CSE 545 Programming Language Design.** (3) N

Language constructs, extensibility and abstractions, and runtime support. Language design process. Prerequisite: CSE 440.

**CSE 550 Combinatorial Algorithms and Intractability.** (3) N

Combinatorial algorithms, nondeterministic algorithms, classes P and NP, NP-hard and NP-complete problems, and intractability. Design techniques for fast combinatorial algorithms. Prerequisite: CSE 450.

**CSE 555 Automata Theory.** (3) N

Finite state machines, pushdown automata, linear bounded automata, Turing machines, register machines, rams, and rasps; relationships to computability and formal languages. Prerequisite: CSE 355.

**CSE 556 Expert Systems.** (3) S

Knowledge acquisition and representation, rule-based systems, frame-based systems, validation of knowledge bases, inexact reasoning, and expert database systems. Prerequisite: CSE 471.

**CSE 560 Software Engineering.** (3) F, S

Software engineering foundations, formal representations in the software process; use of formalisms in creating a measured and structured working environment. Lecture, lab. Prerequisite: CSE 360.

**CSE 562 Parallel and Distributed Software Engineering.** (3) A

Software engineering characteristics particular to parallel and distributed systems. Tools and techniques to support software engineering involving parallel processing and distributed systems. Prerequisite: CSE 560.

**CSE 563 Software Requirements and Specification.** (3) A

Examination of the definitional stage of software development; analysis of specification representations, formal methods, and techniques emphasizing important application issues. Prerequisite: CSE 560.

**CSE 564 Software Design.** (3) A

Examination of software design issues and techniques. Includes a survey of design representations and a comparison of design methods. Prerequisite: CSE 560.

**CSE 565 Software Verification, Validation, and Testing.** (3) A

Test planning, requirements-based and code-based testing techniques, tools, reliability models, and statistical testing. Prerequisite: CSE 560.

**CSE 566 Software Project, Process, and Quality Management.** (3) A

Project management, risk management, configuration management, quality management, and simulated project management experiences. Prerequisite: CSE 560.

**CSE 570 Advanced Computer Graphics I.** (3) F

Hidden surface algorithms, lighting models, and shading techniques. User interface design. Animation techniques. Fractals and stochastic models. Raster algorithms. Prerequisite: CSE 470.

**CSE 571 Artificial Intelligence.** (3) S

Definitions of intelligence, computer problem solving, game playing, pattern recognition, theorem proving, and semantic information processing; evolutionary systems; heuristic programming. Prerequisite: CSE 471.

**CSE 573 Advanced Computer Graphics II.** (3) S

Modeling of natural phenomena: terrain, clouds, fire, water, and trees. Particle systems, deformation of solids, antialiasing, and volume visualization. Lecture, lab. Prerequisite: CSE 470.

**CSE 574 Planning and Learning Methods in AI.** (3) F

Reasoning about time and action, plan synthesis and execution, improving planning performance, applications to manufacturing intelligent agents. Prerequisite: CSE 471 or equivalent.

**CSE 575 Decision-Making Strategies in AI.** (3) S

Automatic knowledge acquisition, automatic analysis/synthesis of strategies, distributed planning/problem solving, causal modeling, predictive human-machine environments. Prerequisite: CSE 471 or 571 or equivalent.

**CSE 576 Topics in Natural Language Processing.** (3) S

Comparative parsing strategies, scoping and reference problems, nonfirst-order logical semantic representations, and discourse structure. Prerequisite: CSE 476 or instructor approval.

**CSE 577 Advanced Computer-Aided Geometric Design I.** (3) F  
General interpolation; review of curve interpolation and approximation; spline curves; visual smoothness of curves; parameterization of curves; introduction to surface interpolation and approximation. Prerequisites: CSE 470 and 477 or instructor approval.

**CSE 578 Advanced Computer-Aided Geometric Design II.** (3) S  
Coons patches and Bezier patches; triangular patches; arbitrarily located data methods; geometry processing of surfaces; higher dimensional surfaces. Prerequisites: CSE 470 and 477 or instructor approval.

**CSE 579 NURBs: Nonuniform Rational B-Splines.** (3) S

Projective geometry, NURBs-based modeling, basic theory of conics and rational Bezier curves, rational B-splines, surfaces, rational surfaces, stereographic maps, quadrics, IGES data specification. Prerequisites: CSE 470, 477.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Construction

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Director

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### PROFESSORS

BADGER, MULLIGAN

### ASSOCIATE PROFESSORS

BASHFORD, ERNZEN, KASHIWAGI, WEBER

### ASSISTANT PROFESSORS

CHASEY, WALSH, WIEZEL

### VISITING EMINENT SCHOLAR

SCHEXNAYDER

## MASTER OF SCIENCE

The faculty in the Del E. Webb School of Construction offer a graduate program leading to the M.S. degree in Construction. Concentrations are available in construction science, facilities, and management. The interdisciplinary nature of the program allows a candidate's program of study to reflect both individual interests and career goals.

The primary objective of the program is to allow students with a baccalaureate degree in construction or a related field such as architecture, business, or engineering to broaden and improve their professional capabilities in construction. The program is designed to meet the growing need for professionals with advanced technical, management, and applied research skills in the construction industry.

The *construction science* concentration allows students with interest in field engineering or supervision of heavy and industrial construction projects to pursue a more technically oriented course of study. The *facilities* concentration (emphasizing facilities management) supports the needs of the student desiring a career in the maintenance, operation, renovation, or decommissioning of existing facilities. The *management* concentration (emphasizing construction management) allows students seeking upper-level management positions in various sectors of the construction industry to improve their competency in project, program, and company management areas.

**Admission Requirements.** Applicants are expected to satisfy all requirements for admission to the Graduate College. In addition, applicants are expected to be competent in basic construction topics. Admission is based upon an evaluation of the student's academic background and industrial experience. Applicants with deficiencies may be required to complete course work beyond that required for the program of study. Students whose native language is not English must also submit a Test of English as a Foreign Language (TOEFL) score of at least 550.

**Program of Study.** As soon as possible after selecting the student's supervisory committee, a program of study must be filed with the Graduate College. The program may include course work from the colleges of Architecture and



Environmental Design, Business, Engineering and Applied Sciences, and Public Programs.

The program of study consists of the following: thesis option—30 semester hours of graduate study culminating in a thesis and an oral defense; or nonthesis option—36 semester hours of graduate study culminating in an oral and written comprehensive examination.

Each program is tailored to meet individual needs based on the student's experience, strengths, and goals. Typically a thesis-based program of study includes 12 semester hours of core requirements, 12 semester hours of electives selected to reinforce an area of interest, and six semester hours of thesis. In the thesis option, an oral examination in defense of the thesis is required.

The nonthesis program of study includes 12 semester hours of core requirements, 12 semester hours of electives selected to reinforce an area of interest, nine semester hours of concentration development electives, and three semester hours of research. In the nonthesis option, the comprehensive exam content is developed from selected course work and includes both oral and written components.

## RESEARCH ACTIVITY

Applied research is an integral part of the M.S. degree in Construction. School faculty and current facilities are adequate for a wide range of research activities related to the construction industry. Students and their Supervisory Committee select research topics of mutual interest. Research may then be completed through normal research methods with guidelines from the committees.

## CONSTRUCTION (CON)

### CON 424 Structural Design. (3) F, S

Economic use of concrete, steel, and wood in building and engineered structures. Design of beams, columns, concrete formwork, and connections. Lecture, field trips. Prerequisite: CEE 310.

### CON 453 Construction Labor Management. (3) F, S

Labor and management history, union, and open shop organization of building and construction workers; applicable laws and government regulations; goals, economic power, jurisdictional disputes, and grievance procedures. Lecture, lab. Prerequisites: CON 371; ECN 112.

### CON 455 Construction Project Management. (3) F, S

Study of methods coordinating people, equipment, materials, money, and schedule to complete a project on time and within approved cost. Lecture, class projects. Pre- or corequisite: CON 495.

### CON 463 Foundations. (3) F, S

Subsurface construction theory and practice for description, excavations, exploration, foundations, pavements, and slopes. Evaluation of specifications and plans of work. Lecture, recitation, field trips. Prerequisites: CEE 450; CON 424.

### CON 468 Mechanical and Electrical Estimating. (3) F

Analysis and organization of performing a cost estimate for both mechanical and electrical construction projects. Computer usage. Prerequisites: CON 273 and 345 and 383 or instructor approval.

### CON 472 Development Feasibility Reports. (3) F, S

Integration of economic location theory, development cost data, market research data, and financial analysis into a feasibility report. Computer orientation. Prerequisite: REA 394 ST: Real Estate Fundamentals. *General Studies: L2.*

### CON 477 Residential Construction Business Practices. (3) S

Topics addressed will include development, marketing, financing, legal issues, and sales. Prerequisite: CON 377 or instructor approval.

### CON 483 Advanced Building Estimating. (3) F, S

Concepts of pricing and markup, development of historic costs, life cycle costing, change order and conceptual estimating, and emphasizing microcomputer methods. Prerequisite: CON 383.

### CON 486 Heavy Construction Estimating. (3) F

Methods analysis and cost estimation for construction of highways, bridges, tunnels, dams, and other engineering works. Lecture, field trips. Prerequisites: CON 344, 383.

### CON 495 Construction Planning and Scheduling. (3) F, S

Various network methods of project scheduling, such as AOA, AON Pert, bar-charting, line-of-balance, and VPM techniques. Microcomputers used for scheduling, resource allocation, and time/cost analysis. Lecture, lab. Prerequisites: CON 383; STP 226. Pre- or corequisite: CON 389. *General Studies: N3.*

### CON 496 Construction Contract Administration. (3) F, S

Survey administrative procedures of general and subcontractors. Study documentation, claims, arbitration, litigation, bonding, insurance, and indemnification. Discuss ethical practices. Lecture, field trips. Prerequisites: COM 225; senior standing. *General Studies: L2.*

### CON 533 Strategies of Estimating and Bidding. (3) F

Course will explore advanced concepts of the estimating process, such as modeling and statistical analysis, to improve bid accuracies. Prerequisite: CON 483 or 486 or instructor approval.

### CON 540 Construction Productivity. (3) F

Productivity concepts. Data collection. Analysis of productivity data and factors affecting productivity. Means for improving production and study of productivity improvement programs. Pre- or corequisite: CON 495.

### CON 543 Construction Equipment Engineering. (3) S

Analysis of heavy construction equipment productivity using case studies. Applies engineering fundamentals to the planning, selection, and utilization of equipment. Lecture, case studies.

### CON 545 Construction Project Management. (3) S

Theory and practice of construction project management. Roles of designer, owner, general contractor, and construction manager. Lecture, field trips. Pre- or corequisite: CON 495.

### CON 547 Strategic Planning. (3) F

The business planning process of the construction enterprise. Differences between publicly held and closely held businesses and their exposure.

### CON 561 International Construction. (3) S

An investigation of the cultural, social, economic, political, and management issues related to construction in foreign countries and remote regions.

### CON 577 Construction Systems Engineering. (3) S

Models of construction operations, alternatives for structuring information flows and the control of projects, applications of information technology in construction. Prerequisite: instructor approval.

### CON 589 Construction Company Financial Control. (3) F

Financial accounting and cost control at the company level in construction companies. Accounting systems. Construction project profit calculations. Financial analysis. Lecture, case studies.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Counseling

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### MASTER OF COUNSELING

The Master of Counseling degree is a two-year, 60-semester-hour professional degree that prepares counselors for a number of settings, including schools, colleges, and universities, organizational settings, and a variety of mental health agencies. The M.C. program, which focuses on community counseling, is accredited by CACREP (Council for the Accreditation of Counseling and Related Educational Programs).

Applicants to the M.C. degree must submit all application materials by February 15 to be considered for admission for the following academic year.

**Purpose.** The two-year (60-semester-hour minimum) program leads to the professional degree Master of Counseling (M.C.). The M.C. program which focuses on community counseling is accredited by the Council for the Accreditation of Counseling and Related Educational Programs (CACREP). This program is designed to prepare students for counseling as a profession, and it includes a set of required professional studies supported by elective subjects in related disciplines. Both practitioner and research options are available.

The M.C. degree identifies the recipient as a professional counselor and prepares individuals to work in a variety of human service fields. Certified teachers who complete this degree are eligible for school counselor certification in Arizona and most other states.

**Admission.** A student initiates application for admission to the M.C. degree program with the Graduate College. Admission is determined by a variety of criteria in addition to GPAs. Applications are accepted any time but must be completed before February 15 for admission for the following fall semester. The number of students admitted to the M.C. degree program is limited by the size of the faculty and the facilities available for practica. For more information, applicants should consult the Division of Psychology in Education.

**Supervisory Committee.** Following admission to the M.C. program, a supervisory committee consisting of a chair and two other faculty members are appointed to plan a program of study with the student and to prepare, administer, and evaluate the final examination(s).

**Program of Study.** The program of study should be planned in consultation with the supervisory committee. Candidates for the M.C. degree must complete COE 501 Introduction to Research and Evaluation in Education. In addition to course work, the program may include supervised practica in consultation, individual and group counseling, marriage and family counseling, and stress management. These experiences involve a variety of client populations. The program of study must be approved by the supervisory committee, the division director, and the dean of the Graduate College.

**Credit Before Admission.** A maximum of 32 semester hours of graduate course work earned in a completed master's degree from an accredited institution may be applied to the program. In all other circumstances, a maximum of nine semester hours of prior course work may be applied to the M.C. degree program.

**Final Examinations.** Students in the practitioner option are required to take a final written comprehensive examination or prepare a final written paper.

Students in the research option are required to complete a thesis. An oral examination in defense of the thesis is also required.

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## Counseling Psychology

Elsie Moore

Director

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### PROFESSORS

BERNSTEIN, CLAIBORN, HACKETT, HORAN, KERR,  
KURPIUS, McWHIRTER

### ASSOCIATE PROFESSOR

KINNIER

### ASSISTANT PROFESSORS

MATTHEWS, OTA-WANG

### CLINICAL ASSOCIATE PROFESSOR

HOMER

### DOCTOR OF PHILOSOPHY

The faculty in the Division of Psychology in Education offer a graduate program leading to the Ph.D. degree in Counseling Psychology. The Ph.D. program in Counseling Psychology is accredited by the American Psychological Association. The Ph.D. program adheres closely to the scientist-practitioner model in preparing graduates for positions in academic and psychological service settings. Although faculty interests are diverse, there is a strong emphasis on empirical data as the basis for professional decision-making. All applicants must submit scores of the Graduate Record Examination and submit all application materials by January 15 to be considered for admission for the following academic year.

Curriculum requirements of the Counseling Psychology program include course work from several domains (general psychology core, empirical foundations, and counseling theory and methods) as well as practicum and internship experiences. Comprehensive examinations cover the psychology core, empirical foundations, and counseling theory and practice. Moreover, candidates for the doctorate must complete a College of Education core course, COE 501 Introduction to Research and Evaluation in Education. See the section below "Courses," page 176, for a listing. Applicants should contact the Division of Psychology in Education and request the *Counseling Psychology Program* brochure for a complete description of admissions and curricular requirements.

### RESEARCH ACTIVITY

In addition to conducting research in career development and self-efficacy, faculty and students are involved in a variety of other projects, including school-based drug abuse prevention, adolescent suicide prevention, problem-solving and decision making, interpersonal and counselor skill development, professional ethics, small group process, consultation, the counseling process, counseling the gifted and talented, health psychology, and specialized problems of women and minorities. Behavioral health topics, including

smoking, eating disorders, cancer, arthritis, pain control, cognitive, and stress and burnout are also studied.

### COUNSELING PSYCHOLOGY (CPY)

**CPY 613 Child Counseling.** (3) N

Applications of counseling theory in working with children in clinics and elementary schools. Integrated practicum available with instructor approval. Prerequisite: CED 577 or equivalent.

**CPY 622 Group Counseling.** (3) F, S

Theories and methodologies used in group counseling. Prerequisites: CED 567 and 577 or equivalents.

**CPY 634 Organizational Development and Planned Change.** (3) N  
Organizational/individual dynamics, including theory, analysis, techniques, and consultation/intervention strategies used in organizational development. Field consultation projects. Prerequisites: CED 567 and 577 or equivalents.

**CPY 644 Psychology of Careers.** (3) S

Advanced career counseling, including theory, research, and practice. Prerequisite: CED 577 or equivalent.

**CPY 645 Professional Issues and Ethics.** (3) F, S

Ethical, legal, and professional issues of concern to practitioners and researchers functioning in a variety of settings. Prerequisites: CED 512 and 523 or equivalents.

**CPY 667 Patterns of Behavior Disorders.** (3) A

Etiology and treatment of a variety of psychological problems, particularly those represented in DSM III-R. Prerequisite: CED 577 or equivalent.

**CPY 671 Multicultural Counseling.** (3) F

Provides awareness of the influence of sociocultural variables on human development and explores implications for counseling minority populations.

**CPY 672 Human Diversity: Social Psychological Perspectives.** (3) A

Implications for psychological practice of social, psychological, and biological factors in the development of behavioral differences.

**CPY 674 Counseling Women.** (3) F

Explores women's development and its implications for counseling. Sexism in mental health, sex differences in diagnosis and psychopathology, and women's particular treatment needs.

**CPY 675 Counseling Interventions in Stress Management.** (3) N

Theory, procedures, and application of stress management techniques, including biofeedback, meditation, relaxation, autogenic therapy, visualization, and imagery. Prerequisites: CED 577 or equivalent; instructor approval.

**CPY 677 Advanced Counseling.** (3) N

Advanced topics in counseling theory, research, and practice. Prerequisite: CED 577 or equivalent.

**CPY 679 History and Systems of Psychology.** (3) A

Examination of the development and differentiation of the discipline of psychology from its origins in philosophy to the present.

**CPY 701 Science and Practice of Counseling Psychology.** (3) F

Directed experiences involving the integration of theory, research, and practice in counseling psychology. Prerequisite: instructor approval.

**CPY 702 Research Methods in Counseling Psychology.** (3) A

The application of experimental and/or quasi-experimental methods to theory construction and treatment evaluation in counseling psychology. Prerequisite: COE 502 or equivalent.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Counselor Education

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### PROFESSORS

BERNSTEIN, CABIANCA, CLAIBORN, HACKETT, HORAN, KERR, KURPIUS, McWHIRTER

### ASSOCIATE PROFESSORS

ARCINIEGA, BROWN, HOOD, KINNIER, SHELL

### ASSISTANT PROFESSORS

FISHER, MATTHEWS, OTA-WANG

### CLINICAL ASSOCIATE PROFESSOR

HOMER

The faculty in the Division of Psychology in Education offer graduate programs leading to the Master of Counseling and Master of Education degrees in Counselor Education.

### MASTER OF EDUCATION

The M.Ed. degree in Counselor Education is designed for teachers seeking a greater understanding of student behavior and information regarding pupil personnel services. This program requires 30 semester hours of graduate course work. Candidates for the M.Ed. degree must complete the College of Education core for master's students, which amounts to nine semester hours. The core courses are COE 501, 504, and 505. See "Courses," page 176. All applicants must submit scores of the Graduate Record Examination or the Miller Analogies Test.

Applicants to the M.Ed. degree must submit all application materials by October 15 or April 15 to be considered for the following semester. Students who complete the M.Ed. degree in Counselor Education and who wish to be certified as school counselors may apply to the program area for admission to an additional sequence of 18 semester hours

See "Master of Education," page 174, for more information.

### RESEARCH ACTIVITY

Counselor Education faculty are engaged in the study of various topics, including counselor training, student development, gerontological counseling, ethics and professional issues, marriage and family counseling, the counseling process, counseling the gifted and talented, career development, and at-risk youth.

### COUNSELOR EDUCATION (CED)

**CED 512 Introduction to Helping Relationships and Community Counseling.** (3) F, S, SS

Introduction to the skills used in the helping professions and an examination of the settings in which they occur.

**CED 522 Personality Development.** (3) F, S, SS

Interaction of affective and cognitive factors in personality development at different age levels. Various personality theories examined.

**CED 523 Psychological Tests.** (3) F, S, SS

Standardized tests in the study of the individual, with emphasis on test score interpretation in counseling.

**CED 534 Occupations and Careers.** (3) F, S, SS

The world of work, career development, education, and training for occupational entry and mobility.

**CED 545 Analysis of the Individual.** (3) F, S, SS

Theory and methods commonly used in studying the individual. Observational methods, diagnostic interviews, structured, and semi-structured methods for assessing personality. Pre- or corequisite: CED 523.

**CED 567 Group Procedures.** (3) F, S, SS

Social psychological factors determining interaction, effectiveness, and morale in small groups. Techniques of observation, assessment, and leadership.

**CED 577 Counseling.** (3) F, S, SS

Principles and application of counseling with particular emphasis on counseling theories. Prerequisites: CED 512, 534, 545; admission to M.C. or school counselor certification program.

**CED 655 Student Development Programs in Higher Education.** (3) A

Emerging conceptual models of student development. Overview of student personnel and student affairs programs in community colleges, four-year colleges, and universities. Observation on campuses.

**CED 656 The American College Student.** (3) S

Provides overview of American college student from demographic, background characteristics and values/attitudes/perspectives. Includes access, persistence, and degree completion. Lecture, group discussion, and research projects. Cross-listed as HED 679. Credit is allowed for only CED 656 or HED 679. Prerequisite: CED 510.

**CED 672 Marriage and Family Counseling I.** (3) F

Introduction to marriage and family counseling theories. Emphasis is on a systems-communication model utilizing cocounseling.

**CED 681 Supervised Practice.** (3) F, S

Supervised experiences in schools or community agencies. Prerequisite: instructor approval.

**CED 684 Internship in Community Counseling.** (3–6) F, S, SS

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

in the College of Liberal Arts and Sciences and the Department of Theatre in the College of Fine Arts.

**MASTER OF FINE ARTS**

One of the unique features of this interdisciplinary program is that, because it utilizes faculty research, creative activity, and teaching interests of two academic units, a student may tailor a course of study to fit individual needs, talents, and goals. The Department of English administers the program and reviews the applications for admission. In the English Department, the studio/academic program requires poets and prose writers to divide work equally between writing workshops and literature courses. This flexible curriculum allows candidates time to study with several gifted writers and scholars in a stimulating atmosphere, time to get quality advice on writing, and time to explore and develop their talents. In the Department of Theatre, the studio/academic program emphasizes the collaborative process of playwriting. Working with actors and directors, playwrights' workshops include informal readings, staged readings and workshop production of students' plays.

**Admission.** In addition to meeting the general requirements of the Graduate College, applicants must have an undergraduate major in English or Theatre, with a GPA of 3.00 or above. Applicants who do not have an undergraduate major in English or Theatre may be admitted provisionally, on the condition that they make up deficiencies in course work. Deficiencies in undergraduate preparation may be removed while pursuing the M.F.A. degree; courses taken to remove deficiencies may not be counted toward the degree. Applicants must also submit the following:

1. an acceptable score on the Miller Analogies Test or the Graduate Record Examination (GRE);
2. three letters of recommendation;
3. a professional résumé; and
4. a statement of career goals, including the designation of an area of specialization (options include fiction, poetry, and playwriting) and a manuscript sample of one of the following: 30 pages of drama; 20 pages of poetry; 30 pages of prose fiction or creative nonfiction; or 40 total pages of work in two of these literary forms.

**Selection Procedures.** Completed application forms should be sent directly to the Graduate College. All other materials and manuscripts, including the teaching assistant application form, should be submitted to the Department of English by February 1. The Creative Writing Committee reviews the materials and manuscripts and makes recommendations for admission by March 15. Guidelines for admission recommendations used by the committee include the following: applicant's academic record and capabilities for successful graduate study; talent and promise demonstrated in the manuscript sample; strength of letters of recommendation; quality of applicant's undergraduate background; and compatibility of the applicant's career goals with the purpose of the degree program.

**Program of Study.** In poetry and fiction, the program of study requires a minimum of 48 semester hours of graduate credit approved by the student's supervisory committee, the director of the Creative Writing Committee, and the dean of the Graduate College. Of these, 24 semester hours must be

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## Creative Writing

### Interdisciplinary Master's Program

Jewell Parker Rhodes

*Director, Executive Committee*

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#### English

Regents' Professors: Dubie, Rios;  
Professors: Boyer, Carlson, Rhodes;  
Associate Professors: Goldberg, Savard;  
Assistant Professor: Pritchard

#### Theatre

Professors: Bedard, Mason;  
Associate Professors: Edwards, Engel;  
Assistant Professor: Reyes

Faculty of the Creative Writing Committee offer an interdisciplinary Master of Fine Arts degree in Creative Writing. The program is offered jointly by the Department of English

creative writing courses and must include nine hours of ENG 580, nine hours of ENG 455, 594, or 598. The course 594 Conference and Workshop may be taken twice to varied offerings. The literature component of 24 hours must include ENG 591 and two of the following courses: ENG 441, 443, 454, 457, and 458. In playwriting, the program of study requires a minimum of 60 hours of graduate credit approved by the student's supervisory committee, the director of the Creative Writing Committee, and the dean of the Graduate College. The program of study must include the following: THP 519 (6 hours), 560 (15 hours), 561 (3 hours), 598 (3 hours), and 693 (9 hours). The literature component of 24 hours must include THE 500, 504, 505, 520, 521, and 562.

**Credit Before Admission.** Subject to the recommendation of the supervisory committee, students with a completed M.A. or Ph.D. degree in English or Theatre may have up to 15 hours of literature credit applied to the M.F.A. program of study. A maximum of nine hours taken before admission and not as part of a completed degree at ASU and/or another institution may be used to fulfill degree requirements. All course work for the degree must be completed within the six-year time limit.

**Comprehensive Examinations.** A final written comprehensive examination is required and is scheduled once in each semester and once during the summer. Upon completion of course work, the student is required to take the written examination. Official application is made through the Graduate College. The student is also required to notify the Creative Writing Committee of intent to take the examination at least 30 days in advance. A student is not eligible to apply for the written examination until a program of study has been filed. If the candidate fails the examination, a re-examination may be administered no sooner than three months and no later than one year from the date of the original examination. Permission for re-examination must be obtained from the student's supervisory committee, the director of the Creative Writing Committee, and the dean of the Graduate College. Only one re-examination is permitted. Students are examined in the following areas:

1. 20th-Century American Writers: Modern Period;
2. 20th-Century Writers: Contemporary Period; and
3. 20th-Century Critical Theory.

Playwrights are examined in the following areas: (1) European and American Drama and (2) Dramatic Theory and Criticism. The examination is constructed and graded by members of the Creative Writing Examination Committee.

**Practicum and Performance Requirements.** ENG 580 or THP 693 Practicum is required of all students in the program. For nine semester hours of credit, the student creates a book-length volume of poetry, short stories, novel, drama, translation, or creative nonfiction (except literary criticism). This project must be approved in advance by the student's supervisory committee on the basis of sample pages and a summary of the proposal. The supervisory committee must evaluate and approve the final project. As the last requirement for the degree, the candidate must read or perform

from the practicum project before students and members of the faculty.

## RESEARCH AND SCHOLARLY ACTIVITY

Research and scholarly endeavors inform the creative work of the faculty, which includes publication of poetry, fiction, and drama; collaborative production with musicians, fine printers, and visual artists. Special research courses are offered on contemporary perspectives emphasizing such topics as "Magical Realism," "The Long Poem," "Pedagogy Forum for Creative Writers," "The Literature of Obsession," "Sexing the Modern," "Internship for Community Outreach," "Literary Management for Theatre," and other multigenre literature and writing courses.

Research and creative activity is enhanced by vigorous faculty and student involvement in producing a national literary magazine, *Hayden's Ferry Review*, an ASU student publication. Creative writing faculty and graduate students participate in public outreach programs, including workshops at ASU for adults and high school students in rural and metropolitan areas of the region. Public lectures and readings by faculty members, original play productions and reader's theatre, and a regular series of public readings, lectures and conferences featuring writers of national renown provide a forum for exchange among artist, audience, scholar, and student. Recent conferences, with support from the National Endowment for the Arts and other agencies, have brought together writers, editors, and publishers, focusing attention on issues in publishing creative work.

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## Curriculum and Instruction

Nicholas Appleton  
*Director*

Robert B. Rutherford Jr.  
*Graduate Director*  
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### PROFESSORS

BAKER, BARONE, BITTER, CHRISTIE, EDELSKY, FAAS, FALTIS, FLORES, GREATHOUSE, GRYDER, GUZZETTI, HUDELSON, McISAAC, PRIETO, RUTHERFORD, SEARFOSS, STAHL, STALEY, ZUCKER

### ASSOCIATE PROFESSORS

ANDERSON, ARIAS, BENAVIDES, BLUMENFELD-JONES, COHEN, COHN, DI GANGI, GOMEZ, KNAUPP, McCOY, MCGOWAN, MIDDLETON, J.C. NELSON, J.R. NELSON, PIBURN, RADER, SURBECK, VALLEJO

### ASSISTANT PROFESSORS

ANIJAR, BRUSH, FLEMISTER, LAMOREY, MacSWAN, ROBERTS, TRUJILLO, YOUNG

The faculty of the Division of Curriculum and Instruction offer the Master of Arts, Master of Education, and Doctor of Education degree programs in Curriculum and Instruction.

The Ph.D. degree in Curriculum and Instruction is offered by the Interdisciplinary Committee on Curriculum and Instruction. See “Curriculum and Instruction Interdisciplinary Doctoral Program,” page 164, for information regarding the Ph.D. curriculum.

Graduate-level endorsement programs in bilingual education, English as a second language, and reading are available and may be completed in conjunction with a M.Ed. or the Postbaccalaureate Program for Teacher Certification.

M.A., M.Ed., and Ed.D. students majoring in Curriculum and Instruction complete requirements by choosing one of the following concentrations: bilingual education, communication arts, early childhood education, elementary education, English as a second language, Indian education, mathematics education, multicultural education (currently applications are not being accepted), reading education, science education, secondary education, and social studies education. An additional concentration in curriculum studies is available in the Ed.D. program.

**Admission.** Applicants for admission to the M.Ed. and M.A. degrees are required to

1. meet Graduate College requirements for admission,
2. provide letter of intent that includes a statement of purpose and a summary of the applicant’s professional teaching experience,
3. provide proof of teacher certification (photocopy of the certificate[s] held), and
4. provide three letters of recommendation.

Applicants who have junior-senior GPAs of 3.00 or higher, have an acceptable application package, and have proof of teacher certification are not required to take the Graduate Record Examination or Miller Analogies Test. Applicants who do not meet this minimum GPA requirement should contact the Division of Curriculum and Instruction graduate programs office for more information.

For admission to the Ed.D. degree, contact the Division of Curriculum and Instruction graduate programs secretary for information regarding specific test scores and materials that need to be submitted with applications.

Applicants should note that meeting minimal admissions requirements does not guarantee admission. In addition, international students are required to submit Test of English as a Foreign Language scores.

**Programs of Study.** The M.Ed. degree requires 30 semester hours of graduate course work and completion of a culminating activity. Students have two options for a culminating activity: either an applied project and an oral defense or a written comprehensive exam. Students should meet with their advisor early in their program to discuss the culminating activity.

The M.A. degree requires a minimum of 30 semester hours of graduate course work, including a thesis. An oral examination in defense of the thesis is required.

Candidates for the Ed.D. degree are required to complete at least 90 hours of graduate course work and research and dissertation credit.

**Endorsements.** The Arizona Reading endorsement requires 18 semester hours of upper-division or graduate-level course work in reading. The teaching endorsements in bilingual education and English as a second language require 21

semester hours and the middle school endorsement requires six semester hours of upper-division or graduate course work in middle level education along with student teaching within fifth through ninth grades or one year of verifiable, full-time teaching experience within fifth through ninth grades. A valid Arizona teaching certificate is required to secure each of the above endorsements. Those interested in qualifying for one of these endorsements should seek advising from a faculty member in the program area.

#### **Postbaccalaureate Program for Teacher Certification.**

The postbaccalaureate initial teacher certification program offers, to those who have completed baccalaureate degrees outside the College of Education, course work needed to qualify for Arizona teacher certification. Postbaccalaureate programs are offered in bilingual education, early childhood education, elementary education, secondary education, and special education. Concurrent postbaccalaureate teacher certification and admission to the M.Ed. program in special education is required for those seeking certification by the State of Arizona. This requirement is waived for Postbaccalaureate Program for Teacher Certification applicants in special education who have already completed a master’s degree.

Two options are provided to Postbaccalaureate Program for Teacher Certification students in bilingual education, English as a second language, early childhood education, elementary education, and secondary education: (1) a non-degree option leading to teacher certification only and (2) a joint certification/master’s degree option leading to completion of certification requirements and an M.Ed. degree.

A maximum of nine semester hours completed after receiving a bachelor’s degree and before formal admission to a graduate program may be applied to an M.Ed. or M.A. degree. The maximum time limit for the program of study is six years.

Prospective Postbaccalaureate Program for Teacher Certification students should contact the Office of Student Affairs (EDB 7) for information about specific admission requirements. Those interested in combining preparation for initial teacher certification with pursuing a master’s degree should also contact the Curriculum and Instruction Graduate Programs Office (ED 412).

#### **MASTER OF ARTS**

See “Master’s Degrees,” page 98, for general requirements.

#### **MASTER OF EDUCATION**

Those who are seeking a master’s degree and initial certification by the State of Arizona are admitted concurrently to the respective M.Ed. degree and corresponding Postbaccalaureate Program for Teacher Certification option.

M.Ed. students in the secondary education concentration who are certified teachers may select a general or academic specialization option. Those selecting the academic specialization option complete 15 semester hours of core and secondary education course work and 15 hours in their academic specialization. The 15 hours of course work in the academic area must be selected in consultation with a member of the academic area faculty. This person serves as cochair of the student’s supervisory committee.

## DOCTOR OF EDUCATION

The Doctor of Education program is designed to provide an opportunity for practitioner-scholars to expand their skills and knowledge related to curriculum and instruction. The program produces practitioner-scholars for leadership roles in curriculum, program evaluation, or teacher education and professional development in school. Students will choose one of the curriculum and instruction concentration areas. The program prepares students for comprehending, interpreting, and applying theories, models, and research methods that have application to curriculum and instruction.

See “Doctor of Education,” page 175, for information on the Doctor of Education degree.

## RESEARCH ACTIVITY

The research activity of faculty and graduate students emphasizes the following areas of study.

**Bilingual/Multicultural Education.** Identification, assessment and evaluation of minority language populations; Native American education; parent and community involvement; second language acquisition; literacy/biliteracy development in school settings; sociolinguistics; development and education of children and youth from diverse cultural, linguistic, and racial/ethnic populations; professional preparation in bilingual and English as a second language.

**Early Childhood Education.** Cross-cultural differences in child-rearing expectations and parent-child relations; professional preparation of early childhood education personnel; teacher preparation practices; infant and toddler development; constructivist approaches to content area learning and play education.

**Educational Media and Computers.** The faculty in educational media and computers maintain an active program of research and development that has been supported by funds from federal agencies, private corporations, and the university. General research areas include (1) the design of effective multi-media and computer-based instruction and (2) the effective utilization of multimedia and computers in schools. Students participate in research and development activities as an integral part of their degree programs.

**Elementary Education.** Pedagogical practices in elementary education; policy and sociological concerns; mathematics discourse and instructional methods; outdoor education; school, technology, and society education (STS); science education methods and materials; language learning; sociolinguistics; school-university collaboration; cognition; social studies pedagogy; middle school teaching practices.

**Reading Education.** Development of literacy; children and adolescent literature; discourse analysis; psycholinguistic and sociolinguistic aspects of reading; content area reading; developmental reading; assessment and remediation of reading problems; children’s play and literacy development.

**Secondary Education.** Critical theory; curriculum development; equity and diversity; pedagogical practices in the sciences; social studies education; learning theory; issues and trends in secondary education; business education; essential elements of effective instruction; teacher-student interactions; collaborative instructional techniques.

**Special Education.** Faculty and student research and development activities focus on (1) improving instructional opportunities for exceptional individuals and those at risk for school failure, and (2) increasing the effectiveness of teachers of exceptional and at-risk individuals. Recent research has included the following: academic precocity; the cognitive development, linguistic proficiency, and academic achievement of minority students. Research focused on improving the preparation of teachers has included projects on field-based instruction, violence prevention, academic and behavioral interventions for students with disabilities and those at risk of school failure, and evaluation of alternative forms of technology integration. Program research efforts receive support from federal, state, and private sources.

## BILINGUAL EDUCATION (BLE)

**BLE 511 Introduction to Language Minority Education.** (3) A Historical, philosophical, theoretical, and pedagogical foundations of language minority education in the United States.

**BLE 514 Bilingual/Multicultural Aspects of Special Education.** (3) S

Theories and issues related to the education of bilingual and culturally diverse exceptional children.

**BLE 515 Instructional Methods for Bilingual Students.** (3) F An introduction to general dual language teaching approaches and assessment strategies. Focuses on the effective teaching of limited English proficient populations. Prerequisite: BLE 511.

**BLE 520 ESL For Children.** (3) S

Examines approaches to second language development and assessment for children congruent with recent research in second language acquisition in children. Prerequisite: BLE 511.

**BLE 521 Primary/Elementary Communication Arts in Bilingual Education.** (3) S

Examination of bilingual/biliterate development of elementary school children, bringing together native and second language, oral language, and literacy development findings with educational practices. Prerequisite: BLE 511.

**BLE 522 Literacy/Biliteracy Development.** (3) F

Acquaints teachers with first and second language literacy research, practice, and assessment in elementary school settings (Spanish-English emphasis). Lecture, discussion. Cross-listed as RDG 522. Credit is allowed for only BLE 522 or RDG 522. Prerequisite: BLE 511.

**BLE 524 Secondary Sheltered ESL Content Teaching.** (3) F

Teaching and assessing ESL adolescents in the content areas with an emphasis on integrating language acquisition principles with content learning. Lecture, small group work. Corequisite: BLE 541.

**BLE 528 Social Studies for Bilingual/ESL Teachers.** (3) S

Provides language and instructional methodologies and assessment strategies relevant to bilingual/multicultural students in social studies content delivered in Spanish and English. Prerequisite: BLE 511.

**BLE 533 Literacy in Secondary BLE/ESL Settings.** (3) S

Examines first and second language literacy research, practice, and assessment across content areas in secondary school settings. Lecture, discussion. Cross-listed as RDG 533. Credit is allowed for only BLE 533 or RDG 533. Prerequisite: BLE 511.

**BLE 535 Sociolinguistic Issues in Bilingual Education.** (3) F

Survey of major theoretical issues (e.g., language situations, communicative competence, language attitudes) interrelating language, social processes, and bilingual education. Prerequisite: BLE 511.

**BLE 541 Nature of Bilingualism/Second Language Acquisition.**

(3) A

Bilingual and second language acquisition, with emphasis on children and adolescents. Cognitive, social, and cultural aspects are stressed. Prerequisite: BLE 511.

**BLE 543 Bilingual Education Models.** (3) A

Bilingual education programs in other countries; analysis of political, social, economic, and educational implications; practice in planning bilingual education curricula. See also offerings under MCE, SED, SPE, and SPF. Prerequisite: BLE 511.

**BLE 561 Parent Involvement in Language Minority Education Programs.** (3) F, S

Examines issues, approaches, and strategies for improving parental and community involvement in the schooling of language minority children and youth. Prerequisite: BLE 511.

**BLE 565 Literature for Hispanic Youth/Literatura para Jóvenes Hispanoparlantes.** (3) S

Selecting, analyzing, and utilizing literature for Hispanic and Spanish speaking children and adolescents. Cross-listed as LIS 565. Credit is allowed for only BLE 565 or LIS 565.

**BLE 580 Practicum.** (1–6) F, S

Provides for practical application in school settings of principles of bilingual education or English as a Second Language. Special permission required.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**EARLY CHILDHOOD EDUCATION (ECD)****ECD 501 Interprofessional Collaboration.** (3) F

Dispositions, knowledge, experiences, and skills necessary for interprofessional collaboration required of professionals who work with multineed families with young children. Prepares students to implement effective strategies and workable plans to support interprofessional collaboration for providing integrative services to young children and their families.

**ECD 521 Primary/Elementary Communication Arts in Bilingual Education.** (3) S

Examination of bilingual/biliterate development of elementary school children, bringing together native and second language, oral language, and literacy development findings with educational practices. Prerequisite: BLE 511.

**ECD 522 Developmental Social Experiences in Early Childhood Education.** (3) F

Materials, techniques, aesthetic expression, creative activities, and values in the integrated curriculum.

**ECD 525 Communication Arts in Early Childhood Education.** (3) S

Problems and trends of current programs and oral language development. Effort to bring together language acquisition findings with educational practices. Opportunity for self-directed learning/study.

**ECD 527 Mathematics in Early Childhood Education.** (3) F

Theory and practice in the use of manipulative materials for teaching mathematics to preschool and primary grade children. Prerequisite: ECD 402 or equivalent.

**ECD 544 Play Education.** (3) S, SS

Theories of play and the educational implications of each. Practical applications at the early childhood level.

**ECD 555 Modern Practices in Early Childhood Education.** (3) F, SS

Trends and practices, instructional and resource materials, and methods and techniques in early childhood education.

**ECD 601 Theories and Issues in Early Childhood Education.** (3) F, SS

Current theories and issues in early childhood education. Presents issues of early childhood best practices, policy, theory, research, and evaluation that are of significance to the early childhood professional. Highlights building on the child development conceptual framework as related to theory and practice.

**ECD 733 Social and Emotional Development.** (3) A

Inquiry into the social and emotional development dynamics in children, such as peer relationships, self-concept, and parenting processes, with implications for teachers.

**ECD 744 Evaluative Procedures: Young Children.** (3) S

A critical examination and use of developmentally appropriate evaluative procedures for children from birth through age eight.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**ELEMENTARY EDUCATION (EED)****EED 511 Principles of Curriculum Development.** (3) F, S, SS

Contemporary curriculum theories. Curriculum as an interrelated entity. Principles of conceiving and effecting change.

**EED 526 Communication Arts in the Elementary School.** (3) S, SS

A critical examination of school language arts teaching, focusing on theoretical assumptions regarding oral- and written-language development.

**EED 528 Social Studies in the Elementary School.** (3) F, SS

Problems and trends of current programs. Development of a balanced and articulated program of social studies.

**EED 529 Science in the Elementary School.** (3) S

Problems and trends of current programs. Development of a balanced and articulated science program.

**EED 530 Outdoor/Environmental Education.** (3) SS

Use of various outdoor settings as laboratories for classroom-related experience, study, observation, inquiry, research, and recreation. Includes strategies and materials for developing environmental literacy.

**EED 537 Mathematics in the Elementary School.** (3) F, SS

Contemporary mathematics teaching. Content, materials, and approaches to instruction.

**EED 578 Student Teaching in the Elementary School.** (9–15) F, S

Supervised teaching for postbaccalaureate students, synthesized experience in curriculum, instruction, and classroom management. Prerequisites: completion of 21 hours of identified course work from an approved program of study; a GPA of 2.50 (postbaccalaureate non-degree) or 3.00 (postbaccalaureate degree); approval of the Office of Professional Field Experiences.

**EED 581 Diagnostic Practices in Mathematics.** (3) F, S

Specific skills in diagnosing/treating children's learning difficulties in mathematics. Includes practicum experiences, both on and off campus, in identifying strengths/weaknesses and initial remediation.

**EED 720 Language in Education.** (3) A

Sociolinguistic seminar on language issues in education, including language acquisition, classroom interaction, language attitudes, relation language, and class-gender ethnicity.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**INDIAN EDUCATION (IED)****IED 500 Administration and Management of Indian Education Programs.** (3) A

Emphasis on educational leadership research and practice in the schooling of American Indian students. Effective practices will be examined.

**IED 510 History of American Indian Education.** (3) F, S

Philosophical and historical review of the development of American Indian education policies in both traditional and contemporary society.

**IED 594 Workshop in Indian Education.** (6) SS

Curriculum, pedagogy, community involvement, current issues, and research will be examined.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**LIBRARY SCIENCE (LIS)****LIS 410 Children's Literature.** (3) F, S, SS

Selecting, analyzing, and using modern and classic literature with young readers.

**LIS 510 Computers and Technology in the School Library.** (3) F

Library uses of technology and computers. Fundamental concepts and issues in library media centers. Prerequisites: LIS 571 and 581 or instructor approval.

**LIS 533 Current Library Problems.** (3) F

Critical analysis of current practices and problems in school librarianship. Prerequisites: LIS 540 and 561 and 571 and 581 or instructor approval.

**LIS 540 Classification and Cataloging.** (3) F

Descriptive cataloging and Dewey Decimal Classification of print and nonprint library materials.

**LIS 561 Selection of Library Materials.** (3) F

Principles and procedures used in the selection of materials for the school library.



**LIS 563 Children's Literature.** (3) F, S, SS

Selecting and using children's literature and related nonprint media to support the elementary school curriculum. Cross-listed as RDG 563. Credit is allowed for only LIS 563 or RDG 563.

**LIS 565 Literature for Hispanic Youth/Literatura para Jóvenes Hispanoparlantes.** (3) S

Selecting, analyzing, and utilizing literature for Hispanic and Spanish speaking children and adolescents. Cross-listed as BLE 565. Credit is allowed for only BLE 565 or LIS 565.

**LIS 571 Basic Reference Resources.** (3) S

Providing reference service in the school library. Content and use of basic resources.

**LIS 581 School Library Administration.** (3) S

Administration of K–12 libraries and media centers.

**LIS 584 School Library Internship.** (1–6) F, S

Prerequisites: LIS 410, 540, 561, 571, 581; instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**READING EDUCATION (RDG)****RDG 481 Reading Practicum.** (3) F, S, SS

Application of concepts from RDG 414 in classroom settings. Students demonstrate teaching strategies under supervision. Required for Elementary Education candidates. Corequisites: DCI 396; RDG 414.

**RDG 505 Developmental Reading.** (3) F, S, SS

For classroom and special reading teachers. Specific professional skills in decoding, comprehension, and evaluation. Required for Special Reading Endorsement. Prerequisite: teaching certificate.

**RDG 507 Content Area Literacy.** (3) F, S, SS

Theory, teaching strategies, and practical application concerning learning from text across subject matter disciplines.

**RDG 522 Literacy/Biliteracy Development.** (3) F

Acquaints teachers with first and second language literacy research, practice, and assessment in elementary school settings (Spanish-English emphasis). Lecture, discussion. Cross-listed as BLE 522. Credit is allowed for only BLE 522 or RDG 522. Prerequisite: BLE 511.

**RDG 533 Literacy in Secondary BLE/ESL Settings.** (3) S

Examines first and second language literacy research, practice, and assessment across content areas in secondary school settings. Lecture, discussion. Cross-listed as BLE 533. Credit is allowed for only BLE 533 or RDG 533. Prerequisite: BLE 511.

**RDG 544 Secondary Reading Programs.** (3) S

Examines rationale for secondary reading programs (grades 7–12), teaching strategies, research, and program assessment. Prerequisite: RDG 507.

**RDG 550 Practicum Experiences in Reading.** (3) F, S, SS

Practicum experience utilizing assessment and instructional techniques for classroom settings. (See RDG 557 for State of Arizona reading endorsement.) Prerequisite: RDG 505 or equivalent.

**RDG 556 Assessment Procedures in Reading.** (3) F, S

Techniques for classroom and clinical reading assessment and instruction. Emphasis on continuous assessment. May be taken concurrently with RDG 557. Recommended for State of Arizona reading endorsement. Prerequisite: RDG 505.

**RDG 557 Advanced Reading Practicum.** (3) F, S

Advanced practicum experience utilizing specialized reading and other assessment and instruction techniques for classroom and clinic settings. Lab sections. Recommended for State of Arizona reading endorsement. May be taken concurrently with RDG 556. Prerequisites: RDG 505; instructor approval.

**RDG 563 Children's Literature.** (3) F, S, SS

Selecting and using children's literature and related nonprint media to support the elementary school curriculum. Cross-listed as LIS 563. Credit is allowed for only LIS 563 or RDG 563.

**RDG 581 Literature-Based Reading Programs.** (3) F, S, SS

For classroom and special reading teachers. The role of literature in the acquisition and development of literacy. Specific suggestions for helping students learn to read and/or expand their reading ability with literature. Introduction to literature studies. Prerequisite: teaching certificate.

**RDG 582 Practicum: Literature Studies.** (3) S

Practical application of literature study group principles in field sites or through on-campus simulations. Lecture, supervised practice. Prerequisite: RDG 581 or instructor approval.

**RDG 596 Gender, Culture, and Literacies.** (3) S

Influence of gender and culture on written, oral, and post-typographical texts. Seminar.

**RDG 630 Research in Reading.** (3) F

For advanced graduate students interested in applied research problems, literature of reading instruction, and major issues related to reading research. Prerequisite: instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**SECONDARY EDUCATION (SED)****SED 400 Principles of Effective Instruction in Secondary Education.** (3) F, S, SS

Different models of education are examined. Appropriate teaching practices for each model are developed and applied to secondary school classrooms. Lecture, discussion. Prerequisite: PTPP admission.

**SED 480 Special Methods of Teaching Social Studies.** (3) F, S

Interdisciplinary approaches; production and collection of materials.

**SED 501 Introduction to Effective Instruction.** (6) F, S, SS

Introductory course for postbaccalaureate certification program in secondary education. Emphasis upon developing basic classroom management, instruction, and evaluation. Includes a field assignment of at least 120 hours. Prerequisite: admission to postbaccalaureate certification program.

**SED 522 Secondary School Curriculum Development.** (3) F, S, SS

Social processes, issues, principles, patterns, and procedures in curriculum development.

**SED 533 Improving Instruction in Secondary Schools.** (3) F, S, SS

Analyses of procedures, methods, techniques, and experiments in teaching in secondary schools. Prerequisites: SED 478, 578.

**SED 577 Issues and Trends in Secondary Education.** (3) N

Analyses of lay and professional reports; problems and issues in American secondary education. Prerequisites: SED 478, 578.

**SED 578 Student Teaching in the Secondary Schools.** (3–12) F, S

The practice of teaching. The relationship of theory and practice in teaching. Postbaccalaureate students only. Prerequisites: completion of approved postbaccalaureate program; a minimum 2.50 GPA; approval of the Office of Professional Field Experiences.

**SED 588 Human Relations in the Secondary Schools.** (3) A

Problems in human relations inherent in the interaction of pupils, teachers, administrators, nonprofessional staff, and laymen. Prerequisites: SED 478, 578.

**SED 711 Secondary Curriculum Development.** (3) S, SS

Theories and processes of developing curriculum; evaluation of research. Prerequisites: SED 478, 522 (or equivalent), 578.

**SED 722 Improvement of Instruction in the Secondary School.** (3) F

Evaluation of the research; issues and theories related to the improvement of instruction. Prerequisite: SED 533.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**BUSINESS EDUCATION (BUE)****BUE 480 Teaching Business Subjects.** (3) S

Organization and presentation of appropriate content for business subjects in the secondary school.

**BUE 501 Principles of Business Education.** (3) F

History, philosophy, principles, and objectives of business and distributive education.

**BUE 502 Organization and Management of Cooperative Programs.** (3) F

Work-study programs for business occupations in high schools and community colleges.

**BUE 503 Competency-Based Business and Vocational Education.** (3) S

Development and administration of competency-based individualized programs in business and vocational education.

**BUE 505 Current Literature in Business and Vocational Education.** (3) S

Critical analyses, generalizations, and trends in business and vocational education.

**BUE 506 Information Processing for Business and Vocational Teachers.** (3) SS

Development of curriculum and strategies for teaching information processing; hardware/software evaluation and equipment acquisition techniques in business and vocational education.

**BUE 512 Technology in Business and Vocational Education.** (3) SS

Emerging curricula and instructional technology in business and vocational education.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Curriculum and Instruction

### Interdisciplinary Doctoral Program

**Robert B. Rutherford Jr.**

*Program Director*

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#### Biology

Professor: Lawson

#### Chemistry and Biochemistry

Professor: Birk

#### Communication

Professor: Arnold

#### Curriculum and Instruction

Professors: Baker, Barone, Bitter, Christie, Edelsky, Faltis, Flores, Greathouse, Guzzetti, Hudelson, Mclsaac, Rutherford, Staley, Zucker;

Associate Professors: Arias, Blumenfeld-Jones, Cohen, Cohn, Di Gangi, Gomez, McCoy, McGowan, Middleton, Nelson, Piburn, Surbeck

Assistant Professors: Flemister, Roberts

#### Educational Leadership and Policy Studies

Regents' Professor: Berliner;

Professor: Richardson;

Assistant Professor: Margolis

#### English

Professors: Donelson, Nilsen

#### Exercise and Physical Education

Professors: Burkett, Corbin, Darst, Pangrazi, Stone;

Assistant Professors: Chen, Cohn, Phillips, Swan

#### Family Resources and Human Development

Professor: Manore;

Associate Professor: Vaughan

#### Music

Professor: Humphreys;

Associate Professor: Stauffer

#### Physics and Astronomy

Professor: Hestenes

The Interdisciplinary Committee on Curriculum and Instruction offers an interdisciplinary graduate program leading to the Ph.D. degree in Curriculum and Instruction.

The interdisciplinary committee sets guidelines and supervises programs of study.

Areas of concentration include

Curriculum studies

Early childhood education

Educational media and computers

Elementary education

English education

Exercise and wellness education

Music education

Physical education

Reading education

Science education

Special education

One of the unique features of this interdisciplinary program is that, because it utilizes faculty research and teaching interests from a number of academic units, students may work in concert with their program committee to tailor a course of study to fit individual needs and goals.

The interdisciplinary Ph.D. committee mentors set guidelines and supervises programs of study, while an executive committee, appointed by the dean of the College of Education and the dean of the Graduate College, has primary responsibility for the operation of the program. It is composed of faculty representing the various concentrations.

### DOCTOR OF PHILOSOPHY

The Ph.D. degree in Curriculum and Instruction is an individualized interdisciplinary degree that integrates graduate courses from a variety of academic units. This course work provides a substantive knowledge base in the concentration area and a sound foundation for research leading to a dissertation.

See "Doctor of Philosophy," page 101, for general requirements.

**Admission.** In addition to meeting minimum Graduate College admission requirements, each applicant must provide the following:

1. a letter of career goals and statement of reasons for seeking the interdisciplinary Ph.D. in Curriculum and Instruction,
2. Graduate Record Examination (GRE) verbal and quantitative test scores,
3. a sample of written work, and
4. three academic letters of recommendation.

One year of full-time teaching experience at the appropriate level, or its equivalent, is strongly recommended. In the absence of prior teaching experience, a teaching internship is required but may not be counted toward the Ph.D. degree.

Admission decisions are based upon the compatibility of the applicant's career goals with the purpose of the degree program, previous academic training and performance, GRE scores, letters of recommendation, and the availability of a potential mentor in the candidate's concentration area. It should be noted that, because of enrollment limits, applicants who meet minimum requirements are not automatically admitted.

**Program Committee.** The student's program committee, consisting of a chair and at least two other members, oversees the preparation of the initial program of study and the

preparation and evaluation of the comprehensive examination. Although the program committee may consist of only three members for early advising, it must have *at least five members* for the administration and evaluation of the comprehensive examination, three of whom must be members of the interdisciplinary committee and two of whom must be experts in the student's area of concentration. At least one member of the program committee must be a faculty member of the Division of Curriculum and Instruction. The committee must be approved by the dean of the Graduate College.

The program committee and the student must decide on the area of concentration and cognate area to be included in the student's comprehensive examination. They also must develop a program of study to establish a professional knowledge base and methods of inquiry and analytical tools for research.

**Dissertation Committee.** After passing the comprehensive examination, a dissertation committee is formed, upon the approval of the dean of the Graduate College. The basic functions of the dissertation committee are as follows:

1. overseeing the development and approval of a dissertation proposal,
2. providing guidance while the candidate conducts the dissertation study/analysis,
3. reviewing the dissertation manuscript, and
4. conducting an oral defense of the dissertation.

Members of the program committee may also serve as members of the dissertation committee; however, the committees may have different memberships. At least one member of the dissertation committee must be a faculty member of the Division of Curriculum and Instruction. The dissertation committee chair must be a faculty member designated eligible to serve in this capacity by the interdisciplinary committee and the dean of the Graduate College.

**Program of Study.** The program requires at least 93 semester hours, or the equivalent of four academic years of full-time study, beyond the bachelor's degree. Students with a master's degree directly related to the anticipated course of study must complete a minimum of 54 semester hours beyond the master's degree. At least 30 semester hours in the approved program of study, exclusive of research and dissertation, must be taken at ASU. Each candidate must also register for a minimum of 24 semester hours of research and dissertation credit, with the dissertation directed by a dissertation chair approved by the interdisciplinary committee and the dean of the Graduate College. The program of study is divided into four general areas:

1. Ph.D. core course requirements,
2. professional focus,
3. cognate study, and
4. independent research and dissertation.

**Core Course Requirements.** All doctoral students are required to complete designated core courses, and Interdisciplinary Research Seminar and Curriculum Theory and Practice requirements.

**Professional Focus.** With the advice and approval of the student's program committee, a student must select a sequence of courses and experiences designed to focus subsequent

efforts on a particular aspect of curriculum and instruction, culminating in a dissertation. The professional focus is divided into three areas:

1. methods of inquiry and analytical tools associated with empirical study of curriculum and instruction,
2. a substantive knowledge base in the area of concentration, and
3. internships in research and college teaching.

Semester hours counted under one category may not be counted under another. Courses (42 semester hours) are drawn from program courses in the student's area of concentration.

**Cognate Study.** Students are expected to choose interrelated courses (12 semester hours minimum) outside their declared area of concentration that have a clear link to their dissertation efforts. Cognate studies can be drawn from a broad range of offerings, both within and outside the College of Education.

**Foreign Language Requirements.** None.

**Annual Report for Ph.D. Candidates.** At the end of each school year (before the last day of final exams), the student's Ph.D. mentor prepares a report to be reviewed by the Director of the Interdisciplinary Ph.D. Degree Program. Copies of the report are distributed to the members of the student's program or dissertation committee. The report from the mentor, which is accompanied by the student's transcript and an up-to-date *curriculum vitae*, includes the following:

1. a statement concerning the status of the student's program of study (with a copy);
2. a statement of the status of preparation toward the student's comprehensive examination (including a projected date for completion);
3. a statement about the student's performance in course work; and
4. a statement about the student's accomplishments during the academic year (and summer, if appropriate), including research activity, writings, presentations, and professional accomplishments.

**Comprehensive Examinations.** Upon completion of course work in the Ph.D. program of study and before admission to candidacy and the start of the dissertation research, the student completes an examination in the areas of concentration, cognate study, and methods of inquiry and analytical tools. The examination is designed to test the student's accumulation of interdisciplinary knowledge and ability to communicate across disciplines. The comprehensive examination is developed and administered by the student's five-member program committee.

**Dissertation Proposal.** The proposal prospectus typically constitutes a draft of the first three chapters of the dissertation, but may vary with the dissertation committee's approval. Following approval of the proposal by the dissertation committee chair, a proposal meeting is scheduled. Approval of the proposal at that meeting indicates that the faculty agree that the rationale, review of the literature, method, and proposed analyses are appropriate and that the study may proceed as planned. If problems are identified in

the proposal meeting, the dissertation committee may meet again to hear a revised proposal or arrange a more relevant way to re-examine the proposal.

**Research and Dissertation.** Twenty-four semester hours of research and dissertation credit are required. Twelve dissertation credits must be reserved for postcandidacy registration. The dissertation is designed to be the student's culminating experience. The dissertation must consist of a fully documented written study demonstrating a high level of expertise in research and scholarship in the student's area of concentration. The dissertation should make an original contribution to inquiry in the area of curriculum and instruction and be worthy of publication by an established press as a book or monograph or as one or more articles in a refereed, scholarly journal. The dissertation should not only demonstrate that the student is able to conduct quality

research, but also should be conceived and carried out in such a way that it should make a contribution to advancing scholarship in the field of curriculum and instruction.

**Final Examinations.** The final oral examination in defense of the dissertation is scheduled and conducted by the student's dissertation committee. A candidate must pass the final examination within five years after completing the comprehensive examination.

### RESEARCH ACTIVITY

Faculty in the Interdisciplinary Ph.D. Degree Program in Curriculum and Instruction are engaged in a variety of research activities. Representative examples may be found under the program descriptions that correspond to the areas of concentration of this degree program.



Aerial view of the ASU Main campus

Tim Trumble photo

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## Dance

Claudia Murphey  
Chair

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www.asu.edu/cfa/dance/academic/dance.html

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### PROFESSORS

JONES, KAPLAN, KEUTER, LESSARD,  
LUDWIG, MURPHEY

### ASSOCIATE PROFESSORS

MATT, MOONEY

### ASSISTANT PROFESSORS

JACKSON, PARK, VISSICARO

## MASTER OF FINE ARTS

The M.F.A. degree in Dance is a 60-semester-hour program. The program is designed to provide opportunities for the student to continue to develop in the areas of dance technique, choreography, performance and production; to gain further understanding of the philosophy, history, theory, and science of dance; and to begin to chart the directions of the future through technology and media opportunities.

**Admission.** A bachelor's degree with a major in dance or its equivalent is required. Three letters of reference and a résumé must be filed with the Department of Dance for the purpose of assessing the qualifications of the candidate. All applicants must audition for admission to the program. The audition consists of performance of technical phrases in modern dance and ballet as well as the presentation of a solo work of no longer than five minutes, choreographed by the candidate. Videotaped documentation of a group work choreographed by the applicant must also be submitted. For more information, contact the Department of Dance.

**Program of Study.** A total of 60 semester hours of graduate credit is required, including:

1. 30 hours of dance studio;
2. 12 hours of dance theory;
3. nine hours of electives; and
4. nine hours of individual project (choreography, performance, or other approved project).

In consultation with the graduate director and the student's supervisory committee a program of study may be tailored to meet specific interests, needs, and abilities.

**Credit Before Admission.** Upon approval of the supervisory committee, a maximum of 24 semester hours of graduate credit completed before admission may be applied to the program if these courses were part of a completed master's degree in Dance. All course work appearing on the program of study must meet the seven-year time limit requirement.

**Foreign Language Requirements.** None.

**M.F.A. Project.** Each candidate submits a prospectus to his or her supervisory committee outlining the nature of the M.F.A. project. This project may be choreography and/or performance, and may be designed to incorporate technology or other approved research components. Supporting documentation of the project may be written and bound, realized with CD-ROM, or completed through other means, which meet format approval from both the student's supervisory committee and the Graduate College.

**Final Examinations.** An oral defense of the M.F.A. project is required.

## RESEARCH AND CREATIVE ACTIVITY

Research and creative activities in the Department of Dance include the following: the creation and performance of new works; theory and teaching of technique, improvisation, and choreography; and concentrated studies in dance education, ideokinesis, kinesiology, dance history, philosophy, ethnology, music for dance, and dance and technology. Cross-disciplinary and cross-cultural work, along with community outreach, are encouraged through course work, internships, and individual projects. Support facilities available within the department include two experimental theaters, the multi-media learning center, and complete production shops staffed by professional designers/technicians.

### DANCE HISTORY (DAH)

#### DAH 501 Philosophy of Dance. (3) A

Analysis of traditional and contemporary theories of dance with regard to issues of expression, form, and meaning.

#### DAH 502 Cultural Concepts of Dance. (3) A

Examines the close connection between culture, dance, and movement through writings in cultural theory, dance ethnology, and philosophy.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### DANCE (DAN)

#### DAN 510 Dance Stagecraft and Production. (1–3) F, S

Theory of costuming, lighting, makeup, scenery, and sound as related to dance performance. May be repeated once for credit. Lecture, studio. Prerequisite: DAN 211 or equivalent.

#### DAN 521 Sound Lab I. (1) F

Introduction to tape recording, sound mixing, audio tape editing for dance choreographers. Lecture, lab. Prerequisite: instructor approval.

#### DAN 522 Sound Lab II. (1) S

Continuation of DAN 521. Emphasis on development of audio compositions for choreographic projects. Lecture, lab. Prerequisite: DAN 521.

#### DAN 523 Dance, Computers, and Multimedia. (3) F, S

Introduction to desktop multimedia as it relates to dance creation, production, education, and research. Lecture, lab.

#### DAN 534 Technique and Theory of Modern Dance. (3) F, S

Preparation in the performance and comprehension of professional-level modern dance for first-year graduate students. 6 hours weekly. May be repeated for credit. Placement audition required.

#### DAN 535 Technique and Theory of Ballet. (2) F, S

Graduate study of ballet technique. May be repeated for credit. Placement audition required. Studio.

#### DAN 542 Ideokinesis. (2) F

A theoretical examination of ideokinetic methods of facilitating postural change and movement efficiency.

#### DAN 550 Graduate Dance Pedagogy: Modern. (3) S

Overview of the role of modern dance technique and theory in the university curriculum including current pedagogical theory, diversity, gender. May follow or precede internship in practical teaching.

**DAN 551 Graduate Dance Pedagogy: Ballet.** (3) F

Advanced analysis of teaching techniques for ballet. Prerequisite: instructor approval.

**DAN 561 Choreographer/Composer Workshop.** (1–3) N

Analysis of, experimentation with, and practice in working with composers of music for choreography. Open to experienced choreographers and composers. Lecture, studio. Prerequisite: instructor approval.

**DAN 564 Solo and Group Choreography I.** (3) F

Original choreography created for solo and group performance. Studio. Prerequisites: DAN 364 and 365 or equivalent.

**DAN 565 Solo and Group Choreography II.** (3) S

Continuation of DAN 564. Studio. Prerequisite: DAN 564.

**DAN 571 Dance Theatre.** (1–3) F, S

Performance in specially choreographed dance productions. May be repeated for credit. Prerequisite: instructor approval.

**DAN 580 Performance Studies Practicum.** (1–3) F, S

Projects include dances reconstructed from labanotation and from student-, faculty-, or guest artist–created performance events. Studio, lab.

**DAN 591 Seminar.** (1–3) F, S

Seminar focusing on enrichment topics, production aspects of thesis projects, teaching concerns, special lectures, films, or critiques.

**DAN 634 Technique and Theory of Modern Dance.** (3) F, S

Preparation in the performance and comprehension of professional-level modern dance for second-year graduate students. 6 hours weekly. May be repeated for credit. Placement audition required.

**DAN 640 Advanced Problems in Analysis of Dance Technique.** (3) S

Theories and principles of human anatomy, kinesiology, and the psychology of learning applied to analysis of dance movement. Prerequisites: DAN 340 and 342 or instructor approval.

**DAN 664 Choreography Workshop.** (1–3) F

Choreographic study in a seminar context with faculty and guest artists. Studio. May be repeated for credit. Prerequisites: DAN 564, 565.

**DAN 671 Dance Arizona Repertory Theatre.** (3) F, S

Professional modern dance company experience and community outreach. Opportunity to work with choreographers, faculty, and guest performers. Lecture, studio.

**DAN 693 M.F.A. Project.** (1–9) F, S, SS

Preparation for required M.F.A. project approved by the student's supervisory committee. Work is followed by a final oral examination and documentation appropriate to the project. Prerequisite: committee approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.



Galvin Playhouse

J. Cameron MacIsaac

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## Design

Jacques R. Giard  
Director

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**PROFESSORS**

GIARD, KROELINGER, REZNIKOFF, WOLF

**ASSOCIATE PROFESSORS**

BRANDT, CUTLER, DETRIE, JOHNSON, McDERMOTT,  
NIELSEN, PATEL, RATNER, SANFT, WITT

**ASSISTANT PROFESSORS**

BERNARDI, HARMON-VAUGHAN, NIEDERHELMAN,  
NICKERSON, RANDALL, ROTHSTEIN

The faculty in the School of Design, College of Architecture and Environmental Design, offer a postprofessional research degree program leading to the Master of Science in Design degree in Design with concentrations in graphic design, industrial design, and interior design.

The faculty in the school also participate in offering the Ph.D. in Environmental Design and Planning program. See “Environmental Design and Planning,” page 192, for information on this Ph.D. degree program.

**MASTER OF SCIENCE IN DESIGN**

The Master of Science in Design (M.S.D.) degree with a major in Design and concentrations in graphic design, industrial design, and interior design prepares students for leadership positions in industry research and teaching. The program has four goals:

1. to provide graduate education both for students who have a baccalaureate degree in Graphic Design, Industrial Design, Interior Design, or a related design discipline and for those who hold a degree in an area not traditionally related to these design professions;
2. to provide the opportunity for the development of specialized research and design skills to support the graphic design, industrial design, and interior design professions;
3. to provide the opportunity for professionals to gain the necessary research and design skills for academic careers; and
4. to develop critical skills which enable the graduate to contribute to the literature of design through articles, essays, and books, or to participate in conferences related to their concentration.

**Admission Requirements.** Applicants for the research-based program of study must hold a baccalaureate degree in Graphic Design, Industrial Design, Interior Design, or a related design discipline to participate in this terminal degree program. Applicants for the studio-based program of study may hold a degree not directly related to the design

professions. When applying for admission, applicants must declare one of three concentrations: graphic design, industrial design, or interior design. Additionally, the areas of interest must be identified from the following: facility planning and management, human factors in design, or design methodology, theory and criticism. Admission to the M.S.D. program is selective on a space-available basis.

**Application Procedures.** Applicants must file separate application materials to both the Graduate College and the School of Design.

**School of Design Requirements.** The following materials should be submitted to

SCHOOL OF DESIGN  
COLLEGE OF ARCHITECTURE AND  
ENVIRONMENTAL DESIGN  
ARIZONA STATE UNIVERSITY  
PO BOX 872105  
TEMPE AZ 85287-2105

1. a statement of intent (maximum 600 words) explaining the applicant's interest in pursuing a post-professional research or studio degree with a concentration in graphic design, industrial design, or interior design and the basis for selecting an area of interest (facilities planning and management; human factors in design; or design methodology, theory and criticism), the applicant's academic background, and, if appropriate, additional preparation for the selected concentration/area of interest;
2. TOEFL scores from international students whose native language is not English;
3. three letters of recommendation from persons who are qualified to comment on the applicant's potential in the selected concentration;
4. an additional statement from applicants wishing to be considered for teaching or research assistantships outlining areas in which they feel competent to serve as a teaching or research assistant and inexpensive copies of samples of work that will not be returned (international students who wish to be considered for a teaching assistantship and whose first language is not English are required to pass the Test of Spoken English [TSE] administered by the American English and Culture Center at ASU); and
5. an 8.5" x 11" folio documenting papers and projects that support the intended concentration.

The portfolio is returned after final admission procedures, provided sufficient prepaid postage is enclosed, or if the materials are claimed in person within one year of submission. Unclaimed portfolios are retained for only one year. The School of Design assumes no liability for lost or damaged materials.

**Application Deadlines.** Primary consideration is given to completed applications received by the deadlines. Applications for assistantships and scholarships normally are considered at the same time.

All materials must be received by the Graduate College and the school by March 1 for fall semester. Late applications are accepted until all positions are filled.

**Selection Procedures and Notifications.** The faculty evaluate the applications and supporting materials and recommend to the Graduate College whether the applicant should be granted regular or provisional admission or if admission should be denied. If admission is provisional, the Graduate College specifies in its letter of admission the provisions to be met to gain regular status. The school informs successful applicants of the procedures for enrollment.

### Graphic Design Concentration

The graphic design program educates and develops students for both the graphic design profession and for academic positions. The goal of the faculty is to offer the best graphic design education, allowing the graduating student every option available. Applied research is intended to help students think critically as individuals and in team situations. Students opting for this concentration can expect to work in the areas of corporate identity, brand identity, publication design, museum informational design, broadcast graphics, ad design, informational graphics, environmental graphics, Web site design, and others. Students pursuing graduate studies can expect to be equally well prepared with critical and analytical thinking skills coupled with a diversified portfolio. Individuals interested in advanced studies to strengthen and refine student's proficiency in the language, process, and technical aspects of the profession will participate in this concentration.

### Industrial Design Concentration

Industrial design is primarily concerned with how humans perceive and use designed objects. The discipline of industrial design has been defined as the professional service of creating and developing concepts and specifications that optimize the appearance, function, and value of products and systems for the mutual benefit of both the user and the manufacturer. This service is often provided in the context of a cooperative working relationship with other members of a development group. The industrial designer's contribution places special emphasis on human characteristics, needs, and interests that require detailed understanding of visual, tactile, safety, and convenience criteria. Industrial designers combine these considerations with practical concern for technical processes, manufacturing requirements, economics, and marketing, including distribution, sales, and service. Individuals wishing to further studies in the development of product and its relationship to human factors will participate in this concentration.

### Interior Design Concentration

Interior design focuses on educating designers for a professional world that needs informed and developed talent. The concentration emphasizes preparation in building bridges between the academic world and the profession. The goal is to develop technically accomplished and conceptually sophisticated graduates who continue to evolve as practicing professionals and educators. Graduates in this concentration accept entry-level professional/research positions in a variety of settings, including interior design firms, architectural firms specializing in interior space planning and design, and facilities and master planning within the corporate environment. Individuals wishing to further studies in the development of interior space will participate in this concentration.



## Areas of Study

**Facilities Planning and Management in Design.** This area of study focuses on the coordination of the work place and equipment with the people and organizational structure of the institution. The intent is to combine programming and management practices with current professional and technical expertise to provide humane and effective work environments. Facility-related responsibilities to support this concentration cluster into seven functional units: programming; facilities analysis; space management; interior planning and design; human factors; interior codes; public welfare and safety; and interior installation.

**Human Factors in Design.** This area of study identifies the problems, establishes the strategies, and develops the design solutions needed for issues surrounding the human/machine interface. The human/machine interface is the focus although the principles have wider application to other systems and environments. Special emphasis is placed on the relationship between the human and test performance factors. Emphases include qualities of function; methods of forming organizational relationships; factors of environmental control systems (acoustics and illumination); and human factors in product and interior design. Subject matter also includes the design of equipment, machines, and spaces; ergonomics and forms of ergonomic documentation; and analysis of relationships between spaces, objects, and people as simulated through computer animation, imaging, and traditional modeling techniques. Because of the significant impact of human factors on the work environment, this concentration shares courses and faculty with the facilities planning and management concentration.

### Design Methodology, Theory and Criticism in Design.

This area of study is available to majors with backgrounds in art or design history, industrial design, interior design, architecture, sociology, environmental psychology, or research methods. Two foci exist: (1) the development of critical skills based on understanding the theories and philosophies that form the basis of contemporary design and (2) the ability to recognize and interpret emerging design issues and trends through impact identification and analysis. Applications include design education, design marketing and production decision, and design criticism. The program examines successful design strategies for problem solving and theories related to design forecasting.

**Program of Study for the Research-Based Program.** The program of study consists of 36 semester hours of course work at the 500 level or above with the following distribution:

DSC 580 Practicum: Methods of Teaching Design.....	3
Approved courses in the concentration area of interest.....	12
Approved electives outside the school.....	9
Approved research methods courses.....	6
Thesis or Applied Project.....	6
Total.....	36

**Program of Study for the Studio-Based Program.** The program of study consists of 36 hours of work at the 500 level or above with the following distribution:

DSC 520 Contemporary Design Issues .....	3
or DSC 525 Design Methodologies (3)	
DSC 593 Applied Project .....	3
Approved courses in the studio.....	10
Approved courses to support the studio.....	11
Approved elective to support the applied project .....	3
Professional electives.....	6
Total.....	36

**Foreign Language Requirements.** None.

**Practicum.** All students in the research-based program must enroll in a three-hour teaching practicum that focuses on the problems and issues surrounding studio instruction. Emphasis is on the techniques of criticism and individual and group studio teaching.

**Thesis or Applied Project.** For students in the research-based program choosing the thesis option, six semester hours of 599 Thesis and 592 Research apply toward the thesis. Guidelines in the *Format Manual* must be followed. For students choosing the applied project option, six hours of 593 Applied Project apply.

**Final Examinations.** An oral examination in defense of the thesis or applied project is required for all students in the M.S.D. program.

### E-Mail and Web Addresses

E-mail inquiries or requests should be addressed to [jacques.giard@asu.edu](mailto:jacques.giard@asu.edu). Information about the program in Design, and the College of Architecture and Environmental Design in general, may be found on the Web at [www.asu.edu/caed/Design](http://www.asu.edu/caed/Design).

## RESEARCH ACTIVITY

Faculty in graphic design, industrial design, and interior design are involved in the following areas of research: human factors, material design, computer-assisted design, lighting and acoustical design, design history, exhibit design, environmental design, facilities planning and management, methodology, theory and criticism, creative thinking, design evaluation, and wayfinding. The College of Architecture and Environmental Design maintains a high-bay research facility, a lighting laboratory, a human factors laboratory, an extensive shop facility, as well as a state-of-the-art material resource center. The college's Research and Service Foundation provides facilities for basic research and community service activities in energy technology, design, and planning.

### DESIGN (DSC)

**DSC 520 Contemporary Design Issues.** (3) F, S  
Projected applications in design production, planning, and decision-making processes. Lecture, seminar. Prerequisites: INT 310 and 311 or equivalents.

**DSC 524 Illumination and Acoustics.** (3) N  
Research and laboratory investigation of advanced illumination and acoustics issues of facility design. Emphasis on human factors and performance aspects. Prerequisites: INT 457 and 458 or equivalents.

**DSC 525 Design Methodologies.** (3) F  
Practical exercises and studies in problem-solving strategies; problem definition and supporting theory for the designer. Lectures, seminars, lab. Prerequisite: senior or graduate standing.

**DSC 527 Modern Design Theory.** (3) S  
Aesthetic, political, economic, and social theories that have shaped modern design; theory as the basis for design philosophies. Lectures, seminars. Prerequisite: DSC 525 or equivalent.



**DSC 529 Design Criticism.** (3) F

Critical methods applied to design as material culture and human expression; evaluation of achievement versus intention. Lecture, seminar. Prerequisite: DSC 527 or equivalent.

**DSC 544 Human Factors Systems and Documentation.** (3) F

Advanced topics associated with theory and methods of human factors in design. Individual projects stressing problem organization, evaluation, and documentation. Lectures, seminars, lab. Prerequisite: DSC 344 or equivalent.

**DSC 552 Computer Simulation in Design.** (3) F

The use of computer graphics as a medium to develop and present images of the environment for analysis and perception. Lecture, lab. Prerequisite: senior or graduate standing.

**DSC 553 Computer Imaging and Visual Perception.** (3) S

Issues and applications of computer simulation as a tool for describing and testing human interface with the environment. Lecture, lab. Prerequisite: senior or graduate standing.

**DSC 558 Daylighting.** (3) N

Daylighting as a design determinant; concepts, techniques, methodology, experiments, and case studies. Lecture, studio. Prerequisite: senior or graduate standing.

**DSC 580 Practicum: Methods of Teaching Design.** (3) F

Background and development of design education theories. Concepts of studio teaching methods. Comprehensive student project development and evaluation methods. Prerequisite: graduate standing.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**GRAPHIC DESIGN (GRA)****GRA 481 Visual Communication V.** (3) F, S

Studio problems with an emphasis on analysis, problem solving, and professional portfolio preparation. 6 hours a week. Prerequisites: GRA 385, 387.

**GRA 482 Visual Communication VI.** (3) S

Individual and group projects with outside clients. All projects culminate in an exhibit. 6 hours a week. Prerequisite: GRA 481.

**GRA 485 Graphic Design Workshop.** (3) F, S, SS

Preprofessional client/designer situations from concept to printed work. Studio workshop and internships for selected students. 6 hours a week. May be repeated once for credit. Prerequisite: instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**INDUSTRIAL DESIGN (IND)****IND 460 Design Project I.** (5) F

Complete analysis of the product unit as an element of mass production, featuring marketing, technology, human factors, and visual design. Emphasis on professional standards. 10 hours studio. Prerequisites: DSC 484; IND 361.

**IND 461 Design Project II.** (5) S

Product design, with emphasis in systems interaction. Culmination of design process and technique. Individual project direction is encouraged. 10 hours studio. Prerequisite: IND 361.

**IND 474 Design Seminar.** (3) S

Manufacturer's liability, statutes, regulations, and common law rules; role of expert witnesses; insurance and product safety programs. Seminar. Prerequisite: senior standing.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**INTERIOR DESIGN (INT)****INT 412 History of Decorative Arts in Interiors.** (3) F

The design of decorative arts as an expression of cultural influences and as an extension of interior spaces. Prerequisite: INT 311 or instructor approval. *General Studies: HU.*

**INT 413 History of Textiles in Interior Design.** (3) S

Cultural and historical expression of textiles as related to interiors. May include field trips. Prerequisite: INT 412 or instructor approval.

**INT 422 Facilities Planning and Management I.** (3) F

The facility management process in large-scale organizations. Planning, long-range forecasting, and productivity. Project management methodologies using micro-based software programs. Prerequisite: senior standing.

**INT 423 Facilities Planning and Management II.** (3) S

The formation of facilities policies, procedures, and standards. The facilities database, space allocations, and management process. Evaluation of programming criteria. Prerequisites: INT 422; senior standing.

**INT 442 Specifications and Documents for Interiors.** (3) F

Contract specifications, documents, schedules, and bidding procedures for interior design. Prerequisites: INT 341, 365. *General Studies: L2.*

**INT 457 Acoustics for Interior Design.** (3) F

Physical properties of sound. Studies pertaining to sound-absorbing materials, constructions, and room acoustics. Prerequisites: MAT 170; PHY 111, 113.

**INT 458 Lighting for Interior Design.** (3) S

Light as an aspect of interior design. Evaluation of light sources for distribution, color, and cost.

**INT 466 Interior Design Studio V.** (5) F

Advanced interior design problem solving, design theory, and criticism. Thesis project development based upon the major's concentration. 10 hours studio. Prerequisite: department approval.

**INT 467 Interior Design Studio VI.** (5) S

Advanced series of specialized projects or continuation of thesis project based upon the major's concentration. 10 hours studio. Prerequisite: department approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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**Economics**

**Arthur E. Blakemore**  
*Chair*

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**asuecn@asu.edu**

**[www.cob.asu.edu/ecn/degprog1.html](http://www.cob.asu.edu/ecn/degprog1.html)**

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**PROFESSORS**

BLAKEMORE, BOYES, BRADA, BURDICK, BURGESS,  
DeSERPA, FAITH, GOODING, HAPPEL, HOFFMAN,  
HOGAN, KINGSTON, LOW, MAYER, McDOWELL,  
McPHETERS, MELVIN, MÉNDEZ, ORMISTON, SCHLEE

**ASSOCIATE PROFESSORS**

AHN, MANELLI, REFFETT, REISER, SCHLEE,  
WILSON, WINKELMAN

**ASSISTANT PROFESSORS**

CHADE, DATTA, HENDRICKS

**SENIOR LECTURER**

ROBERTS

The faculty in the Department of Economics, College of Business, offer programs leading to the M.S. and the Ph.D. degrees in Economics.

The faculty also participate in offering the professional program leading to the Master of Business Administration (see "Master of Business Administration," page 128), the program leading to the M.S. in Statistics (see "Master of Science," page 294) and the program leading to the Ph.D. degree in Business Administration (see "Master of Business Administration," page 128). Further information concerning

the degree programs in Economics can be obtained from the Director of Graduate Programs, Department of Economics.

**Admission.** See “Admission to the Graduate College,” page 89. In addition, each applicant to either graduate program must submit three letters of recommendation from academic sources and test scores for the general aptitude portion of the Graduate Record Examination (GRE). Submission of scores from the GRE advanced test in economics is recommended. Applications should be received at the Department of Economics by March 1 if the student is seeking a graduate assistantship.

Students are expected to have demonstrated competency in economics at a minimum level through ECN 313 and 314 and in mathematics through MAT 271. Passing grades in the equivalents of these courses taken at other colleges are accepted as a demonstration of competency. Additional courses in calculus, linear algebra, and statistics are recommended before the first semester in the program.

Students with inadequate undergraduate preparation in economics or mathematics may be required to remove deficiencies before enrolling in graduate courses.

## FIELDS OF STUDY

Graduate students may choose from several fields of study: econometrics, health economics, industrial organization, international economics, labor economics, macroeconomics, and public economics. The goal of the econometrics field is to provide students with the tools needed to empirically assess economic models using data obtained from observation of real world phenomena. Course work emphasizes applications as well as theory. The intent of the health economics field is to provide students with the tools needed to assess and critique the concepts, structures, functions, and values that characterize contemporary health care systems. Course work focuses on the economics of production and distribution of health care services, with special emphasis on the impact of regulation, competition, and economic incentives. Work in biostatistics can be included. The field of industrial organization is concerned with the theory and empirical evidence concerning the organization of firms and industries. Topics include the “law and economics” of monopoly, collusion, business pricing and marketing practices, corporate control, mergers, and acquisitions. The international economics field examines both the theoretical and empirical literature associated with the determinants of comparative advantage, trade patterns and commercial policy effects on such patterns, the determinants of exchange rates and international financial flows, and effects of international linkages on the domestic economy. The labor economics field includes the study of labor force participation, unemployment, the role and effect of education and other personal variables on earnings, geographical and interfirm earning differentials, the demand for labor, discrimination, the role and economic effects of unions, personnel practices and policies, and similar topics. The intent of the macroeconomic field is to provide the student with tools needed to assess both theoretically and empirically modern macroeconomic models. Public economics is concerned with the positive and normative study of government’s effect on the economy. Course work focuses on evaluating the economic consequences of government policies and on the application of economics to political science. See the *Department of*

*Economics Graduate Student Handbook* for specific field requirements.

## MASTER OF SCIENCE

The M.S. degree program is designed to provide broad training in economics. The purpose is to equip the student with sufficient knowledge of economic analysis and techniques to undertake supervised research positions, to teach in community colleges, to assume business or government positions, or to undertake the more intensive and specialized work leading to the Ph.D. or J.D. degree.

**Program of Study.** See “Master’s Degrees,” page 98, for general requirements. See the *Department of Economics Graduate Student Handbook* for specific requirements.

**Course Load.** Students are limited to 15 semester hours per semester.

**Foreign Language Requirements.** None.

**Thesis Requirements.** Students have the option of a non-thesis or thesis track. For the nonthesis track, students are required to conduct an applied research project under the supervision of a faculty member. The applied research project often is conducted in conjunction with an internship, and three hours of credit is granted for the project. For the thesis option, six semester hours of credit is granted for completion of the thesis.

**Final Examinations.** A final oral examination in defense of the thesis or applied research project is required.

## DOCTOR OF PHILOSOPHY

The Ph.D. degree program is designed to provide the student with a more fundamental command of basic economic analysis and of the subject matter in several specialized fields. It is designed to qualify students for teaching at higher education institutions and for research positions in public agencies and private business organizations.

**Program of Study.** See “Doctor of Philosophy,” page 101, for general requirements. In addition to completing 60 hours of credit beyond the bachelor’s degree (30 hours beyond the master’s degree) and 24 hours research dissertation credit, the Ph.D. student must accomplish five tasks:

1. meet qualification requirement,
2. present at least two fields of study,
3. pass the comprehensive examination,
4. pass the dissertation proposal defense, and
5. complete a dissertation with an oral defense.

See the *Department of Economics Graduate Student Handbook* for details concerning these tasks.

**Qualifying Examinations.** The student must demonstrate proficiency in economic theory and application by passing both the microeconomic and macroeconomic qualifying examinations. These examinations are given at the beginning of the fall semester of the second year of graduate study. The student must demonstrate proficiency in statistical and econometric analysis by passing ECN 525 and ECN 526.

**Fields of Study.** Students are required to present at least one primary field and one secondary field for the Ph.D. The primary field must be the one in which the comprehensive examination is taken; usually this is the field in which dissertation work is contemplated.

**Comprehensive Examination.** The comprehensive examination consists of a written and oral test. The written examination consists of questions designed to test the student's knowledge of the proposed research area. Examination questions are designed to cause the student to examine the research topic in considerable depth and breadth. The oral examination consists of questions designed to test the student's knowledge of the proposed research area. Examination questions are designed to expand on the written examination as well as to provide guidance on the dissertation research.

**Dissertation Proposal Defense.** Students prepare a preliminary draft of the dissertation proposal before taking the comprehensive examination. Upon passing the comprehensive examination, students submit a revised dissertation proposal to their supervisory committee that formalizes the research agenda and incorporates the supervisory committee's suggestions. The dissertation proposal must be defended orally.

**Admission to Candidacy.** The student should apply promptly for admission to candidacy after passing the comprehensive field examination, oral examination, and the dissertation proposal defense.

**Dissertation Requirements.** A dissertation representing original research work of high quality, demonstrating the student's proficiency in the field, is required.

**Foreign Language Requirements.** None.

**Final Examinations.** An oral examination in defense of the dissertation is required.

## RESEARCH ACTIVITY

There is a strong commitment to professional research in the Department of Economics. Faculty are actively engaged in both applied and theoretical research in a variety of areas. Topics of recently published research include: optimal labor contracts and involuntary unemployment; efficient estimation with dynamic panel data; the effects of restructuring and privatization in Central and Eastern Europe; unemployment insurance programs; the economics of mob goods; the stability of long-run money demand; an empirical methodology for cointegrated systems; job search; labor market consequences of U.S. immigration; volatility in foreign exchange markets; equity control of multinational firms by less developed countries; optimal portfolios; the demand for insurance and insurable assets; wage uncertainty and competitive equilibrium in labor markets; exchange rate dynamics; real business cycle analysis; strategic information manipulation in duopolies; non-expected utility theory; comparative statics under uncertainty; the value of information in alternative economic environments; and an empirical examination of organization structure.

Research tools at ASU are excellent. The Hayden Library holds an extensive collection of works in economics and

related areas. The Noble Science and Engineering Library is a designated U.S. Patent Depository. ASU has computer facilities that provide exceptional support for processing empirical research. A remote site terminal for both batch processing and time sharing is located in the College of Business.

## ECONOMICS (ECN)

### ECN 436 International Trade Theory. (3) A

The comparative-advantage doctrine, including practices under varying commercial policy approaches. The economic impact of international disequilibrium. Prerequisite: ECN 314 or instructor approval. *General Studies: SB, G.*

### ECN 438 International Monetary Economics. (3) A

History, theory, and policy of international monetary economics. Balance of payments and exchange rates. International financial markets including Eurocurrency markets. Prerequisite: ECN 313 or instructor approval. *General Studies: SB, G.*

### ECN 441 Public Finance. (3) A

Public goods, externalities, voting models, public expenditures, taxation, and budget formation with emphasis on the federal government. Prerequisite: ECN 314 or instructor approval. *General Studies: L2/SB.*

### ECN 453 Government and Business. (3) A

Development of public policies toward business. Antitrust activity. Economic effects of government policies. Prerequisite: ECN 314 or instructor approval.

### ECN 480 Introduction to Econometrics. (3) A

Elements of regression analysis: estimation, hypothesis tests, prediction. Emphasis is on use of econometric results in assessment of economic theories. Prerequisite: instructor approval. *General Studies: N2.*

### ECN 485 Mathematical Economics. (3) A

Integration of economic analysis and mathematical methods into a comprehensive body of knowledge within contemporary economic theory. Prerequisite: instructor approval.

### ECN 498 PS: Pro-Seminar. (3) A

Topic chosen from current area of interest. Prerequisites: ECN 313 and 314 or instructor approval.

### ECN 502 Managerial Economics. (3) F, S

Application of microeconomic analysis to managerial decision-making in areas of demand, production, cost, and pricing. Evaluation of competitive strategies. Prerequisite: MBA degree program student.

### ECN 503 Global Economics for Managers. (3) F, S

Macroeconomic analysis of issues related to economic growth, inflation, interest rates behavior, unemployment, exchange rate determination, and global competitiveness.

### ECN 504 History of Economic Thought. (3) S

Historical development of economic theory. Emphasis on the development of economic analysis from preclassical economics through Keynes. Prerequisite: ECN 510 or instructor approval.

### ECN 509 Macroeconomic Theory and Applications. (3) F

Theory of income, output, employment, and price level. Influence on business and economic environment. Prerequisites: ECN 111 and calculus or instructor approval.

### ECN 510 Microeconomic Theory and Applications. (3) F, S

Application of economic theory to production, consumer demand, exchange, and pricing in a market economy. Prerequisites: ECN 112 and calculus or instructor approval.

### ECN 511 Macroeconomic Analysis I. (3) F

Current theories of output, employment, inflation, and asset prices as well as major aggregates. Introduction to dynamic optimization techniques. Prerequisites: ECN 313 and calculus or instructor approval.

### ECN 512 Microeconomic Analysis I. (3) F

Theory of production, consumer demand, resource use, and pricing in a market economy. Prerequisites: ECN 314 and calculus or instructor approval.

### ECN 513 Macroeconomic Analysis II. (3) F

Focus on growth theory, dynamic general equilibrium models, monetary theory, open-economy issues. Prerequisite: ECN 511 or instructor approval.

### ECN 514 Microeconomic Analysis II. (3) S

General equilibrium, welfare economics, production, and capital theory. Prerequisite: ECN 512 or instructor approval.

**ECN 515 Advanced Macroeconomic Analysis.** (3) F

Focus on current research areas in macroeconomics and monetary theory with emphasis on methods in economic dynamics and numerical techniques. Prerequisite: ECN 511 or instructor approval.

**ECN 516 Economics of Uncertainty, Information, and Strategic Behavior.** (3) F

Economic behavior under uncertainty; markets and contracts under asymmetric information; the theory of games with incomplete information and applications. Prerequisite: ECN 512 or instructor approval.

**ECN 517 Monetary Theory.** (3) F

Traditional and post-Keynesian monetary theory, interest rate determination, the demand and supply of money. Prerequisite: ECN 511 or instructor approval.

**ECN 521 Labor Economics I.** (3) F

Development of basic theoretical models for analyzing labor market issues. Prerequisite: ECN 510 or instructor approval.

**ECN 522 Labor Economics II.** (3) N

Extensions/criticisms of labor market theories. Applications to a variety of policy issues. Prerequisite: ECN 521.

**ECN 525 Econometrics I.** (3) S

Problems in the formulation of econometric models. Emphasis on estimation, hypothesis testing, and forecast of general linear models. Prerequisite: 6 hours of statistics or instructor approval.

**ECN 526 Econometrics II.** (3) F

Estimation and inference of qualitative and limited dependent variable models as well as general multiple equation models. Prerequisite: ECN 525 or instructor approval.

**ECN 527 Econometrics III.** (3) S

Generalized method of moment estimation, estimation with censored and truncated samples, nonlinear models, panel-data models, econometrics of nonstationarities. Prerequisite: ECN 526 or instructor approval.

**ECN 531 Comparative Economic Systems.** (3) F

Philosophical foundations of major economic systems and of properties of principal system models. Comparison of alternative institutions and system components of contemporary economies. Prerequisites: ECN 509 and 510 or instructor approval.

**ECN 536 International Trade Theory.** (3) S

Theories of comparative advantage and their empirical verification. Theory and political economy of commercial policy. Resource transfers and the role of the multinational corporation. Prerequisites: ECN 509 and 510 or instructor approval.

**ECN 538 International Monetary Theory and Policy.** (3) F

The foreign exchange market, balance of payments, and international financial institutions and arrangements; theory and applications. Prerequisites: ECN 509 and 510 or instructor approval.

**ECN 541 Public Economics.** (3) S

Economics of collective action, public spending, taxation, and politics. Impact of central governmental activity on resource allocation and income distribution. Prerequisite: ECN 510 or instructor approval.

**ECN 553 Industrial Organization.** (3) S

Analysis of structure, conduct, and performance in industrial markets; the economics of organizations. Prerequisite: ECN 510 or instructor approval.

**ECN 560 Economics of Growth and Development.** (3) F

Economic problems, issues, and policy decisions facing the developing nations of the world. Prerequisites: ECN 509 and 510 or instructor approval.

**ECN 584 Economics Internship.** (1–3) SS

Academic credit for professional work organized through the Internship Program. Prerequisites: ECN 510 and 511 or instructor approval.

**ECN 585 Mathematics for Economists.** (3) F

Survey of mathematical ideas encountered in economics and econometrics: nonlinear programming, the Kuhn-Tucker theorem, concave programming, optimization over time. Prerequisite: calculus or instructor approval.

**ECN 591 Economics Seminar.** (1–3) F, S, SS

Presentations by outside speakers, department faculty, and graduate students of work in progress. Prerequisite: instructor approval.

**ECN 593 Applied Projects.** (3) F

Preparation of a supervised applied project typically in conjunction with an internship. Prerequisites: ECN 510, 511.

**ECN 594 Conference and Workshop in Economics.** (1–12) F, S, SS

Topics such as the following are offered:

- Economic Analysis Workshop. Introduction to Economic Analysis. Prerequisite: Ph.D. degree program student.
- Macroeconomic Topics Workshop. Issues in macroeconomic theory. Prerequisite: ECN 513 or instructor approval.
- Microeconomic Topics Workshop. Issues in microeconomic theory. Prerequisite: ECN 514 or instructor approval.

**ECN 598 ST: Special Topics.** (3) N

Advanced topics in economics. Consult the *Schedule of Classes* for offerings. Prerequisite: instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Education

### MASTER OF EDUCATION

Master of Education (M.Ed.) programs in the College of Education prepare scholarly professionals. Programs are available in Counselor Education, Curriculum and Instruction, Educational Administration and Supervision, Educational Media and Computers, Educational Psychology, Higher and Postsecondary Education, Learning and Instructional Technology, and Special Education. Concentrations within the M.Ed. in Curriculum and Instruction include bilingual education, communication arts, early childhood education, elementary education, English as a second language, Indian education, mathematics education, multicultural education, reading education, science education, secondary education, and social studies education. Within Special Education, M.Ed. areas of concentration are education of the gifted, the mildly handicapped, the multicultural exceptional, and severely and multiply handicapped children.

**Admission.** The College of Education requires above-average performance on the verbal scale of the GRE in addition to the general requirements for admission to the Graduate College. (For some programs the Miller Analogies Test may be substituted for the GRE.) Individual divisions or programs, however, may require superior test scores or GPA for admission. Division admission committees review a variety of evidence presented by applicants for admission consideration. Applicants with lower test scores or grades below minimum levels may be considered for admission recommendation if counterbalancing evidence suggesting the potential for outstanding performance in a master's program is available to division admission committees.

**Program of Study.** A minimum of 30 to 36 semester hours of course work approved by the student's supervisory committee, division director, and the Graduate College is required for the Master of Education degree. Candidates for the Master of Education degree should contact the division offering the graduate degree they are seeking for specific core requirements. *A program of study should be filed as early as possible and not later than upon completion of nine semester hours of graduate course work.*

**Examinations.** All M.Ed. programs require successful completion of written comprehensive examinations. These examinations focus on the specialized content of the specific M.Ed. program of study. Comprehensive examinations are written and evaluated by program faculty. If the student should fail the written comprehensive examination, a re-examination may be administered no sooner than three months and no later than one year from the date of the original examination. Approval of the re-examination must be obtained from the supervisory committee, division director, and the dean of the Graduate College.

## DOCTOR OF EDUCATION

The Doctor of Education (Ed.D.) degree is primarily a professional degree, designed for persons who wish to pursue careers as leaders in education or as applied researchers. Emphasis is on application of research and theory in education, and on acquisition of professional skills. Prospective students must demonstrate superior scholarship and leadership in professional education. Each student is expected to acquire broad knowledge in the major field and to produce a dissertation addressing a significant educational issue or problem.

**Admission.** Applicants must meet the general requirements established by the Graduate College as well as College of Education requirements. Satisfaction of these requirements does not guarantee admission. All divisions require submission of a two-page formal letter of application describing the applicant's prior relevant experience and accomplishments and specifying areas of greatest interest as well as career goals. Individual divisions or programs may have standards higher than these minimums or may require submission of additional materials. Applicants should consult the division director or program coordinator for specific admission requirements.

**Program of Study.** The program requires a minimum of 60 semester hours beyond the master's degree. Of these, at least six hours must be in internship. College of Education core courses must also be completed. These vary according to the degree sought. See the section below "Courses," page 176, for a listing. The recommendation for the program committee is reviewed simultaneously with the program of study.

The quality of student work is evaluated through written comprehensive examinations, formal oral and written presentation of the dissertation proposal, and a final oral examination in defense of the dissertation. Students must demonstrate competence both in the application of research findings and in conducting research. The dean of the Graduate College, upon recommendation of the division director, appoints the dissertation committee for each Ed.D. student. This committee reviews and evaluates the student's dissertation proposal and conducts the final oral examination.

**Residency.** The minimum residence requirement for the Ed.D. degree is completion of 30 semester hours within a period of 18 consecutive months after admission to the doctoral program at ASU. Not more than 10 semester hours of Research (792), Applied Project (793), and Dissertation (799) credit may be included in the course work used to meet the 30-hour residence requirement.

**Continuous Enrollment and Re-Entry.** Graduate students in the College of Education who have not been in attendance at ASU for one or more semesters must apply to the Graduate College for re-entry and, following approval of the re-entry application, must register for a minimum of one semester hour of graduate credit in the degree area during each of the following semesters. Applications for re-entry are considered along with all other new applications to the degree program.

Re-entry is not an issue for students who maintain continuous enrollment and make satisfactory progress toward their degrees. If a program of study must be interrupted for one or more semesters, the student must apply to the supervisory committee and the division director for leave status, not to exceed one calendar year.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** When students have essentially completed the course work in an approved program of study, they should request permission from the Graduate College to take the comprehensive examinations. The written and oral examinations are designed to assess the student's mastery of the field of specialization. Failure in the comprehensive examinations is considered final unless the supervisory committee and the director of the division recommend, and the dean of the Graduate College approves, a re-examination. A re-examination may be administered no sooner than three months and no later than one year from the date of the original examination. Only one re-examination is permitted.

**Candidacy.** Doctoral students should apply for admission to candidacy immediately after they have met all requirements for the degree, except the dissertation. These requirements include passing the comprehensive examinations and other requirements specified by the division.

**Research and Dissertation Requirements.** The dissertation should demonstrate advanced analytic competence and contribute to the understanding and improvement of professional practice. Each candidate must register for a combined total of 24 semester hours credit for 792 Research and 799 Dissertation. The final copy of the dissertation must be reviewed by the supervisory committee and the staff of the Graduate College at least three weeks before the degree conferral date. Copies of the *Format Manual* are available in the Graduate College.

**Final Examinations.** The final oral examination in defense of the dissertation is mandatory and must be held on the campus of ASU. The oral defense is scheduled by the supervisory committee with the approval of the dean of the Graduate College.

**Graduation.** The student is eligible for graduation when the Graduate College scholarship requirements have been met, the final oral examination has been passed, and the dissertation has been approved by the supervisory committee and accepted by the director of the division and the dean of the Graduate College.

Applications for graduation should be made no later than the date specified in the Graduate College calendar.

**Maximum Time Limit.** The candidate must take the final oral examination in defense of the dissertation within five

years after passing the comprehensive examinations. Any exception must be approved by the supervisory committee and the dean of the Graduate College and ordinarily involves repetition of the comprehensive examinations.

**Courses.** The core courses for the College of Education graduate programs carry the prefix “COE.” These courses are no longer required for all graduate majors in the College of Education. Contact the appropriate division to obtain specific core requirements.

### COLLEGE OF EDUCATION (COE)

**COE 501 Introduction to Research and Evaluation in Education.** (3) F, S, SS

Overview of educational inquiry from controlled, quantitative to qualitative, naturalistic. Emphasis on locating and critically interpreting published research.

**COE 502 Introduction to Quantitative Methods.** (3) F, S, SS

Topics in statistical analysis, measurement, and research design. Exploratory data analysis, estimation theory, and statistical inference. Use of computers for data analysis. Cross-listed as EDP 502. Credit is allowed for only COE 502 or EDP 502.

**COE 503 Introduction to Qualitative Research.** (3) F, S, SS

Terminology, historical development, approaches (including ethnography, ethnomethodology, critical theory, grounded theory, and hermeneutics), and qualitative versus quantitative social sciences; methods of inquiry. Cross-listed as EDP 503. Credit is allowed for only COE 503 or EDP 503.

**COE 504 Learning and Instruction.** (3) F, S, SS

Introduction to psychology of learning and instruction. Includes the foundations of learning theories and their application to educational practice. Cross-listed as EDP 504. Credit is allowed for only COE 504 or EDP 504.

**COE 505 American Education System.** (3) F, S, SS

Political, social, historical, and philosophical analyses of American education at all levels. Examination of primary sources, legal findings, and case studies.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.



One of the original campus buildings, the University Club is a popular site for meetings, seminars, and luncheons.

Tim Trumble photo

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## Educational Administration and Supervision

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### PROFESSORS

APPLETON, BARONE, GLASS, METOS, NORTON, SMITH,  
STOUT, VALVERDE, WEBB

### ASSOCIATE PROFESSORS

CASANOVA, HARTWELL-HUNNICUTT

### ASSISTANT PROFESSORS

MARGOLIS, PEÑA

### CLINICAL PROFESSOR

DYER

### CLINICAL ASSOCIATE PROFESSOR

MIACEY

The faculty in the Division of Educational Leadership and Policy Studies offer graduate programs leading to the Master of Education and Doctor of Education degrees in Educational Administration and Supervision.

Students interested in the Ph.D. degree with a field of study encompassing educational administration should refer to “Educational Leadership and Policy Studies,” page 178. See also “Doctor of Philosophy,” page 101, for general information on the Ph.D. degree.

For admission to the M.Ed. degree program applicants must submit scores on either the Graduate Record Examination (GRE) or the Miller Analogies Test (MAT); scores on the GRE are preferred. A minimum of 36 hours is required for the M.Ed. degree. Applicants for admission to the doctoral degree programs must submit scores on the GRE.

Candidates for all degrees must pass a written comprehensive examination. An oral examination over the written portion of the comprehensive examination may be required of Ed.D. candidates at the discretion of the student’s program committee. In addition, candidates for the Ed.D. must pass a final oral examination in defense of the dissertation. Candidates for the M.Ed. and Ed.D. programs may be required to take certain College of Education core courses depending upon previous experience and education. Pre-approval by an advisor is required. The core courses are COE 501, 502, 503, 504, and 505; see “EDA” courses on this page. A set of research courses is required for the Ed.D. degree.

### MASTER OF EDUCATION

See “Master of Education,” page 174, for information on the Master of Education degree.

### DOCTOR OF EDUCATION

See “Doctor of Education,” page 175, for information on the Doctor of Education degree.

## RESEARCH ACTIVITY

Faculty research includes the study of economics and financing of education, competency performance, administrator preparation, roles and characteristics of school administrators, educational demographics, equity in leadership, administrative decision processes, evaluation of teaching performance, evaluation of administrative performance, community education, effects of legislative budget limitations, personnel administration communications, alternative school programs, policy formation, and planning and school board problems. Students have the opportunity to work on research projects in the College of Education and in school districts and educational agencies throughout the state. The division is a member of the University Council for Educational Administration.

## EDUCATIONAL ADMINISTRATION AND SUPERVISION (EDA)

### EDA 501 Competency/Performance in Educational Administration. (3) F, SS

The nature of educational administration and the concept of competency as it applies to educational administration.

### EDA 507 Computers in Educational Administration. (3) F

Survey of computer use and applications in educational administration. Lecture, lab. Cross-listed as EMC 507. Credit is allowed for only EDA 507 or EMC 507.

### EDA 510 Introduction to Organization and Administration of American Public Schools. (3) F, S

Organizational structure and administration of public education are explored through the application of legal and ethical concepts and relevant information of the social sciences. Cross-listed as SPF 510. Credit is allowed for only EDA 510 or SPF 510.

### EDA 511 School Law. (3) S

Constitutional, statutory, and case law that relates to all school personnel, pupils, the school district, and other governmental units. Contracts, dismissals, tenure, retirement, pupil injuries, liability of personnel and district, school district boundary changes, and bonding.

### EDA 521 Evaluation of Teaching Performance. (3) F

In-depth analysis of legal basis of teacher appraisal, teacher competency, measurement of teacher performance, and application of performance appraisal systems. Prerequisite: COE 504.

### EDA 524 Theory and Application of Educational Administration. (3) F, SS

History and development of public school administration in the United States; current organizational patterns for public education at local, intermediate, state, and national levels; current theoretical positions in educational administration.

### EDA 525 Human Relations and Societal Factors in Education. (3) N

Interrelations between problems of educational administration and interdisciplinary social sciences. Communications skills, morale, authority, and perception. Concepts from political science, economics, and social-psychology useful to the administrator.

### EDA 526 Instructional Supervision. (3) F, S, SS

Administering curriculum improvement, in-service education, evaluating, and improving teaching competence; administrative instructional responsibilities.

### EDA 527 Managerial Functions in School Administration. (3) N

Relates to the work of the central district office staff and the school principal. Use of human resources, educational planning, and organization and management of time.

### EDA 544 Public School Finance. (3) F

Measures of ability, efforts, and educational need; capital outlay funding; tax revenues; federal, state, and local financing alternatives; major issues and trends in the financing of public education.

### EDA 548 Community Relations in Education. (3) N

Administrative factors of primary importance in developing community involvement in public schools. Emphasis on theory and skill of school system and individual communication.

### EDA 555 Educational Facility Planning. (3) N

School building needs, educational planning for facilities, responsibilities of architects, duties of contractors, and equipping and furnishing of school buildings.

### EDA 571 School Business Management. (3) F, S, SS

Purchasing, budgeting, accounting, payroll management, auditing, financial reporting, insurance, and administration of nonteaching personnel and services.

### EDA 573 School Personnel Administration. (3) S

Organization for personnel services; development of policy to govern selection, orientation, placement, remuneration, transfers, separations, and development of morale among instructional and noninstructional personnel.

### EDA 576 The School Principalship. (3) F

Problem and laboratory approaches used to provide application of administrative activities of elementary and secondary schools. Prerequisites: EDA 501, 526.

### EDA 634 Instructional Leadership. (3) N

Curricular practices and processes used by instructional leaders who plan, organize, and coordinate the professional activities in elementary and secondary schools. Prerequisite: EDA 526.

### EDA 675 Politics of Education. (3) S

Social science theory and research are used to consider the political context of educational policy making. Prerequisite: COE 505.

### EDA 676 The School Superintendency. (3) S

Critical examination of the school superintendency and the primary functions of this educational position. The duties, responsibilities, activities, and problems of the school superintendent are included. The unique leadership role of the school superintendent is examined. Prerequisite: instructor approval.

### EDA 679 Administration of Special Programs in Education. (1–3) N

For personnel administering special educational services; responsibilities of superintendents, principals, supervisors, and directors for special education, student personnel, audiovisual, library science, and others.

### EDA 711 Administrative Leadership. (3) F

Emphasis on research in leadership; application of research findings to administrative and supervisory functions in educational endeavors. Prerequisites: EDA 524; 30 semester hours in educational administration; admission to doctoral program.

### EDA 722 Administration of Instructional Improvement. (3) S

Recent research relating to administrative and supervisory responsibilities for the improvement of the educational program. Effective processes by administrators, supervisors, consultants, and coordinators. Prerequisites: 30 semester hours in educational administration; admission to doctoral program.

### EDA 733 Administrative Management. (3) S

Recent research relating to school management. School finance, law, buildings, transportation, food services, and supply management. Prerequisites: EDA 527, 544, 571; 30 semester hours in educational administration; admission to doctoral program.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Educational Leadership and Policy Studies

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### REGENTS' PROFESSOR BERLINER

**PROFESSORS**  
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NORTON, RENDÓN, RICHARDSON, SMITH,  
STOUT, WEBB

**ASSOCIATE PROFESSORS**  
CASANOVA, HARTWELL-HUNNICUTT

**ASSISTANT PROFESSORS**  
MARGOLIS, PEÑA

The faculty in the Division of Educational Leadership and Policy Studies offer a Ph.D. degree with an interdisciplinary approach to complex problems of educational policy and leadership. It brings together scholarly interests found in educational administration, higher education, and social and philosophical foundations of education. Emphasis is placed upon critical thought, theories and practice within political, demographic, historical, sociocultural, and intellectual contexts in the United States and other nations. The purpose of the program is to develop educational researchers, policy analysts, and leaders for careers in schools, colleges, universities, and government and private agencies.

### DOCTOR OF PHILOSOPHY

See "Doctor of Philosophy," page 101, for general requirements.

**Admission.** In addition to meeting Graduate College minimum requirements, applicants must submit scores on the Graduate Record Examination, a statement of intent, a résumé, and three letters of recommendation. The admission committee meets in early February. All required materials must be in the division office in early January to assure review. Students entering the program must have a bachelor's or master's degree in either education or an appropriate subject field (e.g., anthropology, economics, history, philosophy, or sociology), or additional courses are required in the areas of deficiency before admission to the program. Contact the division office for the appropriate admissions application.

**Program Committee.** The program committee (chair and at least two other members) advises in the preparation of the program of study and administers the comprehensive examinations. The committee must be approved by the dean of the Graduate College.

**Dissertation Committee.** After passing the comprehensive examination, a dissertation committee is formed upon the

approval of the dean of the Graduate College. The dissertation committee approves the subject and title of the dissertation. Members of the program committee may also serve as members of the dissertation committee; however, the committees may have different memberships. The dissertation chair must be a faculty member designated eligible to serve in this capacity by the dean of the Graduate College.

**Program of Study.** Students entering the Ph.D. program are expected to meet the requirement of an 84-semester-hour program of study (including the semester hours transferred from the master's degree in a related discipline). The following represents components of a program of study.

**Policy Studies Foundation.** At the heart of the Ph.D. program are 27 semester hours of course work on the foundations of policy studies. During the students' first year in the program, they take a two-semester sequence, Proseminar I and II (6 hours). In addition, they take Evaluation Theory (3 hours). In the second year, students enroll for Theoretical Issues in Policy Studies (3 hours). Other required courses in this category are Politics of Education, Theory of Educational Organization, Foundations of American Education, and Policy Issues in Learning and Instruction (3 hours each). To understand the economic and financial aspects of educational policy, students take one of the following three courses (3 hours each): Public School Finance, Higher Education Finance and Budgeting, or Political Economy.

**Advanced Research Methods.** Students must complete a minimum of nine semester hours of research methods beyond the core courses. Courses satisfying this requirement can be taken outside the College of Education curricula with the committee chair's approval. The courses taken deepen the student's research emphasis, whether it is qualitative or quantitative.

**Specialty Studies.** Each student completes 12 semester hours of course work in an area of special interest. This course work represents added depth in the specialty in which the student plans to practice as a scholar, administrator, or policy analyst. These courses are normally selected from those offered within the division.

**Practicum.** Students must earn three semester hours of credit for a supervised practicum. This work is planned in conjunction with the student's committee chair and involves applied work in a practical setting relating to the student's intended postdoctoral position.

**Research and Dissertation.** Each Ph.D. candidate is required to complete a minimum of 24 semester hours of research and dissertation.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** The examination centers on the professional focus and the cognate study and must be passed before admission to candidacy. A written examination is required; an oral examination over the written portion may be required at the discretion of the student's program committee.

**Dissertation Precis and Proposal.** The precis is a 15-page summary of the dissertation research proposed by the student. Upon approval of the precis by the dissertation com-



mittee, the student proceeds with developing a dissertation proposal.

**Research and Dissertation.** Twenty-four semester hours of research and dissertation credit are required. The dissertation must consist of a fully documented written study demonstrating a high level of research competence and scholarship in the student's area of professional focus. The dissertation should make an original contribution to knowledge in the area of educational leadership and policy studies and be worthy of publication by an established press as a book or monograph or as one or more articles in a refereed, scholarly journal.

**Final Examinations.** A final oral examination in defense of the dissertation is required.

### RESEARCH ACTIVITY

Faculty research focuses on issues in education from pre-school to higher education, such as: culture, language, and the schools; access to education by women and ethnic minorities; financing public education; the role of educational leaders; the schools' use of technology. The approach is interdisciplinary since problems in education are illuminated by all of the social and behavioral sciences as well as the humanities. Research techniques include both quantitative and qualitative methods.

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## Educational Media and Computers

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### PROFESSORS

BITTER, McISAAC

### ASSISTANT PROFESSOR

FLEMISTER

### CLINICAL ASSISTANT PROFESSORS

BLOCHER, BRUSH

The faculty in the Division of Curriculum and Instruction offer a graduate program leading to the Master of Education degree in Educational Media and Computers. However, applications are not currently being accepted for this program.

A concentration in educational media and computers is offered through the interdisciplinary Ph.D. degree in Curric-

ulum and Instruction. However, applications are not currently being accepted for this program. For more information on the Ph.D. degree in Curriculum and Instruction, see "Curriculum and Instruction—Interdisciplinary Doctoral Program," page 164.

### MASTER OF EDUCATION

The M.Ed. program emphasizes the use of media and computers in education. Students study the design, production, selection, utilization, and evaluation of instructional programs. Students may also select an area of concentration in business education, and other areas of study are available.

The graduate program prepares students to work with a wide range of media and computers in schools and in business training programs. Potential employment opportunities for graduates include positions as media specialists, computer coordinators, and computer education instructors in schools and universities. Graduates are also prepared to design multimedia training materials and computer-based training programs for business and industry.

A minimum of 36 hours is required in the master's degree program. Each master's degree candidate in Educational Media and Computers produces and orally defends an instructional unit.

In addition to meeting minimum Graduate College requirements for master's degree admission, each applicant must provide

1. Graduate Record Examination verbal test scores, Miller Analogies Test scores, or Test of English as a Foreign Language scores (for international students);
2. three letters of recommendation;
3. up-to-date résumé; and
4. a statement of professional goals.

For information on course work pertaining to media and computers, contact the program coordinator.

See "Master of Education," page 174, for more information on the Master of Education degree.

### RESEARCH ACTIVITY

The faculty in educational media and computers maintain an active program of research and development that has been supported by funds from federal agencies, private corporations, and the university. General research areas include (1) the design of effective multimedia and computer-based instruction, (2) the effective utilization of multimedia and computers in schools, and (3) distance education. Students participate in research and development activities as an integral part of their degree programs.

## EDUCATIONAL MEDIA AND COMPUTERS (EMC)

### EMC 455 Animation and Special Effects. (3) S

An examination of the art, science, and impact of animation and other special effects used in film.

### EMC 503 Current Issues and Problems in Media/Computer Education. (3) F

Introduction to current theory and practice in instructional media and computers. Overview of production areas.

### EMC 505 Presentation Technology for Multimedia. (3) F, S

An exploration of multimedia hardware and software used in creating presentations for educational, corporate, and commercial applications. Lecture, lab.

### EMC 506 Computer Graphics and Animation. (3) F, S

The study and application of design and animation techniques for use in video or computer-based presentations. Lecture, lab.

### EMC 507 Computers in Educational Administration. (3) F

Survey of computer use and applications in educational administration. Lecture, lab. Cross-listed as EDA 507. Credit is allowed for only EDA 507 or EMC 507.

### EMC 511 Computer Applications in Education. (3) F, S

Use and evaluation of computers for word processing, information management, graphics, and authoring instruction in educational settings.

### EMC 513 Introduction to Multimedia. (3) F, S

Introduction to multimedia, emphasizing applications for business, industry, and public and higher education.

### EMC 521 Instructional Media Design. (3) F, S, SS

Solve problems using technology; specify solutions to instructional design challenges. Prerequisite: EMC 511 or instructor approval.

### EMC 522 Evaluating Computer Materials. (3) F

Selection, utilization, design, and evaluation of instructional computer material. Focus on learning theory, criteria for evaluating educational software.

### EMC 523 Distance Education Systems for Instruction. (3) F

Introduction to Internet resources for educators. Instructional applications of distance-learning technologies.

### EMC 524 Imaging Technology. (3) F, S, SS

Use of optical scanning and digital data manipulation of photographs for use in educational presentations and publications.

### EMC 525 Presentation Graphics. (3) S

Design, production, and display of computer graphics for group presentations. Prerequisite: EMC 521 or instructor approval.

### EMC 527 Instructional Television. (3) F

Design and production of instructional programs for television. Lecture, lab. Prerequisite: EMC 521 or instructor approval.

### EMC 528 Photomedia Production. (3) S

Design and production of multimedia programs. Emphasis on slide/tape format. Prerequisites: EMC 521 and 524 and 525 or instructor approval.

### EMC 530 Development of Computer-Based Instruction. (3) S

The systematic design, development, and formative evaluation of computer-based instruction. Prerequisite: EMC 511 or instructor approval.

### EMC 531 Hypermedia. (3) F, S

Explores the design, development, and production of computer-based instruction for education and industry. Lecture, lab.

### EMC 532 Desktop Publishing. (3) F, SS

Design and production of educational materials using computer-based word processing, graphics, and page layout programs. Lecture, lab.

### EMC 535 Interactive Video. (3) S

The use of various authoring systems and support programs to assist in the design and production of regular and repurposed interactive video. Lecture, lab.

### EMC 584 Educational Media Internship. (1–6) F, S, SS

Prerequisites: EMC 521; LNT 502; instructor approval.

### EMC 637 Computers in Elementary School Curriculum. (3) SS

Experiences with educational uses of computers; computer awareness, family/societal impact, classroom applications/software, and curriculum development.

### EMC 701 Advanced Technologies in Education. (3) S

Examining the role and impact of artificial intelligence, expert systems, and related advanced technologies in education.

### EMC 702 Research in Technology-Based Education. (3) F

Critical exposure to theories, research, and methods in technology-based education.

### EMC 703 Research in Distance Education. (3) S

Seminar with emphasis on research in telecommunications and distance education. Prerequisite: EMC 523 or instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Educational Psychology

Elsie Moore

*Director*

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### REGENTS' PROFESSORS

BERLINER, KULHAVY

### PROFESSORS

BARONA, GLASS, HARRIS, KERR, KRUS, NELSEN,  
SMITH, STROM

### ASSOCIATE PROFESSORS

BEHRENS, BETZ, MOORE, SANTOS de BARONA

### ASSISTANT PROFESSORS

NAKAGAWA, ROBERTS, STAFFORD

The faculty in the Division of Psychology in Education offer graduate programs leading to the M.A., Master of Education, and Ph.D. degrees in Educational Psychology. In the Ph.D. program, concentrations are available in lifespan developmental psychology; measurement, statistics, and methodological studies; and school psychology.

Students applying for admission to any of these programs are required to submit scores on the Graduate Record Examination (GRE).

### MASTER OF EDUCATION

The Master of Education degree program requires 36 semester hours of graduate course work. The M.A. degree program requires 30 semester hours of graduate course work, which includes a thesis. In the M.A. program, areas of study are available in measurement, statistics, and methodological studies and life-span developmental psychology. All applicants must submit scores of the GRE. All programs except school psychology (see "School Psychology," page 181) have deadlines of October 15 for receiving all application materials, including test scores, to be considered for admission for the following semester. All degree programs require written comprehensive examinations; doctoral degree programs require a final oral examination as well. Additional information on these degree programs may be obtained from the Division of Psychology in Education.

See “Master’s Degrees,” page 98, for general requirements.

See “Master of Education,” page 174, for information on the Master of Education degree.

### DOCTOR OF PHILOSOPHY

The Ph.D. degree in Educational Psychology with a concentration in school psychology is accredited by the American Psychological Association and the National Association of School Psychologists.

**School Psychology.** The faculty specializing in school psychology offer a scientist-practitioner program leading to the Ph.D. degree. The program provides preparation in academic and professional areas through course work, research, practica, and internship. Graduates are employed in school districts, behavioral health settings serving children and adolescents, and universities. All application materials, including test scores, must be received by January 15 to be considered for admission the following academic year. For more information on the faculty, the programs of study, and admission requirements, applicants should contact the Division of Psychology in Education and request the *School Psychology Program* brochure.

See “Doctor of Philosophy,” page 101, for general information on the Ph.D. degree.

### RESEARCH ACTIVITY

Research in methodology includes the development and assessment of theory and techniques of design, statistics, psychometrics, and evaluation. Specific topics include multivariate analysis, personnel and program evaluation, qualitative methodology, and use of computers in instruction and testing.

Research in human development includes studies of critical thinking, moral development and honesty, prejudice, belief systems, authority, social environments of schools, and cultural influences on development.

School psychology research involves assessment of cognitive and academic skills, classroom processes and school cultures, and assessment of minority individuals. Additional research topics in school psychology include cognitive-emotional processes in achievement motivation, cognitive behavioral interventions, and social-cognitive development.

### EDUCATIONAL PSYCHOLOGY (EDP)

**EDP 502 Introduction to Quantitative Methods.** (3) F, S, SS  
Topics in statistical analysis, measurement, and research design. Exploratory data analysis, estimation theory, and statistical inference. Use of computers for data analysis. Cross-listed as COE 502. Credit is allowed for only COE 502 or EDP 502.

**EDP 503 Introduction to Qualitative Research.** (3) F, S, SS  
Terminology, historical development, approaches (including ethnography, ethnomethodology, critical theory, grounded theory, and hermeneutics), and qualitative versus quantitative social sciences; methods of inquiry. Cross-listed as COE 503. Credit is allowed for only COE 503 or EDP 503.

**EDP 504 Learning and Instruction.** (3) F, S, SS  
Introduction to psychology of learning and instruction. Includes the foundations of learning theories and their application to educational practice. Cross-listed as COE 504. Credit is allowed for only COE 504 or EDP 504.

**EDP 510 Essentials of Classroom Learning.** (3) F, S, SS  
Theoretical and empirical foundations of learning in the classroom milieu. Critical exposure to research and method in instructional psychology. Cross-listed as LNT 510. Credit is allowed for only EDP 510 or LNT 510.

**EDP 513 Child Development.** (3) F, S, SS  
Examination of problems and achievements experienced by children growing up in a technological society. Emphasis on discovering the child’s perspective.

**EDP 514 Psychology of the Adolescent.** (3) F, S, SS  
Cognitive, physical, and social development of adolescents in contemporary society. Impact of family, school, and work place on adolescent development. Prerequisite: EDP 310 or PGS 101 or equivalent.

**EDP 530 Theoretical Issues and Research in Human Development.** (3) F  
Psychological theories, research, and methods relevant to human development, emphasizing the relations between early development and later performance.

**EDP 534 Principles of Behavior Modification.** (3) F  
Principles of conditioning as applied to behavior modification; current research on the experimental analysis of behavior in educational psychology.

**EDP 535 Applied Behavior Analysis.** (3) F  
Principles of conditioning as applied to behavior. Current research on the experimental analysis of behavior in educational psychology.

**EDP 536 Physiology of Behavioral Disorders.** (3) F  
Critical study of nervous system, brain function for fundamental behaviors, and system dysfunctions in mental/neurological disorders. Prerequisite: instructor approval.

**EDP 540 Theoretical Views of Learning.** (3) F, S  
Classical and cognitive theories of learning, plus recent orientations. Illustrative experimental and rational foundations; implications for educational practice. Cross-listed as LNT 540. Credit is allowed for only EDP 540 or LNT 540.

**EDP 542 The Psychology of Learning and Instruction.** (3) S  
Critical review and evaluation of research on learning variables relevant to acquisition and retention of instructional materials. Lab. Cross-listed as LNT 542. Credit is allowed for only EDP 542 or LNT 542.

**EDP 544 Psychology of Reading.** (3) F  
Alternate analyses of the reading process; designs and procedures for investigating instructional and noninstructional variables related to reading achievement.

**EDP 550 Introduction to Measurement in Education.** (3) F, S  
Nature and types of educational measures. Critiquing and selecting appropriate measuring devices. Constructing measuring devices. Social controversies about tests. Lecture, lab. Prerequisite: EDP 502 or instructor approval.

**EDP 552 Quantitative Data Analysis in Education I.** (3) F, S, SS  
Continued treatment of statistical estimation, testing, and research synthesis. Inferential techniques including ANOVA and multiple regression with computers. Lecture, lab. Prerequisite: EDP 502 or instructor approval.

**EDP 554 Quantitative Data Analysis in Education II.** (3) F, S, SS  
Advanced issues in applied multiple regression and ANOVA. Introduction to ANCOVA. Use of computers for data analysis. Lecture, lab. Prerequisite: EDP 552 or instructor approval.

**EDP 556 Data Processing Techniques in Measurement and Research.** (3) A  
Use of statistical packages for data analysis. Emphasis on data management, data structures, and related statistical procedures. Lecture, lab. Prerequisite: EDP 552. Pre- or corequisite: EDP 554 or instructor approval.

**EDP 560 Individual Intellectual Assessment.** (3) F, S  
Issues in administration and interpretation of individual intelligence tests. Theoretical basis, ethical considerations, and diagnostic use of test results. Prerequisite: admission to a program in professional psychology or instructor approval.

**EDP 561 Lab in Psychological Assessment.** (3) S  
Lab experience in administration, scoring, and interpretation of individual intelligence tests. Lab. Prerequisite: admission to a program in professional psychology or instructor approval. Corequisite: EDP 560.

**EDP 562 School Psychology: Theory and Practice.** (3) F  
Development and present status of school psychology, including an overview of assessment and intervention strategies and professional issues.

**EDP 563 Interventions in School Psychology.** (3) F  
Examination of case-based consultation and consultation research relevant to school psychology practice. Field experience. Prerequisite: school psychology program or instructor approval.

**EDP 564 Curriculum-Based Assessment and Academic Interventions.** (3) S

Construction administration and scoring outcome-based measures. Use of measures for using the various educational decisions.

**EDP 566 Diagnosis of Learning Difficulties.** (3) S

Clinical diagnosis of learning difficulties, emphasizing specific academic problems. Use and interpretation of diagnostic instruments in practical school situations. Prerequisites: EDP 560 and 562 or equivalents; instructor approval.

**EDP 567 School Psychological Services to Minority Students.** (3) S

Historical perspectives and major issues in psychological and academic assessment and interventions with minority school children.

**EDP 568 Diagnosis and Interventions for Children and Adolescents with Emotional Handicaps.** (3) F

Clinical diagnosis of emotional handicaps in children and adolescents with emphasis on interpretation of diagnostic instruments and designing appropriate interventions in school settings. Lecture, lab. Prerequisites: EDP 566; PSY 578 or equivalent.

**EDP 651 Methods and Practices of Qualitative Research.** (3) S

Advanced course for students familiar with theory and extant work. Topics include data collection, analysis, reporting, and an extensive fieldwork project. Prerequisite: COE 503.

**EDP 652 Multivariate Procedures in Data Analysis I.** (3) F

Introduction to matrix algebra. Application of MANOVA, MANCOVA, power analysis, effect size, discriminant and repeated measures analysis with computers. Lecture, lab. Prerequisite: EDP 554 or instructor approval.

**EDP 654 Multivariate Procedures in Data Analysis II.** (3) S

Treatment of applied multivariate multiple regression, canonical correlation, factor analysis, log-linear models, and structural equation models with computers. Lecture, lab. Prerequisite: EDP 652 or instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Electrical Engineering

Joseph C. Palais

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### REGENTS' PROFESSORS

BALANIS, FERRY

### PROFESSORS

BACKUS, CROUCH, DeMASSA, EL-GHAZALY,  
GOODNICK, GORUR, HEYDT, HIGGINS, KARADY,  
KOZICKI, PALAIS, PAN, ROEDEL, SADOWSKY,  
SCHRODER, SPANIAS, THORNTON

### ASSOCIATE PROFESSORS

ABERLE, ALLEE, BIRD, CHAKRABARTI, COCHRAN,  
EL-SHARAWY, GREENEICH, GRONDIN, HOLBERT,  
MORRELL, RODRIGUEZ, SHEN, SI, SKROMME,  
TSAKALIS, TYLAVSKY, ZHANG

### ASSISTANT PROFESSORS

CAPONE, DUMAN, KARAM,  
VASILESKA-KAFEDZISKA, YAZDI

The faculty in the Department of Electrical Engineering offer graduate programs leading to the M.S., the Master of Science in Engineering, and the Ph.D. degrees in Electrical Engineering.

The faculty also participate in offering the interdisciplinary program leading to the Ph.D. degree in the Science and Engineering of Materials. See "Science and Engineering of Materials," page 281, for program description.

**Admission.** See "Admission to the Graduate College," page 89. In addition, a student whose undergraduate degree is not based on an ABET-accredited program must submit scores on the Graduate Record Exam and must have earned the equivalent of a 3.50 GPA in the last two years of study. All applicants must submit a short statement of purpose to the department. This statement must include the desired area of study within electrical engineering. Refer to the department's Web site cited above for further information on programs, faculty, financial aid, and for admission and statement of purpose forms.

### MASTER OF SCIENCE

See "Master's Degrees," page 98, for general information.

### MASTER OF SCIENCE IN ENGINEERING

See "Master of Science in Engineering," page 186, for information on the Master of Science in Engineering degree.

A final written comprehensive exam is required for Option 2 in this program. Most master's degree students are admitted to the M.S.E. program, Option 2. Those who are offered financial support or who are outstanding students showing research potential are admitted to the M.S. program.

**Internship.** An internship program is available to full-time, on-campus, master's degree students. Students spend a semester or a summer term at a company working on practical engineering problems. Up to three hours of credit are allowed for internship under course EEE 584 Internship.

### DOCTOR OF PHILOSOPHY

The Ph.D. degree in Electrical Engineering is awarded based upon evidence of excellence in research leading to a scholarly dissertation that is a contribution to knowledge.

See "Doctor of Philosophy," page 101, for general requirements.

**Program of Study.** The program of study should be filed soon after the student has been admitted to the program and the supervisory committee has been formed.

**Foreign Language Requirements.** None.

**Qualifying Examinations.** Every student must pass a qualifying examination consisting of a short research paper and an oral presentation of the research. The exam must take place before the end of the second semester in attendance at ASU.

**Comprehensive Examinations.** Written and oral comprehensive examinations are required before the student is admitted to candidacy. The examinations are administered by the supervisory committee.

**Dissertation Requirements.** A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required.

**Final Examinations.** A final oral examination in defense of the dissertation is required.

## RESEARCH ACTIVITY

Opportunities at the level of the master's or doctoral degree are offered to students whose goals are research, development, design, manufacturing, systems, engineering management, teaching, or other professional activities in electrical engineering or related disciplines.

Research opportunities in the Department of Electrical Engineering are available in a broad spectrum of subjects encompassing traditional as well as new specialties. Significant research activity exists in Solid-State electronics, power systems, electromagnetic, communications, signal processing, control systems, and coherent optics, reflecting the continuing strong interest and cooperation of local industry in these disciplines. Solid-State electronics, telecommunications, and power systems have been selected for support by industry as part of a program establishing excellence centers for engineering at ASU.

The list that follows provides an indication of the breadth of subjects available for research in the department. A research project may embrace more than one of the topics listed and may involve cooperative activity with local industry. The list is not meant to be exhaustive; topics other than those shown may also be suitable.

*Solid-State Electronics.* Semiconductor crystal growth: epitaxial, and thin films. Processing: oxidation, diffusion, ion-implantation, rapid thermal processing, low pressure CVD, reactive ion etching, evaporation, and optical and electron beam lithography. Devices: quantum functional devices, neural network circuits, discrete and integrated circuits, thin film devices, solar cells, lasers, microwave devices, and integrated optical circuits. Characterization: electrical, optical, physical, and chemical measurements, SEM, STM/AFM, Auger surface analysis. Modeling: heterojunction device modeling, MOSFET and bipolar transistor modeling, charge carrier ballistics, Monte Carlo simulations, quantum device modeling, quantum transport, theory of optical processes and effects, and VLSI circuit design and novel architectures.

*Power Engineering.* Research efforts in power engineering are coordinated through the NSF-sponsored Center for Advanced Control of Energy and Power Systems. Power systems: operation analysis, transient stability and reliability analysis, generation and transmission planning, system protection, application of expert systems, and short-term load forecasting using neural networks. Transmission and distribution: electric power quality, distribution system design, load management, and automation. Power electronics: rectifiers and inverters, high power switching devices, power supplies for fusion devices, accelerators, and power conditioning. High voltage techniques: electrical strength of dielectrics, insulation coordination, aging of non-ceramic insulators, electric field calculation, remote data gathering, status assessment, and high-voltage effects on fiber-optic cables. Computer applications: software development, real-time control, large network techniques, and neural networks. Power generation: power plant dynamics, modeling, diagnostics, and advanced instrumentation.

*Control Systems.* Nonlinear systems analysis and control; adaptive control; robust control; sampled-data and real-time

digital control, virtual instrumentation in control; neural networks; system identification and model validation; control of distributed parameter systems; modeling, simulation, and graphical visualization of dynamical systems. Applications to aerospace, robotics, semiconductor processes, manufacturing systems, and power systems.

*Communications.* Digital communications: modulation, coding, equalization, wireless communications, multiple access; communications networks: wireless networks, quality of service, integrated services.

*Signal Processing.* Detection and estimation; signal processing architectures; nonlinear signal analysis; statistical decision theory; spectral estimation; image processing and compression; speech, coding and recognition; adaptive signal processing.

*Antennas, Microwaves, Computational Electromagnetics, and Radar.* Antennas: antenna analysis, design, and measurements; electromagnetic wave radiation, propagation, scattering, and reception; slotted waveguides; patch antennas; antenna broadbanding techniques. Microwaves: microwave circuits, devices, and systems; microwave, millimeter wave, and optical integrated circuits and transmission lines; transient analysis of striplines and microstrips; printed lines on anisotropy substrates; microwave solid-state circuits and devices and measurement techniques. Packaging of microwave integrated circuits. Computational electromagnetics: Geometrical and physical theories of diffraction; moment method; finite-difference time-domain; finite element. Radar: wideband radar techniques, radar cross section, radar multipath, and tracking.

*Lasers and Coherent Optics.* Fiber optics: communications, active and passive components, and networks. System analysis; lasers, and holography.

In addition, students are encouraged to undertake interdisciplinary research projects encompassing several technical areas in electrical engineering, as well as other areas of engineering, science and mathematics.

## ELECTRICAL ENGINEERING (EEE)

### EEE 405 Filter Design. (3) F

Principles of active and passive analog filter design, frequency domain approximations, sensitivity and synthesis of filters. Prerequisite: EEE 303.

### EEE 407 Digital Signal Processing. (4) F

Time and frequency domain analysis, difference equations, z-transform, FIR and IIR Digital Filter Design, Discrete Fourier Transform, FFT, and random sequences. Lecture, lab. Prerequisites: EEE 303; MAT 342.

### EEE 425 Digital Systems and Circuits. (4) F, S

Digital logic gate analysis and design. Propagation delay times, fan out, power dissipation, noise margins. Design of MOS and bipolar logic families, including NMOS, CMOS, standard and advanced TTL, ECL, and BiCMOS. Inverter, combinational and sequential logic circuit design. MOS memories, VLSI circuits. Computer simulations using PSPICE. Lecture, lab. Prerequisite: ECE 334.

### EEE 433 Analog Integrated Circuits. (3) S

Analysis, design, and applications of modern analog circuits using integrated bipolar and field effect transistor technologies. Prerequisite: ECE 334.

### EEE 434 Quantum Mechanics for Engineers. (3) F

Angular momentum, wave packets, Schroedinger wave equation, probability, problems in one dimension, principles of wave mechanics, scattering, tunneling, central forces, angular momentum, hydrogen atom, perturbation theory, variational techniques. Prerequisites: ECE 352; EEE 340.

**EEE 435 Microelectronics.** (3) S

Practice of solid-state device fabrication techniques, including thin film and integrated circuit fabrication principles. Lecture, lab. Pre- or corequisite: EEE 436.

**EEE 436 Fundamentals of Solid-State Devices.** (3) F, S

Semiconductor fundamentals, pn junctions, metal-semiconductor contacts, metal-oxide-semiconductor capacitors and field-effect transistors, bipolar junction transistors. Prerequisite: ECE 352.

**EEE 437 Optoelectronics.** (3) N

Basic operating principles of various types of optoelectronic devices which play important roles in commercial and communication electronics; light emitting diodes, injection lasers, and photodetectors. Prerequisite: EEE 436.

**EEE 439 Semiconductor Facilities and Cleanroom Practices.** (3) F

Microcontamination, controlled environments, cleanroom layout and systems, modeling, codes and legislation, ultrapure water, production materials, personnel and operations, hazard management, advanced concepts. Prerequisite: EEE 435 or instructor approval.

**EEE 440 Electromagnetic Engineering II.** (4) F, S

Second half of an introductory course in electromagnetic theory and its application in electrical engineering. Analytical and numerical solution of boundary value problems. Advanced transmission lines; waveguides; antennas; radiation and scattering. Lecture, lab. Prerequisite: EEE 340 or equivalent.

**EEE 443 Antennas.** (3) S

Fundamental parameters; engineering principles and radiation integrals; linear wire antennas; loops and arrays; numerical computations; measurements. Prerequisite: EEE 340 or equivalent.

**EEE 445 Microwaves.** (4) F

Waveguides; circuit theory for waveguiding systems; microwave devices, systems, and energy sources; striplines and microstrips; impedance matching transformers; measurements. Lecture, lab. Prerequisite: EEE 340 or equivalent.

**EEE 448 Fiber Optics.** (4) F

Principles of fiber-optic communications. Lecture, lab. Prerequisites: EEE 303, 340.

**EEE 455 Communication Systems.** (4) F, S

Signal analysis techniques applied to the operation of electrical communication systems. An introduction to and overview of modern digital and analog communications. Lecture, lab. Prerequisite: EEE 350.

**EEE 459 Data Communication Systems.** (3) S

System characteristics. Communications media. Communication codes. Data validity checking. Line protocols, terminals, and system configurations. Examples. Prerequisite: EEE 303.

**EEE 460 Nuclear Concepts for the 21st Century.** (3) N

Radiation interactions, damage, dose, and instrumentation. Cosmic rays, satellite effects; soft errors; transmutation doping. Fission reactors, nuclear power. TMI, Chernobyl. Radioactive waste. Prerequisite: PHY 241 or 361.

**EEE 463 Electrical Power Plant.** (3) F

Nuclear, fossil, and solar energy sources. Analysis and design of steam supply systems, electrical generating systems, and auxiliary systems. Power plant efficiency and operation. Prerequisites: ECE 301, 340 (or PHY 241).

**EEE 470 Electric Power Devices.** (3) F

Analysis of devices used for short circuit protection, including circuit breakers, relays, and current and voltage transducers. Protection against switching and lightning over voltages. Insulation coordination. Prerequisite: EEE 360.

**EEE 471 Power System Analysis.** (3) S

Review of transmission line parameter calculation. Zero sequence impedance, symmetrical components for fault analysis, short circuit calculation, review of power flow analysis, power system stability, and power system control concepts. Prerequisite: EEE 360.

**EEE 473 Electrical Machinery.** (3) F

Operating principles, constructional details, and design aspects of conventional DC and AC machines, transformers and machines used in computer disc drives, printers, wrist watches, and automobiles. Prerequisite: EEE 360.

**EEE 480 Feedback Systems.** (4) F, S

Analysis and design of linear feedback systems. Frequency response and root locus techniques, series compensation, and state variable feedback. Lecture, lab. Prerequisite: EEE 303.

**EEE 482 Introduction to State Space Methods.** (3) F

Discrete and continuous systems in state space form controllability, stability, and pole placement. Observability and observers. Pre- or corequisite: EEE 480.

**EEE 490 Senior Design Laboratory.** (3) F, S

Project-oriented laboratory. Each student must complete one or more design projects during the semester. Lecture, lab. Prerequisites: ECE 300, 334; EEE 303; senior status. *General Studies: L2.*

**EEE 506 Digital Spectral Analysis.** (3) S

Principles and applications of digital spectral analysis, least squares, random sequences, parametric, and nonparametric methods for spectral estimation. Prerequisites: EEE 407, 554.

**EEE 507 Multidimensional Signal Processing.** (3) F

Processing and representation of multidimensional signals. Design of systems for processing multidimensional data. Introduction to image and array processing issues. Prerequisite: EEE 407 or instructor approval.

**EEE 508 Digital Image Processing and Compression.** (3) S

Fundamentals of digital image perception, representation, processing, and compression. Emphasis on image coding techniques. Signals include still pictures and motion video. Prerequisites: EEE 350 and 407 or equivalents.

**EEE 511 Artificial Neural Computation Systems.** (3) F

Networks for computation, learning function representations from data, learning algorithms and analysis, function approximation and information representation by networks, applications in control systems and signal analysis. Prerequisite: instructor approval.

**EEE 523 Advanced Analog Integrated Circuits.** (3) F

Analysis and design of analog integrated circuits: analog circuit blocks, reference circuits, operational-amplifier circuits, feedback, and nonlinear circuits. Prerequisite: EEE 433 or equivalent.

**EEE 525 VLSI Design.** (3) F, S

Analysis and design of Very Large Scale Integrated (VLSI) Circuits. Physics of small devices, fabrication, regular structures, and system timing. Open only to graduate students.

**EEE 526 VLSI Architectures.** (3) F

Special-purpose architectures for signal processing. Design of array processor systems at the system level and processor level. High-level synthesis. Prerequisite: CSE 330 or EEE 407 or instructor approval.

**EEE 527 Analog to Digital Converters.** (3) F

A detailed introduction to the design of Nyquist rate, CMOS analog to digital converters. Prerequisite: EEE 523.

**EEE 530 Advanced Silicon Processing.** (3) S

Thin films, CVD, oxidation, diffusion, ion-implantation for VLSI, metallization, silicides, advanced lithography, dry etching, rapid thermal processing. Pre- or corequisite: EEE 435.

**EEE 531 Semiconductor Device Theory I.** (3) F

Transport and recombination theory, pn and Schottky barrier diodes, bipolar and junction field-effect transistors, and MOS capacitors and transistors. Prerequisite: EEE 436 or equivalent.

**EEE 532 Semiconductor Device Theory II.** (3) S

Advanced MOSFETs, charge-coupled devices, solar cells, photodetectors, light-emitting diodes, microwave devices, and modulation-doped structures. Prerequisite: EEE 531.

**EEE 533 Semiconductor Process/Device Simulation.** (3) F

Process simulation concepts, oxidation, ion implantation, diffusion, device simulation concepts, pn junctions, MOS devices, bipolar transistors. Prerequisite: EEE 436 or equivalent.

**EEE 534 Semiconductor Transport.** (3) S

Carrier transport in semiconductors. Hall effect, high electric field, Boltzmann equation, correlation functions, and carrier-carrier interactions. Prerequisites: EEE 434, 436 (or 531).

**EEE 536 Semiconductor Characterization.** (3) S

Measurement techniques for semiconductor materials and devices. Electrical, optical, physical, and chemical characterization methods. Prerequisite: EEE 436 or equivalent.

**EEE 537 Semiconductor Optoelectronics I.** (3) F

Electronic states in semiconductors, quantum theory of radiation, absorption processes, radiative processes, nonradiative processes, photoluminescence, and photonic devices. Prerequisites: EEE 434, 436 (or 531).

**EEE 538 Semiconductor Optoelectronics II.** (3) S

Material and device physics of semiconductor lasers, light-emitting diodes, and photodetectors. Emerging material and device technology in III-V semiconductors. Prerequisite: EEE 537.

**EEE 539 Introduction to Solid-State Electronics.** (3) F

Crystal lattices, reciprocal lattices, quantum statistics, lattice dynamics, equilibrium, and nonequilibrium processes in semiconductors. Prerequisite: EEE 434.

**EEE 541 Electromagnetic Fields and Guided Waves.** (3) N

Polarization and magnetization; dielectric, conducting, anisotropic, and semiconducting media; duality, uniqueness, and image theory; plane wave functions, waveguides, resonators, and surface guided waves. Prerequisite: EEE 440 or equivalent.

**EEE 543 Antenna Analysis and Design.** (3) F

Impedances, broadband antennas, frequency independent antennas, miniaturization, aperture antennas, horns, reflectors, lens antennas, and continuous sources design techniques. Prerequisite: EEE 443 or equivalent.

**EEE 544 High Resolution Radar.** (3) N

Fundamentals; wideband coherent design, waveforms, and processing; stepped frequency; synthetic aperture radar (SAR); inverse synthetic aperture radar (ISAR); imaging. Prerequisites: EEE 303 and 340 or equivalents.

**EEE 545 Microwave Circuit Design.** (3) S

Analysis and design of microwave attenuators, in-phase and quadrature-phase power dividers, magic tee's, directional couplers, phase shifters, DC blocks, and equalizers. Prerequisite: EEE 445 or instructor approval.

**EEE 546 Advanced Fiber-Optics.** (3) N

Theory of propagation in fibers, couplers and connectors, distribution networks, modulation, noise and detection, system design, and fiber sensors. Prerequisite: EEE 448 or instructor approval.

**EEE 547 Microwave Solid-State Circuit Design I.** (3) S

Application of semiconductor characteristics to practical design of microwave mixers, detectors, limiters, switches, attenuators, multipliers, phase shifters, and amplifiers. Prerequisite: EEE 545 or instructor approval.

**EEE 548 Coherent Optics.** (3) N

Diffraction, lenses, optical processing, holography, electro-optics, and lasers. Prerequisite: EEE 440 or equivalent.

**EEE 549 Lasers.** (3) N

Theory and design of gas, solid, and semiconductor lasers. Prerequisite: EEE 448 or instructor approval.

**EEE 550 Transform Theory and Applications.** (3) N

Introduction to abstract integration, function spaces, and complex analysis in the context of integral transform theory. Applications to signal analysis, communication theory, and system theory. Prerequisite: EEE 303.

**EEE 551 Information and Coding Theory.** (3) N

Fundamental theorems of information theory for sources and channels; convolutional and burst codes. Prerequisites: EEE 553, 554.

**EEE 552 Digital Communications I.** (3) S

Fundamentals of digital communications: complex signal theory; modulation; optimal coherent and incoherent receivers; coded modulation and the Viterbi algorithm. Prerequisites: EEE 455, 554.

**EEE 553 Error-Correcting Codes.** (3) S

Application of modern algebra to the design of random error-detecting and error-correcting block codes. Prerequisite: EEE 455.

**EEE 554 Random Signal Theory I.** (3) F

Application of statistical techniques to the representation and analysis of electrical signals and to communications systems analysis. Prerequisite: EEE 350 or instructor approval.

**EEE 555 Random Signal Theory II.** (3) N

Processing of signals in the presence of noise. Random signals, correlation, frequency spectra, estimation, filtering, noise, prediction, and transients. Prerequisite: EEE 554.

**EEE 556 Detection and Estimation Theory.** (3) S

Combination of the classical techniques of statistical inference and the random process characterization of communication, radar, and other modern data processing systems. Prerequisites: EEE 455, 554.

**EEE 558 Digital Communications II.** (3) F

Continuation of EEE 552. Advanced topics in digital communications: synchronization; multipath and fading; equalization; miscellaneous topics. Prerequisite: EEE 552.

**EEE 571 Power System Transients.** (3) N

Simple switching transients. Transient analysis by deduction. Damping of transients. Capacitor and reactor switching. Transient recovery voltage. Travelling waves on transmission lines. Lightning. Protection of equipment against transient overvoltages. Introduction to computer analysis of transients. Prerequisite: EEE 471.

**EEE 572 Advanced Power Electronics.** (3) N

Analysis of device operation, including thyristors, gate-turn-off thyristors, and transistors. Design of rectifier and inverter circuits. Applications such as variable speed drives, HVDC, motor control, and uninterruptable power supplies. Prerequisite: EEE 470.

**EEE 573 Electric Power Quality.** (3) S

Sinusoidal waveshape maintenance; study of momentary events, power system harmonics, instrumentation, filters, power conditioners, and other power quality enhancement methods. Prerequisite: EEE 360 or equivalent.

**EEE 574 Computer Solution of Power Systems.** (3) N

Algorithms for digital computation for power flow, fault, and stability analysis. Sparse matrix and vector programming methods, numerical integration techniques, stochastic methods, solution of the least squares problem. Prerequisite: EEE 471.

**EEE 577 Power Engineering Operations and Planning.** (3) F

Economic dispatch, unit commitment, dynamic programming, power system planning and operation, control, generation modeling, AGC, and power production. Prerequisite: EEE 471 or graduate standing.

**EEE 579 Power Transmission and Distribution.** (3) S

High-voltage transmission line electric design; conductors, corona, RI and TV noise, insulators, clearances. DC characteristic, feeders voltage drop, and capacitors. Prerequisite: EEE 470.

**EEE 581 Filtering of Stochastic Processes.** (3) N

Modeling, estimation, and filtering of stochastic processes, with emphasis on the Kalman filter and its applications in signal processing and control. Prerequisites: EEE 482, 550, 554.

**EEE 582 Linear System Theory.** (3) S

Controllability, observability, and realization theory for multivariable continuous time systems. Stabilization and asymptotic state estimation. Disturbance decoupling, noninteracting control. Prerequisite: EEE 482.

**EEE 585 Digital Control Systems.** (3) F

Analysis and design of digital and sampled data control systems, including sampling theory, z-transforms, the state transition method, stability, design, and synthesis. Prerequisites: EEE 482, 550.

**EEE 586 Nonlinear Control Systems.** (3) N

Stability theory, including phase-plane, describing function, Liapunov's method, and frequency domain criteria for continuous and discrete, nonlinear, and time-varying systems. Prerequisite: EEE 482.

**EEE 587 Optimal Control.** (3) F

Optimal control of systems. Calculus of variations, dynamic programming, linear quadratic regulator, numerical methods, and Pontryagin's principle. Cross-listed as MAE 507. Credit is allowed for only EEE 587 or MAE 507. Prerequisite: EEE 482 or MAE 506.

**EEE 588 Design of Multivariable Control Systems.** (3) S

Practical tools for designing robust MIMO controllers. State feedback and estimation, model-based compensators, MIMO design methodologies, CAD, real-world applications. Prerequisite: EEE 480 or equivalent.

**EEE 606 Adaptive Signal Processing.** (3) F

Principles/applications of adaptive signal processing, adaptive linear combiner, Wiener least-squares solution, gradient search, performance surfaces, LMS/RLS algorithms, block time/frequency domain LMS. Prerequisites: EEE 506, 554.

**EEE 607 Speech Coding for Multimedia Communications.** (3) S

Speech and audio coding algorithms for applications in wireless communications and multimedia computing. Prerequisite: EEE 407. Pre- or corequisite: EEE 506.

**EEE 631 Heterojunctions and Superlattices.** (3) F

Principles of heterojunctions and quantum well structures, band line-ups, optical, and electrical properties. Introduction to heterojunction devices. Prerequisites: EEE 436, 531.

**EEE 632 Heterojunction Devices.** (3) N

Applications of heterostructures, quantum wells, and superlattice to modulation-doped FETs, heterostructure bipolar transistors, lasers, detectors, and modulators. Prerequisites: EEE 434 and 631 (or 537).

**EEE 641 Advanced Electromagnetic Field Theory.** (3) N

Cylindrical wave functions, waveguides, and resonators; spherical wave functions and resonators; scattering from planar, cylindrical, and spherical surfaces; Green's functions. Prerequisite: EEE 541 or equivalent.

**EEE 643 Advanced Topics in Electromagnetic Radiation.** (3) S  
High-frequency asymptotic techniques, geometrical and physical theories of diffraction (GTD and PTD), moment method (MM), radar cross section (RCS) prediction, Fourier transforms in radiation, and synthesis methods. Prerequisite: EEE 543.

**EEE 647 Microwave Solid-State Circuit Design II.** (3) F

Practical design of microwave free-running and voltage-controlled oscillators using Gunn and Impatt diodes and transistors; analysis of noise characteristics of the oscillator. Prerequisites: EEE 545, 547.

**EEE 686 Adaptive Control.** (3) N

Main topics covered: adaptive identification, convergence, parametric models, performance and robustness properties of adaptive controllers, persistence of excitation, and stability. Prerequisites: EEE 582 and 586 or instructor approval.

**EEE 731 Advanced MOS Devices.** (3) S

Threshold voltage, subthreshold current, scaling, small geometry effects, hot electrons, and alternative structures. Prerequisite: EEE 531.

**EEE 732 Advanced Bipolar Devices and Circuits.** (3) N

Critical examination of new bipolar device and circuit technologies. Performance trade-offs, scaling effects, and modeling techniques. Prerequisite: EEE 531.

**EEE 770 Advanced Topics in Power Systems.** (3) N

Power system problems of current interest, approached at an advanced technical level, for mature students. Prerequisites: EEE 577 and 579 or equivalents; instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Engineering

### MASTER OF ENGINEERING

Arizona's three state universities—Arizona State University, Northern Arizona University, and the University of Arizona—are cooperating in offering a new tri-university degree program: the Master of Engineering.

The Master of Engineering is a graduate-degree program intended to meet the educational needs of Arizona's practicing engineers. With input from industry professionals, the three universities are developing courses that address the enhancement and development of skills, knowledge, and understanding that are critical to today's practicing engineer. These courses are offered through a variety of distance-delivery methods and in flexible formats. Students enrolled in the program will be able to take advantage of course offerings at any of the three universities. These offerings reflect the diversity of strengths across the state.

The Master of Engineering program offers the practicing engineer the opportunity to design, in conjunction with an advisory committee, a program of study that can reflect the increasingly interdisciplinary nature of engineering practice.

**Admission.** For application materials, students may visit the program's Web site at [TriUniv.engr.arizona.edu](http://TriUniv.engr.arizona.edu), contact the College of Engineering and Applied Sciences at 480/965-1726, or address e-mail to [m.eng@asu.edu](mailto:m.eng@asu.edu).

Applicants who have graduated from accredited U.S. institutions and who have a suitable background for the

desired field of study must have a minimum grade point average of 3.00 (on a 4.00 scale) for the last 60 units of the undergraduate transcript (or for the last 12 units of the post-baccalaureate transcript). The Graduate Record Exam (GRE) may be required for a particular area of study or concentration by the tri-university coordinating board for the program. Graduates of non-U.S. institutions will have to satisfy admission requirements, in addition to those specified above.

Individuals not meeting the above conditions may be recommended for either provisional admission or admission to a non-degree status at the discretion of the campus director. After completing suitable undergraduate deficiencies or recommended graduate courses with a minimum grade point average of 3.00 (on a 4.00 scale), the individual may apply again for admission to the Master of Engineering program.

**Program of Study.** Graduate College requirements of the home institution must be followed. All programs of study will require the completion of at least 30 hours of graduate credit. Each program of study will require three semester hours of course work in each of the following subject areas: engineering management/business and applied engineering mathematics.

At the discretion of an academic unit or academic working group, a practice-oriented project may constitute a limited part of the program of study not to exceed six semester hours. Students must maintain a minimum GPA of 3.00 in courses taken as part of their program of study and maintain a 3.00 or higher for all graduate courses (500-level or above).

**Foreign Language Requirements.** None.

**Thesis Requirements.** None.

**Final Examination.** A final examination (or its equivalent demonstrating mastery of the program of study) is required. The structure of the examination will be determined by the student's advisory committee. The inclusion of practicing engineers from outside academia in the examination process is desirable.

**Time Limit.** The time limit for completing the Master of Engineering degree is six years from the time of admission.

### MASTER OF SCIENCE IN ENGINEERING

The faculty in the College of Engineering and Applied Sciences offer professional programs leading to the Master of Science in Engineering (M.S.E.) degree with majors in Aerospace Engineering, Chemical Engineering, Civil Engineering, Electrical Engineering, Engineering Science, Industrial Engineering, and Mechanical Engineering. The programs are designed to bridge the gap between knowledge of engineering sciences and creative engineering practice while at the same time increasing the depth and breadth of knowledge in selected areas of emphasis. The pattern of course work applicable to the degree is potentially unique for each student, although it must conform to the general guidelines for subject matter content for the degree as authorized in the *Graduate Catalog*.

Two options are available within the M.S.E. degree program. Option 1 requires a thesis and is designed primarily for full-time students. Option 2 is designed for full-time students not intending to write a thesis and for students who



hold full-time jobs and must attend university classes on a part-time basis. A thesis or equivalent is not required of students who elect this option.

**Admission.** Applicants are expected to satisfy all requirements for admission to the Graduate College. Entry into this program normally requires a bachelor's degree with a major in engineering or in a closely related bachelor's degree program.

Deficiencies for admission to the graduate degree programs are specified at the time of admission. The verbal, quantitative, and analytical components of the Graduate Record Examination (GRE) are recommended but not required unless specified by the respective academic unit in which the major is offered. TOEFL scores must be submitted by international applicants before admission is considered. Applicants with TOEFL scores of 550 or higher may be regularly admitted without requiring further language study. Applicants with scores below 550 may be regularly admitted but must complete study in ASU's American English and Culture Program (AECF) before enrolling in course work in the academic program.

**Program of Study.** In general, all candidates for the M.S.E. degree program are required to complete 30 semester hours. Additional courses may be assigned by the supervisory committee depending on the background of the candidate.

*Option 1.* A minimum of six semester hours of research and thesis credit must be included in the 30 hours.

*Option 2.* A minimum of 30 semester hours and a comprehensive examination are required.

**Foreign Language Requirements.** None.

**Thesis Requirements.** Only students who elect Option 1 are required to write a thesis.

**Final Examinations.** A final oral examination in defense of the thesis is required for students who choose Option 1. A final comprehensive examination is required for students in Option 2. Examination format and times should be obtained from the academic unit.

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## Engineering Science

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The faculty of the School of Engineering offer graduate programs leading to the M.S., the Master of Science in Engineering, and the Ph.D. degrees in Engineering Science. Faculty offer programs of a special and interdisciplinary nature. An area of study also is available in materials science and engineering. Contact the Department of Chemical, Bio, and Materials Engineering.

See "Master's Degrees," page 98, and "Doctor of Philosophy," page 101, for information.

**Graduate Record Examination.** A student whose undergraduate degree program is not ABET accredited must sub-

mit scores on the Graduate Record Examination (GRE) General Test as part of the admission process. Certain disciplines also require GRE scores for application to the M.S., M.S.E., and Ph.D. programs in Engineering Science.

### MATERIALS SCIENCE AND ENGINEERING

Faculty members who advise students in this area of study are located within the Department of Chemical, Bio, and Materials Engineering. Courses offered carry the MSE prefix and are listed beginning on page 138.

For more information contact Professor Stephen L. Krause by phone at 480/965-3313, by e-mail at skrause@asu.edu, or in person at ECG 202.

Each student admitted as a regular degree candidate is required to complete an approved program of study. Students who have an undergraduate degree in an area other than materials science, or a similarly named program, may qualify for admission to a transition program and may be required to take one or more undergraduate courses in preparation for enrollment in graduate courses in materials science and engineering. The program of study of transition students is determined by the student's supervisory committee after review of the student's academic record.

Research activities in materials science and engineering include programs in semiconductor processing and characterization, polymeric and ceramic composites, cuprates for high critical temperature superconductor applications, ferritic thin films for capacitor and memory applications, high temperature materials for space applications, mechanical behavior of high strength Al-Li alloys, environmentally influenced mechanical effects, and microbiologically influenced corrosion reactions.

### Courses

Graduate courses offered by the College of Engineering and Applied Sciences that apply to degree requirements are listed under degree majors in this catalog. Basic courses that may be required, or taken as electives, are shown below.

#### ANALYSIS AND SYSTEMS (ASE)

**ASE 485 Engineering Statistics.** (3) F, S, SS  
Designing statistical studies for solutions to engineering problems. Methods include regression, design and analysis of experiments, and other statistical topics. Prerequisite: ECE 380. *General Studies: N2.*

**ASE 496 Professional Seminar.** (0) F, S  
Topics of interest to students in the engineering special and interdisciplinary studies.

**ASE 500 Research Methods: Engineering Statistics.** (3) F, S, SS  
Designing statistical studies for solutions to engineering problems. Methods include regression, design and analysis of experiments, and other statistical topics. Prerequisite: ECE 380.

**ASE 582 Linear Algebra in Engineering.** (3) F  
Development and solution of systems of linear algebraic equations. Applications from mechanical, structural, and electrical fields of engineering. Prerequisite: MAT 242 or equivalent.

**ASE 586 Partial Differential Equations in Engineering.** (3) S  
Development and solution of partial differential equations in engineering. Applications in solid mechanics, vibrations, and heat transfer. Prerequisites: ECE 386; MAT 242, 274.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## English

Nancy A. Gutierrez  
*Chair*  
 (LL 542) 480/965-3168  
 enggrad@asu.edu  
 www.asu.edu/clas/english/enggrad.htm

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### REGENTS' PROFESSORS

DUBIE, RIOS

### PROFESSORS

BENDER, BJORK, BOYER, BRACK, BRINK,  
 BUCKINGHAM, CANDELARIA, CARLSON, CROWLEY,  
 DONELSON, HELMS, KEHL, LESTER, LIGHTFOOT,  
 A. NILSEN, D. NILSEN, RHODES, ROEN, SANDS

### ASSOCIATE PROFESSORS

ADAMS, BATES, CASTLE, CHANCY, CORSE,  
 DeLAMOTTE, GOLDBERG, GREEN, GUTIERREZ, HORAN,  
 JANSSEN, LUSSIER, D.B. MAHONEY, MAJOR, MILLER,  
 NELSON, OJALA, RAMAGE, SAVARD, SCHWALM,  
 SENSIBAR, VAN GELDEREN

### ASSISTANT PROFESSORS

BIVONA, FUSE, GOGGIN, HARRIS, JOHNSON, McCABE,  
 PERRY, PRITCHARD, STEVENS, THOMPSON, TOHE,  
 VOADEN, WEBB

### SENIOR LECTURERS

COOK, COOPER, DUGAN, D.M. MAHONEY,  
 OBERMEIER, SUDOL

### LECTURERS

DUERDEN, DWYER, HEENAN, KYBURZ, NORTON,  
 ORLICH, RAY, WHEELER

### ACADEMIC PROFESSIONAL

GLAU

The faculty in the Department of English offer the M.A. degree in English, the Master of Teaching English as a Second Language degree, and the Ph.D. degree in English.

Students admitted to the Master of Education degree program with a major in Secondary Education may also elect English as the subject matter field. For information on the Master of Education degree, see "Master of Education," page 174.

Students may also pursue an interdisciplinary program leading to the Master of Fine Arts degree in Creative Writing, offered by the faculties in the Departments of English and Theater. See "Master of Fine Arts," page 158.

### MASTER OF ARTS

This degree is designed to provide further cultural and professional advancement for students of English.

**Admission Requirements.** The department requires that applicants have an undergraduate major in English and a 3.00 GPA in courses taken in the major field. Those who do not have a major in English are encouraged to register as

nondegree students while they take courses in areas of deficiency as identified by the advisor.

Deadline for admission applications and requests for financial assistance, including teaching assistantships, is February 1. Incomplete files are not considered.

Applicants for the M.A. program in English with concentrations in literature and language and rhetoric and composition are required to submit Graduate Record Examination (GRE) General Test scores, three letters of recommendation, a personal statement of aims and purposes, and an academic writing sample.

Applicants for the M.A. program with a concentration in English linguistics must show completion of one upper-division course in a linguistics-related field, and must submit a personal statement of aims and purposes and three letters of recommendation. GRE scores are not required.

Applicants for the M.A. program in English with a concentration in comparative literature must prove fluency in a foreign language to a level sufficient for graduate study.

**Program of Study.** A student may pursue a concentration in comparative literature, English linguistics, literature and language, or rhetoric and composition.

For the concentration in comparative literature, a candidate must complete 36 semester hours of graduate courses, with a minimum of 12 hours being taken in the Department of Languages and Literatures. Included in the 36 hours must be ENG 500 Research Methods, ENG 501 Introduction to Comparative Literature, and ENG 599 Thesis.

For the concentration in English linguistics, a candidate must complete a minimum of 30 semester hours of graduate courses. The 30 semester hours must include LIN 500 Research Methods, 511, 514, one LIN 591 Seminar, or their equivalents chosen in consultation with the advisor, and ENG 599 Thesis. Electives are chosen in consultation with the advisor.

For the concentration in literature and language, a candidate must complete a minimum of 30 semester hours. The 30 semester hours must include ENG 500 Research Methods; a course in Literary Theory; ENG 599 Thesis, a 12-hour distribution requirement; and six hours of other electives. Two courses selected must carry ENG 591 Seminar credit.

For the concentration in rhetoric and composition, a candidate must complete a minimum of 30 hours of graduate courses, including a 12-hour core, a six-hour thesis, and 12 elective hours that must include six hours of ENG 591 Seminar and may include nine hours of appropriate graduate courses outside the English department.

**Foreign Language Requirements.** A reading knowledge of French, German, Spanish, or other suitable language is required. The choice of language must be approved by the student's supervisory committee.

**Comprehensive Examinations.** A comprehensive examination is required for students in the comparative literature concentration. (A detailed description of its scope is available in the Department of English.)

**Thesis Requirements.** A thesis is required.

**Final Examinations.** A final oral examination in defense of the thesis is required.

## M.TESL

The Master of Teaching English as a Second Language degree is designed for students who seek a professionally oriented graduate education. For information, see “Master of Teaching English as a Second Language,” page 296.

## DOCTOR OF PHILOSOPHY

See “Doctor of Philosophy,” page 101, for general requirements.

**Admission Requirements.** Applicants for the Ph.D. degree in English are required to submit scores on the GRE (verbal and advanced literature sections), three letters of recommendation, a personal statement of aims and purposes, and an academic writing sample. Deadline for admission applications and requests for financial aid, including teaching assistantships, is February 1. Incomplete files are not considered.

**Areas of Concentration.** The Ph.D. degree in English offers concentrations in the following areas:

*Literature.* A minimum of 60 hours of graduate courses (exclusive of dissertation) beyond the bachelor’s degree constitutes the formal course preparation. Specifically required are three hours in history of the English language (for example, ENG 507 Old English, ENG 508 Old English Literature, ENG 509 Middle English, LIN 505 American English, and LIN 548 Studies in English Language); six hours in theory courses; and the following distribution requirement: English literature before 1660 (including one course in each of the following: Chaucer, Shakespeare, and Milton); English literature 1660–1900; British literature since 1900; American literature before 1900; and American literature since 1900. Students must take a minimum of five graduate seminars en route to the Ph.D. degree, at least three of which must be taken in the doctoral program at ASU. Up to 12 hours of course work taken outside the department may be counted toward the degree.

*Rhetoric/Composition and Linguistics.* A minimum of 60 hours of graduate courses (exclusive of dissertation) beyond the bachelor’s degree constitutes the formal course preparation. Specifically required are three hours of language (for example, ENG 507 Old English, ENG 508 Old English Literature, ENG 590 Middle English, LIN 505 American English, LIN 548 Studies in English Language); six hours in theory courses; and the following distribution requirements: Syntax/Semantics; Rhetorical Theory; Composition Theory and Method; Philosophy and Theories of Pedagogy; Pragmatics/Sociolinguistics. Students must take a minimum of five graduate seminars en route to the Ph.D. degree, at least three of which must be taken in the doctoral program at ASU. Up to 12 hours of course work taken outside the department may be counted toward the degree.

**Foreign Language Requirements.** A competent reading knowledge of a language other than modern English is required. The requirement can be met by

1. earning a grade of “B” or higher in a 400- or 500-level course in an appropriate language;
2. demonstrating proficiency by taking a language examination approved by the supervisory committee; and

3. showing native speaker proficiency in a language approved by the supervisory committee.

**Ph.D. Examinations.** The Ph.D. examination consists of three parts. Part I is a portfolio of three essays, representing different historical periods or fields of concentration and employing more than one critical approach. After successful completion of Part I, the student may advance to Part II, a three-hour written exam in the student’s area of specialization based on a bibliography compiled by the student and approved by the student’s supervisory committee. Part III is a colloquy, based on a written prospectus, defining the topic, scope, and significance of the dissertation.

**Dissertation Requirements.** (See “Research and Dissertation Requirements,” page 102.) The subject of the dissertation is decided in consultation with the chair of the student’s supervisory committee, subject to approval of the director of the Ph.D. program.

**Final Examinations.** A final examination in defense of the dissertation, arguing for its method and conclusions, is required.

## RESEARCH ACTIVITY

Recent and current research by the Department of English faculty includes the following titles and areas: Old English poetry; Arthurian romance; Renaissance literature; the Elizabethan masque; Shakespeare’s plays in performance; Spenser biography; wordplay in Milton; literature of the age of discovery and encounter; literature of the Restoration; textual edition of Smollett (nine volumes) and Johnson (three volumes); letters of William Michael Rossetti; Victorian poetry; American sea fiction; Melville; reception of Dickinson’s poetry; bibliography of Dickinson criticism; 19th-century American literary periodicals; American writers’ responses to Darwin (from Howells to Hemingway); Kate Chopin; *Sehnsucht* in 20th-century American literature; Faulkner; biblical backgrounds for literature; Chicana/o literature; film history; film making in Arizona; science fiction and fantasy; literature and aging; gender studies; contemporary literary theory; translation theory; censorship in American schools; young adult literature; classical, 18th-century and modern rhetoric; stylistics; Latin American literature; composition theory; history of the English curriculum; literary language and the type-token ratio; sociolinguistics; pragmatics and discourse analysis; language and politics; language and gender; iconicity in syntax, connectionism and language teaching; phonology; natural language processing; language typology; language acquisition; English morphological structure; performance and contemporary theater; literatures of the Americas; gender studies in comparative contexts; science and literature; history of secondary English teaching; Irish literature; gay and lesbian studies; post colonialism; Native American literature; Afro-Caribbean literature; Black women writers; modern and contemporary drama; African American literature and popular culture; the representation of fasting women in early modern discourse; early modern prose fiction; contemporary multicultural literature; colonialism and culture; travel literature; William Blake.

Among recent books published by the faculty are *Gospel Fictions*; *As Far Away as China*; *Perspectives on Official English*; *On the Rim of the Mandala*; *Body Betrayed*; *Snow*

*Water Cove; Writing Arguments; Groom Falconer; The Lime Orchard Woman; News of the World; The Old English Verse Saints' Lives; The Origins of Faulkner's Art; Richard Brautigan; Screenwriting: A Method; Thematic Relations; Truants; Worlds Within Women: Myth and Mythmaking in Fantastic Literature by Women; Faulkner's Poetry; Emily Dickinson's Critical Reception in the 1890s: A Documentary History; Studies in American Indian Literature; American Indian Women: A Guide to Research; Sacrificial Smoke (trans.); Expedition of Humphry Clinker (ed.); Playing With Gender: A Renaissance Pursuit (ed.); Dryden's Aeneid: The English Virgil; Radio Sky; Victorian Sagas and Cultural Discourse: Renegotiating Gender and Power (ed.); Teodoro Luna's Two Kisses; Teaching and Learning English Worldwide (ed.); Only a Mother (trans.); The Adventures of Ferdinand Count Fathom (ed.); The History and Adventures of an Atom (ed.); The Clouds of Magellan; Voice of Deliverance: The Language of Martin Luther King, Jr. and Its Sources; American College Life in English Communication; Your Reading; Humor in American Literature: A Selected Annotated Bibliography; Writing Arguments; Voodoo Dreams; The Instinct for Bliss; Inspiring Literacy: Literature for Children and Young Adults (ed.); Men Writing the Feminine: Literature, Theory, and the Question of Gender; Lushootseed Dictionary (ed.); Writing and Being; Sea Brothers: The Tradition of American Sea Fiction from Moby Dick to Present; Elizabeth Bishop: Her Poetics of Loss; Ismael Reed; Sidney Lumet; Charrería Mexicana An Equestrian Folk Tradition; Gabriela Mistral: An Artist and Her People; Cynewulf: Basic Readings (ed.); Magic City; Presenting M.E. Ker; A Beowulf Handbook; Bob Rafelson; Humor in Irish Literature; Humor in British Literature from the Middle Ages to the Restoration; Major Women Writers of Seventeenth-Century England (ed.); Pig Cookies; The Hotel Eden; Fortress of the Sun; The Descent of Love: Darwin and the Theory of Sexual Selection in American Fiction; Desire and Contradiction: Imperial Visions and Domestic Debates in Victorian Literature; British Imperial Literature, 1870-1940: Writing and the Administration of the Empire; The Rise of Functional Categories: Verbal Agreement and the Grammar behind its Breakdown; Romantic Dynamics: The Poetics of Physicality; Who Wrote the Gospels; Women Shapeshifters: Transforming the Contemporary Novel; Perils of the Night: A Feminist Study of Nineteenth-Century Gothic; Women Imagine Change: A Global Anthology of Women's Resistance from 600 B.C to Present; Framing Silence: Revolutionary Novels by Haitian Women; Searching for Safe Spaces: Afro-Caribbean Women Writers in Exile; Happiness (trans. and ed.); The Writer's Toolbox; Living Rhetoric and Composition: Stories of the Discipline; Thinking and Writing by Design; Ntozake Shange: A Critical Study of the Plays; Anne Conway: The Principles of the Most Ancient and Modern Philosophy (trans. and ed.).*

English faculty currently serve as editors of *Explorations in Ethnic Studies; Modern Scandinavian Literature in Translation; Rocky Mountain Review of Language and Literature; Centennial Review; Manoa: New Chicano Writing*. Other faculty serve on the editorial boards of *Age of Johnson, English Literature in Transition, MELUS, Metaphor and Symbolic Activity: An Interdisciplinary Journal of Empirical Inquiry, Modern Language Journal, Revista Argentina de Linguistic, Rhetoric Review, Resources for*

*American Literary Study, Dickinson Studies, and 18th Century: A Current Bibliography; Victorian Poetry; WPA: Writing Program Administration; Studies in American Indian Literature; English Journal; English Education.*

## ENGLISH (ENG)

*English majors and minors are expected to have completed ENG 200 before taking 400-level literature courses.*

**ENG 400 History of Literary Criticism.** (3) N  
Major critics and critical traditions in the western world. Prerequisite: 6 hours of literature or instructor approval. *General Studies: HU.*

**ENG 405 Style and Stylistics.** (3) N  
Linguistic, rhetorical, and literary approaches to the analysis of style in poetry, fiction, and other forms of written discourse.

**ENG 409 Advanced Screenwriting II.** (3) N  
Application of the principles taught in a complete feature-length screenplay.

**ENG 411 Advanced Creative Writing.** (3) F, S  
Separate poetry and fiction workshops for experienced writers, emphasizing individual style. May be taken once for poetry, once for fiction. Prerequisite: ENG 310 or instructor approval.

**ENG 412 Professional Writing.** (3) N  
Lectures and conferences concerning techniques of writing for publication. Prerequisite: ENG 310 or instructor approval.

**ENG 413 History of the English Language.** (3) A  
Development of English from the earliest times to the modern period. Prerequisite: junior standing or instructor approval. *General Studies: HU.*

**ENG 415 Medieval Literature.** (3) N  
Medieval English literature in translation, from *Beowulf* to Malory (excluding Chaucer), emphasizing cultural and intellectual backgrounds; includes continental works. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

**ENG 416 Chaucer: Canterbury Tales.** (3) A  
Chaucer's language, his last work, and its relationship to continental and insular traditions. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

**ENG 417 Chaucer: Troilus and Criseyde and the Minor Works.** (3) N  
Chaucer's language, his major poem, and his early works in their medieval context. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

**ENG 418 Renaissance Literature.** (3) F  
Topics, authors, and themes in English literature, 1485–1603. Prerequisite: ENG 221 or instructor approval. *General Studies: L2/HU.*

**ENG 419 English Literature in the Early 17th Century.** (3) F  
Topics, authors, and themes in English literature, 1603–1660. Prerequisite: ENG 221 or instructor approval. *General Studies: L2/HU.*

**ENG 423 Renaissance Drama.** (3) S  
Topics, authors, and themes in the drama of the Tudor and early Stuart periods. Prerequisite: ENG 221 or instructor approval. *General Studies: L2/HU.*

**ENG 424 Milton.** (3) A  
Selected prose and poetry, emphasizing *Paradise Lost*, *Paradise Regained*, and *Samson Agonistes*. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

**ENG 425 Studies in English Romanticism.** (3) F  
All genres of Romantic literature in cultural contexts, Blake to the death of Wordsworth. May be repeated for credit. *General Studies: HU.*

**ENG 426 Victorian Poetry.** (3) F  
Poetry of the second half of the 19th century. May include such poets as Tennyson, Browning, and Arnold. Prerequisite: ENG 222 or instructor approval. *General Studies: L2/HU.*

**ENG 427 Restoration and Early 18th Century.** (3) N  
Writers and movements in the nondramatic literature of the Restoration and early 18th century. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

**ENG 428 The Later 18th Century.** (3) N  
Writers, movements, and books during the second half of the 18th century. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

- ENG 430 Victorian Cultural Backgrounds.** (3) N  
Social, religious, and other cultural issues of the period. May include Carlyle, Ruskin, Darwin, Arnold, Pater, and Morris. Prerequisite: ENG 222 or instructor approval. *General Studies: L2/HU.*
- ENG 435 19th-Century American Poetry.** (3) N  
Themes and developments in American poetry to 1900, including Poe, Whitman, and Dickinson. *General Studies: HU.*
- ENG 439 Restoration and 18th-Century Drama.** (3) S 2001  
English drama 1600–1800. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*
- ENG 440 Studies in American Literature to 1815.** (3) N  
Thought and expression from the time of first contact to 1815. May be repeated for credit. Prerequisite: ENG 241 or instructor approval. *General Studies: HU.*
- ENG 441 20th-Century American Drama.** (3) N  
American drama since World War I, especially experimental techniques. Prerequisite: ENG 241 or 242 or instructor approval. *General Studies: HU.*
- ENG 442 20th-Century British and Irish Poetry.** (3) N  
Theory and practice of poetry since 1900. Prerequisite: ENG 222 or instructor approval.
- ENG 443 American Poetry, 1900–1945.** (3) N  
Developments in theory and practice of major poets. Prerequisite: ENG 241 or 242 or instructor approval. *General Studies: HU.*
- ENG 444 Studies in American Romanticism, 1830–1860.** (3) F  
Cultural expression in works of representative writers. May be repeated for credit. Prerequisite: ENG 241 or instructor approval. *General Studies: HU.*
- ENG 445 Studies in American Realism, 1870–1910.** (3) S  
Writers and influences that shaped the development of literary realism. May be repeated for credit. Prerequisite: ENG 242 or instructor approval. *General Studies: L2/HU*
- ENG 448 20th-Century British and Irish Novel.** (3) N  
Theory and practice of the novel since 1900. Prerequisite: ENG 222 or instructor approval. *General Studies: HU.*
- ENG 451 The Novel to Jane Austen.** (3) N  
From origins of prose fiction through the 18th century. *General Studies: HU, H.*
- ENG 452 The 19th-Century Novel.** (3) S  
May include such novelists as Austen, Dickens, Eliot, and Conrad. *General Studies: HU.*
- ENG 453 The American Novel to 1900.** (3) N  
The rise and development of the novel to Dreiser. Prerequisite: ENG 241 or instructor approval. *General Studies: HU.*
- ENG 454 The American Novel, 1900–1945.** (3) N  
Developments in theory and practice of major novelists. Prerequisite: ENG 241 or 242 or instructor approval. *General Studies: HU.*
- ENG 455 The Form of Verse: Theory and Practice.** (3) N  
Types, history, criticism, and schools of theory of metrical form. Analysis of lyric, narrative, and dramatic poetry.
- ENG 457 American Poetry Since 1945.** (3) A  
Major American poets of the period. Developments in theory and practice. Prerequisite: ENG 241 or instructor approval. *General Studies: HU.*
- ENG 458 American Novel Since 1945.** (3) N  
Major novelists of the period. Developments in theory and practice. Prerequisite: ENG 242 or instructor approval. *General Studies: L2/HU.*
- ENG 460 Western American Literature.** (3) A  
Critical examination of ideas and traditions of the literature of the western United States, including the novel. *General Studies: L2/HU.*
- ENG 461 Women and Literature.** (3) N  
Selected topics in literature by or about women. May be repeated for credit when topics vary. *General Studies: HU.*
- ENG 462 20th-Century Women Authors.** (3) N  
Critical examination of literature by 20th-century women writers. May be repeated for credit when topics vary. *General Studies: HU.*
- ENG 463 European Drama from Ibsen to 1914.** (3) N  
Chief continental and British dramatists of the period, emphasizing the beginnings and development of realism. *General Studies: HU.*
- ENG 464 European Drama from 1914 to the Present.** (3) N  
Chief continental and British dramatists of the period, emphasizing experimental techniques. *General Studies: HU.*
- ENG 471 Literature for Adolescents.** (3) F, S  
Prose and poetry that meet the interests and capabilities of junior high and high school students. Recent literature stressed. A passing grade of at least “C” required before students are permitted to student teach in English. *General Studies: HU.*
- ENG 480 Methods of Teaching English.** (3) F, S  
Methods of instruction, organization, and presentation of appropriate content in English. A passing grade of at least “C” required before students are permitted to student teach in English. Prerequisite: ENG 312 or 314 or 413.
- ENG 500 Research Methods.** (3) A  
Methodology and resource materials for research. Analysis of criticism and scholarship, including evaluation of sources.
- ENG 501 Introduction to Comparative Literature.** (3) N  
Problems, methods, and principles, illustrated by selected critical essays and literary texts.
- ENG 502 Contemporary Critical Theory.** (3) A  
An advanced survey of major schools of 20th-century literary and critical theory. Lecture, discussion. Cross-listed as HUM 549. Credit is allowed for only ENG 502 or HUM 549.
- ENG 507 Old English.** (3) N  
Elements of Old English grammar with selected readings.
- ENG 508 Old English Literature.** (3) N  
Intensive literary, linguistic, and cultural study of Old English literature. May be repeated for credit when topics vary. Prerequisite: ENG 507.
- ENG 509 Middle English.** (3) N  
A study of the principal dialects of the language with selected readings. Prerequisite: graduate standing.
- ENG 512 The Teaching of Composition.** (3) N  
The theory and practice of teaching writing at all levels. Emphasis on current research. Prerequisites: teaching experience; instructor approval.
- ENG 515 Middle English Literature.** (3) N  
English literature from the 12th through the 15th centuries, exclusive of Chaucer. Prerequisite: ENG 509 or instructor approval.
- ENG 517 Contemporary Rhetorical Theory.** (3) A  
Investigation of the work of such important rhetorical theorists as Burke, Toulmin, Perelman, Gates, and Cixous.
- ENG 520 Renaissance Literature.** (3) N  
Poetry and prose of the English Renaissance, excluding drama.
- ENG 521 Shakespeare.** (3) A  
A selection of comedies, histories, and tragedies presented in the context of literary history and critical theories, with an emphasis on classical and medieval backgrounds.
- ENG 525 American Literary Criticism.** (3) N  
Analysis and discussion of leading historical and critical interpretations of American literature from the beginnings to the present.
- ENG 530 Classical Rhetoric and Written Composition.** (3) F  
Relationship of major texts in classical rhetoric to developments in composition theory, literary theory, and practice through the 19th century.
- ENG 531 Rhetorical Theory and Literary Criticism.** (3) S  
Intensive study of major rhetorical theorists of the 20th century in such areas as literary criticism, discourse theory, and composition theory.
- ENG 532 Composition Theory.** (3) N  
Intensive study in the rhetorical categories of invention, arrangement, style, aims, modes, and forms of written discourse.
- ENG 545 Studies in English Literature.** (3) N  
This course offers selected authors or issues and may be repeated for credit.
- ENG 547 Studies in American Literature.** (3) N  
This course offers selected authors or issues and may be repeated for credit.
- ENG 549 Studies in Comparative Literature.** (3) N  
This course offers selected authors or issues and may be repeated for credit.
- ENG 550 Contemporary Comparative Literature.** (3) N  
Comparative studies in modern literature in English and other literatures in translation. May be repeated for credit when content varies.
- ENG 560 Studies in Dramatic Forms.** (3) F, N  
Selected topics in dramatic and cinematic literature, history, criticism, theory, and cross-disciplinary study. May be repeated for credit when topic varies. Lecture, studio.

**ENG 571 Advanced Study in Literature for Adolescents.** (3) N  
History and criticism of adolescent literature. Prerequisite: ENG 471 or instructor approval.

**ENG 573 Censorship and Literature.** (3) N  
The history of censorship, primarily in the United States, and significant court decisions that affected writers and books.

**ENG 591 Seminar.** (3) F, S  
Selected topics regularly offered in the various areas of English studies.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### LINGUISTICS (LIN)

**LIN 500 Research Methods.** (3) F  
Methodology and resource materials for research. Analysis of criticism and scholarship, including evaluation of sources.

**LIN 505 American English.** (3) S  
Development of the English language in America, including a survey of geographical and social dialects.

**LIN 510 English Linguistics.** (3) F  
Current approaches to the study of the English language.

**LIN 511 Phonetics and Phonology.** (3) S  
Current trends in phonological theory and its basis in acoustic and articulatory phonetics. Prerequisite: LIN 510 or equivalent or instructor approval.

**LIN 513 Semantics.** (3) F 2000  
Current approaches to linguistic meaning with particular attention to English. Prerequisite: LIN 510 or equivalent or instructor approval.

**LIN 514 Syntax.** (3) S  
The analysis of syntactic structure by contemporary theoretical models with a focus on English. Prerequisite: LIN 510 or equivalent or instructor approval.

**LIN 516 Pragmatics and Discourse Theory.** (3) F 1999  
The study of language use in context and of language structures in conversation and written text. Lecture, discussion. Prerequisite: LIN 510 or equivalent or instructor approval.

**LIN 548 Studies in English Language.** (3) N  
This course offers selected authors or issues and may be repeated for credit.

**LIN 572 Theories Underlying the Acquisition of English as a Second Language.** (3) F  
Theories of second language acquisition including the linguistic, cognitive, affective, and sociocultural aspects.

**LIN 574 The Teaching of English as a Second Language.** (3) S  
Methods of teaching English as a second language, language teaching trends, practical applications, and the teaching of different skills. Prerequisite: LIN 572 or instructor approval.

**LIN 575 Advanced Studies in the Teaching of English as a Second Language.** (3) A  
Current research issues in the teaching and learning of English as a second language. Prerequisite: LIN 572 or instructor approval.

**LIN 576 Sociolinguistic Aspects of Second Language Acquisition.** (3) N  
A survey of studies in second language acquisition in the context of recent sociolinguistic theory.

**LIN 577 Grammar for TESL.** (3) N  
A survey of major grammatical structures in English and how they can be taught to ESL speakers. Lecture, discussion. Prerequisite: LIN 510.

**LIN 591 Seminar.** (3) F, S  
Selected topics.

**LIN 593 Applied Project.** (3) F, S  
Preparation of a supervised applied project that is a graduation requirement in the TESL professional major. Independent study with consultation.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Environmental Design and Planning

### Interdisciplinary Doctoral Program

**Michael D. Kroelinger**  
*Director, Executive Committee*  
(ARCH 126) 480/965-4620  
caed.phd@asu.edu  
www.asu.edu/caed/PHD

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#### Architecture

Regents' Professor: J. Cook;  
Professors: Boyle, Scheatzle;  
Associate Professors: McIntosh, Ozel, Zygas;  
Assistant Professor: Ellin

#### Design

Professors: Giard, Kroelinger, Reznikoff;  
Associate Professor: Brandt

#### Planning and Landscape Architecture

Professors: Brady, Brock, Kihl, Lai, Mushkatel,  
Pijawka, Steiner;  
Associate Professors: E. Cook, Green, Kim, Miller, San  
Martin, Whysong, Yabes;  
Assistant Professors: Cameron, Crewe, Guhathakurta

The Committee on Environmental Design and Planning offers a collegewide interdisciplinary program leading to the Ph.D. degree in Environmental Design and Planning. Three areas of concentration are available: design; history, theory, and criticism; and planning. The faculty of the Schools of Architecture, Design, and Planning and Landscape Architecture participate in offering the degree. Faculty from disciplines outside of the College of Architecture and Environmental Design may participate in offering the program if appropriate to the interdisciplinary nature of the student's research interest.

### DOCTOR OF PHILOSOPHY

The Ph.D. degree in Environmental Design and Planning is an individualized collegewide interdisciplinary degree that integrates graduate courses and faculty research expertise from a variety of academic areas: architecture, building design, environmental planning, environmental resources, graphic design, industrial design, and interior design. The program is at the cutting edge of creating new knowledge in environmental design and planning. It complements interdisciplinary research in other disciplines within the university. Broad in scope, the program involves multidisciplinary research interests at both micro- and macro-scale levels of design and planning. The program provides research experience for students wishing to pursue careers in academe and in industry as members of interdisciplinary design and planning teams on environmental and energy issues, as well as for those wishing to teach in the architecture, design, or planning fields.

#### Areas of Concentration

The Ph.D. degree in Environmental Design and Planning offers concentrations in the following areas based on the research and teaching expertise of participating faculty.

**Design.** Design—microscale issues in the designed environment—includes the study of architecture, building science, graphic design, industrial design, interior design, and landscape architecture. Research fields include acoustics, affordable housing, climate-responsive building, computer-aided design, energy modeling, exhibit design, human factors in design, facilities planning and management, fire protection, industrialized housing, landscape architecture, lighting, passive solar energy and conservation, and site planning and wayfinding.

**History, Theory, and Criticism.** History, theory, and criticism—cultural and theoretical issues in the history of the environment—includes the study of architecture, environmental planning, industrial design, interior design, landscape architecture, and urbanism. Research fields include study of the arts and crafts movement, contemporary criticism and analysis, design theories and methods, history of building science, history of city planning, landscape theory and criticism, and the history of architecture and design.

**Planning.** Planning—macroscale issues in the planned environment—includes the study of environmental resource management, landscape architecture, planning, and urban design. Research fields include contemporary urban design, economic development, environmental assessment, environmental planning, ethics in planning, housing and urban development, international development planning, landscape ecology, legal aspects of planning, planning for ethnically diverse populations, the protection of environmentally sensitive areas, public participation, social dimensions of planning, urban design policy, urban planning, and urban and regional development.

**Admission Requirements.** Students are admitted to the Ph.D. program only upon completion of a master's degree in architecture, environmental resources, design, landscape architecture, or planning or upon the demonstration of equivalent standing.

In addition to meeting Graduate College admission requirements, applicants must submit the following to:

PH.D. PROGRAM IN ENVIRONMENTAL DESIGN  
AND PLANNING  
COLLEGE OF ARCHITECTURE AND  
ENVIRONMENTAL DESIGN  
ARIZONA STATE UNIVERSITY  
PO BOX 871905  
TEMPE AZ 85287-1905

1. a minimum of three letters of reference;
2. a sample of written work and any other evidence relevant to admission to the program;
3. a statement of purpose (summarizing career objectives, the reasons for pursuing a doctoral education, an indication of the proposed area of concentration, and a potential mentor in the College of Architecture and Environmental Design); and
4. Graduate Record Examination (GRE) scores.

A Test of English as a Foreign Language score of at least 600 is required of all applicants whose native language is not English.

Submitted materials are returned after final admission procedures, provided sufficient prepaid postage is enclosed,

or if the materials are claimed in person within one year of submission. Unclaimed materials are retained for only one year. The Ph.D. program assumes no liability for lost or damaged materials.

**Application Deadlines.** All application materials should be received on or before February 15 for fall semester admissions. Applications for associateships and scholarships normally are considered at the same time.

**Selection Procedures.** The Ph.D. Executive Committee evaluates the applications and supporting materials and recommends to the Graduate College whether the applicant should be granted admission or if admission should be denied. Admission decisions are based on the compatibility of the applicant's career goals with the purpose of the degree program and research interests of faculty, previous academic training and performance, GRE scores, reference letters, and the ability of the potential mentor to devote time to the student.

If admission is provisional, the Graduate College specifies in its letter of admission the provisions to be met to gain regular status. The Ph.D. Program informs successful applicants of the procedures for enrollment.

**Program of Study.** The Ph.D. degree in Environmental Design and Planning is structured as a 54-semester-hour post-master's program, not as an 84-semester-hour postbaccalaureate program. Students must be thoroughly familiar with design and planning and are expected to demonstrate a high level of academic maturity before being admitted to the program.

Of the 54 semester hours, 24 must be research and dissertation credit. At least 30 semester hours of the remainder, exclusive of dissertation and research hours, must be completed after admission to the Ph.D. program at ASU. No transfer credits are allowed to fulfill the 54-semester-hour minimum requirement for the program.

The student is required to take 15 semester hours in the area of concentration and a minimum of nine semester hours of specialized course work outside the area of concentration; a minimum of six semester hours in current research and research methods is required.

Each student entering the Ph.D. program is required to submit a program of study during the first year. The director of the Ph.D. program appoints a program committee composed of a minimum of three faculty from the areas of concentration. This committee includes a prospective mentor and is responsible for approving the student's program of study and monitoring the student's progress in the program.

**Preliminary Candidate Evaluation.** Before the end of the first academic semester of course work, the student's mentor and the program director conduct a preliminary evaluation of the student. The evaluation is based on the student's program check sheet, a progress evaluation by the mentor, and an informal meeting with the program director. It is directed at the student's selected area of concentration at the time of their admission to the program.

Performance on the preliminary evaluation candidate serves as a guide to the student's program committee as the committee members counsel the student and formulate a program of study.

**Academic Standard and Evaluation.** Each student in the program will receive an annual evaluation. Students will submit, to their mentor and the program director, a two-page summation of the academic year. The summation must include proposed research, including progress toward dissertation; a list of goals accomplished during the past academic year; and projected goals for the upcoming academic year. In addition students will present their summation to the CAED core faculty.

Students must meet the minimum Graduate College requirements, but program standards may exceed these requirements. For example, students are expected to

1. have all grades in graduate courses 3.00 GPA or higher,
2. have made sufficient progress in their research projects,
3. have attended or presented papers at seminars/meetings,
4. have accomplished their goals from the previous year, and
5. set realistic goals for the upcoming academic year.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Upon completion of course work in the Ph.D. program of study and before admission to candidacy and the start of dissertation research, the student must take a written examination on his or her knowledge of the chosen area of concentration and interdisciplinary knowledge, including the ability to communicate across disciplines. The student's program committee conducts an oral examination following the review of the written examination.

**Dissertation Requirements.** The dissertation must consist of a fully documented written analysis of a problem that is original in nature and extends the knowledge and/or theoretical framework of the field. The research must demonstrate the student's creativity and competence in independent research.

**Final Examinations.** A final oral examination in defense of the dissertation is required. A candidate must pass the final examination within five years after completing the comprehensive examination.

## RESEARCH ACTIVITY

The College of Architecture and Environmental Design maintains a rooftop testing laboratory for solar research, a high-bay research facility, a lighting simulation laboratory, a human factors laboratory, an urban design laboratory, an extensive shop facility, computing resources and laboratories, a material resource center, a general rangeland ecology laboratory, a soils and riparian research laboratory, a GIS laboratory, and a range-wildlife nutrition ecology laboratory. These facilities are augmented by the CAED library, media center, and the Gallery of Design.

Facilities for basic research activities and community service oriented programs in energy technology, design, real estate development, and planning are also provided by the college through the Herberger Center for Design Excellence and the Joint Urban Design Program.

Faculty from the three schools participate in research in the following broadly defined areas.

**School of Architecture.** Architectural design methodology, solar architecture design, energy performance in buildings, architectural computing and graphics, facilities development and management, environments for aging, housing, urban design, building technology, environmental analysis and programming, passive cooling and heating, ecotechniques, arid region building and systems design, and architectural history.

**School of Design.** Problem-solving strategies; problem definition; aesthetic, political, economic, and social theories; design history, methodology, theory, and criticism; methods as applied to materials culture and human expression; theories and methods of human factors and ergonomics; design production, planning, and marketing; acoustics and lighting design; perception and visual performance; computer imaging, visualization, analysis, and perception; human-machine interface design; product semantics, appropriate technology, and environmental issues; environmental graphics; environmental psychology; corporate, institutional, and healthcare design; postoccupancy evaluation; aging and design; public welfare and safety; rehabilitation, restoration, and preservation design; facility management methodology; design education theory; design forecasting; and collaborative learning and design journalism.

**School of Planning and Landscape Architecture—Environmental Planning.** Research is primarily conducted in the following four areas.

*Urban and Regional Development.* Housing, economic and community development, citizen participation, policy analysis, transportation, and the politics of planning.

*Urban Design.* Urban landscape design, planning and land-use law, urban design theory, development controls, and design guidelines.

*Landscape Ecological Planning.* Public land management, the conservation of renewable and nonrenewable resources, sustainable development, hazards planning, environmental impact assessment, riparian and wetlands protection, and land-use planning.

*International Planning.* Housing, economic and community development, urban design, landscape ecology, and agroforestry.

**School of Planning and Landscape Architecture—Environmental Resources.** Research programs include applications of geographic information systems to resource management, monitoring of ecological change, wildlife habitat ecology, vegetation dynamics, fire ecology, soil ecology and ecosystem restoration.

Range ecology studies investigate various problems, from shrub control and hydrologic research in Arizona chaparral to the use of microcomputers in field data acquisition and the effects of power plant emission on vegetation. Other research has considered the relationships between both livestock and wildlife and their environments.

## Environmental Design and Planning

In addition to the EPD 700-level courses, refer to the course listing under the following majors for courses that are available to support the collegewide interdisciplinary



degree program in Environmental Design and Planning: architecture, building design, environmental planning, environmental resources, industrial design, interior design, and landscape architecture.

#### ENVIRONMENTAL DESIGN AND PLANNING (EPD)

**EPD 700 Interdisciplinary Research Methods.** (3) F  
Introduction to the philosophy and methodology of interdisciplinary research in environmental design and planning. Seminar.

**EPD 710 Current Research in Design.** (3) S  
Review and critical evaluation of contemporary literature and method in architecture, building science, interior design, industrial design, and landscape architecture. Seminar.

**EPD 712 Current Research in Planning.** (3) S  
Review and critical evaluation of contemporary literature and method in environmental planning, landscape ecology, urban design, and urban and regional planning. Seminar.

**EPD 714 Current Research in History, Theory, and Criticism.** (3) S  
Review and critical evaluation of contemporary literature and method in the theory and history of architecture, design, and planning. Seminar.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Environmental Planning

Frederick Steiner

Director

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#### PROFESSORS

KIHL, LAI, MUSHKATEL, PIJAWKA, STEINER

#### ASSOCIATE PROFESSORS

COOK, KIM, McSHERRY, SAN MARTIN, YABES

#### ASSISTANT PROFESSORS

CAMERON, CREWE, EWAN,  
FISH-EWAN, GUHATHAKURTA

The faculty in the School of Planning and Landscape Architecture offer a graduate program leading to the professional Master of Environmental Planning degree in Environmental Planning with a concentration in urban planning. Three areas of specialty are offered: urban and regional development, urban design, and landscape ecological planning.

The faculty in the school also participate in offering the Ph.D. degree in Environmental Design and Planning program. See "Doctor of Philosophy," page 101, for general information on the Ph.D. degree.

#### MASTER OF ENVIRONMENTAL PLANNING

The faculty in the School of Planning and Landscape Architecture offer a program leading to the professional degree Master of Environmental Planning (M.E.P.). Three areas of specialty are offered: urban and regional development; urban design; and landscape ecological planning. Graduates acquire the knowledge and skills necessary for leadership roles in the planning profession. Students take a core and select additional courses from the area of specialty.

*Urban and regional development* prepares students for employment in areas such as housing, economic and community development, policy analysis, transportation, and the politics of planning. *Urban design* provides a link between the School of Planning and Landscape Architecture and the other disciplines in the College of Architecture and Environmental Design—architecture, interior design, and industrial design. Students selecting this area of specialty should have a degree in design or planning or be prepared to take basic design courses as a prerequisite. Students are prepared to work in land-use planning, the design of specific parcels of land, the preparation of development controls, and the drafting of guidelines for development controls and design. *Landscape ecological planning* prepares students for careers in public land management, conservation of renewable and nonrenewable resources, the management of solid and hazardous wastes, environmental impact assessment, and land-use planning. All areas of specialty emphasize environmental and urban planning in rapidly developing metropolitan areas, preparing graduates for advanced careers in either the public or private sector.

A common core of required lecture, seminar, and studio courses provides knowledge of urban and environmental planning issues and fundamental theories, practices, and skills in planning. The areas of specialty in urban design and landscape ecological planning offer a series of fundamental and advanced design studios that enhance knowledge of urban form and land planning.

Individual practical experience in planning is provided through an internship program and independent work on a required final thesis. In addition to the planning faculty, the program is enriched by the interdisciplinary participation of faculty from other academic units of the university as well as leading planning and landscape architecture practitioners from the Phoenix area.

**Admission Requirements and Procedures.** To be considered for the program, the applicant must fulfill all admission requirements of the Graduate College, in addition to meeting admission requirements of the School of Planning and Landscape Architecture. Separate application materials must be submitted.

**School of Planning and Landscape Architecture.** The following materials should be submitted to

SCHOOL OF PLANNING AND LANDSCAPE  
ARCHITECTURE  
COLLEGE OF ARCHITECTURE AND  
ENVIRONMENTAL DESIGN  
ARIZONA STATE UNIVERSITY  
PO BOX 872005  
TEMPE AZ 85287-2005

1. a statement of intent (maximum 600 words) explaining (a) the applicant's interest in planning; (b) the applicant's academic background, and if appropriate, preparation for the selected area of specialty: urban and regional development, urban design, or landscape ecological planning (these may include written samples or a portfolio); and (c) the applicant's educational objectives;
2. test scores: TOEFL scores from international students whose native language is not English;

3. three letters of recommendation from references who are qualified to comment on the applicant's potential in the selected area of study; and
4. a résumé.

International students who wish to be considered for a teaching assistantship and whose first language is not English are required to pass the TSE administered by the American English and Culture Center at ASU.

**Application Deadlines.** For fall enrollment, application materials are due in the School of Planning and Landscape Architecture and the Graduate College on March 15.

For spring enrollment, application materials are due in the School of Planning and Landscape Architecture and the Graduate College on October 15.

**Selection Procedures and Notifications.** School faculty evaluate the applications and supporting materials and recommend to the Graduate College whether the applicant should be granted regular or provisional admission or if admission should be denied. If admission is provisional, the Graduate College specifies in its letter of admission the provisions to be met to gain regular status. The school informs successful applicants of the procedures for enrollment.

**Program of Study.** An approved program of study is 48 semester hours or 51 with an optional internship. The program has the typical distribution as follows:

Required core courses, including two four-hour studios ....	25
Specialization courses.....	15
Optional internship .....	3
Approved elective .....	3
Thesis .....	5
Total .....	51
Total without internship .....	48

Students are encouraged to take the required core courses and then to select an area of specialization. The program of study must be approved by the student's supervisory committee and be completed as specified for graduation. Requests for changes in the program must be made in writing. Some graduate courses may require undergraduate-level prerequisites; specifically, all students are expected to have taken introductory courses in planning and statistics. Inquiries regarding the M.E.P. program should be directed to the School of Planning and Landscape Architecture.

**Foreign Language Requirements.** None.

**Thesis Requirements.** A thesis is required.

**Final Examinations.** A comprehensive oral examination based on the student's thesis is required. The oral examination is administered by the supervisory committee.

## RESEARCH ACTIVITY

Faculty and students in this graduate program are involved in the following areas of research.

*International Planning.* Housing, economic and community development, urban design, landscape ecology, and sustainable development.

*Landscape Ecological Planning.* Public land management, the conservation of renewable and nonrenewable resources, sustainable development, hazards planning, environmental

impact assessment, riparian and wetlands protection, and land-use planning.

*Urban and Regional Development.* Housing, economic and community development, citizen participation, policy analysis, transportation, and the politics of planning.

*Urban Design.* Urban landscape design, planning and land-use law, urban design theory, development controls, and design guidelines.

## LANDSCAPE ARCHITECTURE (PLA)

**PLA 411 Landscape Architecture Theory and Criticism.** (3) S  
Landscape architecture theories and projects are critically analyzed to evaluate validity of design and contribution to society. Prerequisites: PLA 210, 361, 362, 420, 461.

**PLA 461 Landscape Architecture V.** (4) F  
Landscape ecological planning: collection and application of ecological data relevant to planning and design at landscape scale. Studio. Prerequisite: PLA 362.

**PLA 485 International Field Studies in Planning and Landscape Architecture.** (1–12) F, S, SS  
Organized field study of planning and landscape architecture in specified international locations. May be repeated for credit with department approval. Study abroad. Cross-listed as PUP 485. Credit is allowed for only PLA 485 or PUP 485.

**PLA 546 Urban Design Policy.** (3) N  
Advanced study of local, state, and federal urban design policy. Cross-listed as PUP 546. Credit is allowed for only PLA 546 or PUP 546. Prerequisite: PLA/PUP 420.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## URBAN AND ENVIRONMENTAL PLANNING (PUP)

**PUP 412 History of the City.** (3) F  
The city from its ancient origins to the present day. Emphasis on European and American cities during the last five centuries. Cross-listed as APH 414. Credit is allowed for only APH 414 or PUP 412. *General Studies: H.*

**PUP 420 Theory of Urban Design.** (3) F  
Analysis of the visual and cultural aspects of urban design. Theories and techniques applied to selected study models. Prerequisite: junior standing. *General Studies: HU.*

**PUP 433 Zoning Ordinances, Subdivision Regulations, and Building Codes.** (3) F, S  
Analysis of zoning ordinances, subdivision regulations, building codes, and other planning implementation techniques relative to local development.

**PUP 442 Environmental Planning.** (3) F  
Environmental planning problems, including flood plains, water quality and quantity, solid and hazardous waste, air quality, landslides, and noise. Field trips. Prerequisite: PUP 301 or instructor approval.

**PUP 444 Preservation Planning.** (3) S  
History, theory, and principles of historic preservation. Emphasis on legal framework and methods practiced. Lecture, off-campus field study. Prerequisite: instructor approval.

**PUP 445 Women and Environments.** (3) F  
Examines the role women play in shaping the built environment; ways built/natural forms affect women's lives. Focus on contemporary U.S. examples. Prerequisite: upper division or graduate status. *General Studies: C.*

**PUP 452 Ethics and Professional Practice.** (3) F  
Ethical problems and issues in planning, professional practice, and decision making. Prerequisite: department major or instructor approval. *General Studies: L2.*

**PUP 485 International Field Studies in Planning and Landscape Architecture.** (1–12) F, S, SS  
Organized field study of planning and landscape architecture in specified international locations. May be repeated for credit with department approval. Study abroad. Cross-listed as PLA 485. Credit is allowed for only PLA 485 or PUP 485.

**PUP 498 PS: Senior Pro-Seminar.** (1) F

**PUP 510 Citizen Participation.** (3) S

Theory and practice of citizen participation in planning. Examines and critiques participation techniques and roles of planners. Prerequisite: instructor approval.

**PUP 520 Planning Theories and Processes.** (3) F

Review of past and current theoretical developments related to social change perspectives, the role and ethics of planners. Prerequisite: instructor approval.

**PUP 524 Planning Methods I: Planning Research Methods.** (3) F

Tools useful for urban planning research; emphasis on research design and survey methods. Prerequisite: PUP 301 or instructor approval.

**PUP 525 Urban Housing Analysis.** (3) F

Nature, dimensions, and problems of urban housing, government policy environment, and underlying economics of the housing market.

**PUP 531 Planning and Development Control Law.** (3) S

Case studies on police power, eminent domain, zoning, subdivision controls, exclusion, preservation, urban redevelopment, and aesthetic and design regulation.

**PUP 532 Advanced Urban Planning Law.** (3) S

Advanced study on selected issues in planning law, such as urban design controls, exclusionary practices, compensable regulation, and tax policy. Prerequisite: PUP 432 or instructor approval.

**PUP 544 Urban Land Use Planning.** (3) F

Theory and methods of urban land use planning, including the rational planning process, comprehensive, functional, and neighborhood plans. Prerequisite: PUP 301 or instructor approval.

**PUP 546 Urban Design Policy.** (3) N

Advanced study of local, state, and federal urban design policy. Cross-listed as PLA 546. Credit is allowed for only PLA 546 or PUP 546. Prerequisite: PLA/PUP 420.

**PUP 561 Urban Design Studio.** (4) N

Current urban form and urban landscape design problems within the Phoenix-centered region. Studio. Prerequisite: PLA/PUP 420 or instructor approval.

**PUP 572 Planning Studio I: Data Inventory and Analysis.** (4) F

Comprehensive planning workshop dealing with real community problems. Focus on the data gathering and analysis steps of the planning process. Prerequisite: Master of Environmental Planning major or instructor approval.

**PUP 574 Planning Studio II: Options and Implementation.** (4) S

Comprehensive planning workshop dealing with real community problems. Focus on the development of options, plan making, and plan implementation. Studio. Prerequisite: PUP 572 or instructor approval.

**PUP 575 Environmental Impact Assessment.** (3) S

Criteria and methods for compliance with environmental laws; development of skills and techniques needed to prepare environmental impact statements/assessments.

**PUP 584 Internship.** (3) F, S, SS (SS1 only)

Internship under the supervision of practitioners in the Phoenix area or other locales. Credit/no credit.

**PUP 622 Planning Methods II: Quantitative Planning Analysis.** (3) S

Methods and models used as the basic quantitative techniques of urban, regional, and environmental planning and policy analysis. Prerequisites: PUP 424; statistics; instructor approval.

**PUP 642 Land Economics.** (3) F

Land use and locational impact of economic activity and the urban real property market. Prerequisite: instructor approval.

**PUP 644 Public Sector Planning.** (3) S

Urban fiscal problems and public goods provision in state and local governments. Prerequisites: instructor approval; 1 course in micro-economics.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Environmental Resources

Frederick Steiner  
*Director*

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icgrn@asu.edu

[www.asu.edu/caed/Planning/PLERSMS.html](http://www.asu.edu/caed/Planning/PLERSMS.html)

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**PROFESSORS**

BRADY, BROCK

**ASSOCIATE PROFESSORS**

GREEN, MILLER, WHYSONG

The faculty in the School of Planning and Landscape Architecture offer a program leading to the M.S. degree in Environmental Resources. Areas of study are offered in natural resource management, GIS/remote sensing, and range ecology.

The faculty in the school also participate in offering the Ph.D. in Environmental Design and Planning program. See "Doctor of Philosophy," page 101, for general information on the Ph.D. degree.

**MASTER OF SCIENCE**

**Admission.** Applicants to the program are expected to meet the minimum requirements for admission to the Graduate College. In addition, scores from the Graduate Record Examination or Miller Analogies Test are required. Applicants are expected to have completed 18 semester hours in environmental sciences or closely related courses. Applicants not meeting these requirements may be considered for admission with deficiencies.

Submit the following separate application materials to:

ENVIRONMENTAL RESOURCES PROGRAM  
SCHOOL OF PLANNING AND LANDSCAPE  
ARCHITECTURE  
ARIZONA STATE UNIVERSITY  
PO BOX 872005  
TEMPE AZ 85287-2005

1. a statement of intent (maximum 600 words) explaining
  - (a) the applicant's interest in environmental resources,
  - (b) the applicant's academic background, and
  - (c) the applicant's educational objectives;
2. three letters of recommendation from references who are qualified to comment on the applicant's potential in the selected area of study; and
3. a résumé.

**Application Deadlines.** For fall enrollment, application materials are due in the School of Planning and Landscape Architecture and the Graduate College on March 15.

For spring enrollment, application materials are due in the School of Planning and Landscape Architecture and the Graduate College on October 15.

**Selection Procedures and Notifications.** School faculty evaluate the applications and supporting materials and recommend to the Graduate College whether the applicant should be granted regular or provisional admission or if admission should be denied. If admission is provisional, the Graduate College specifies in its letter of admission the provisions to be met to gain regular status. The school informs successful applicants of the procedures for enrollment.

**Program of Study.** A minimum of 30 semester hours of approved graduate course work is required. All students are required to complete a 13-semester-hour core curriculum. First-year students are expected to complete ERS 550 Vegetation Dynamics Studio, ERS 591 Environmental Resources Seminar, and ERS 551 Environmental Statistics Studio. Second-year students are required to complete ERS 591 in the fall semester. Students can complete ERS 485 GIS in Natural Resources or ERS 486 Remote Sensing in Environmental Resources (or an approved substitute if the student has previously taken both ERS 485 and 486) at any time during their residence. All students are also expected to complete a minimum of three semester hours of research and three semester hours of thesis. The remaining hours (11 semester hours) are chosen to support the student's educational objectives.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** None.

**Thesis Requirements.** A thesis is required.

**Final Examinations.** A final oral examination covering the thesis and related subject matter is required.

## RESEARCH ACTIVITY

Faculty and graduate students in Environmental Resources are active in a number of research programs, including applications of geographic information systems to resource management, monitoring of ecological change, wildlife habitat ecology, vegetation dynamics, fire ecology, soil ecology, and ecosystem restoration. Range ecology studies investigate various problems, from shrub control and hydrologic research in Arizona chaparral to the use of microcomputers in field data acquisition and the effects of power plant emission on vegetation. Other research has considered the relationships between both livestock and wildlife and their environments.

### ENVIRONMENTAL RESOURCES (ERS)

#### ERS 402 Vegetation Measurement. (4) S

Vegetation sampling and inventory as related to animal-habitat relations. Lecture, lab, 1 weekend field trip. Prerequisites: CSE 180 and ERS 350 and 360 and department major or instructor approval.

#### ERS 407 Wildland Plants and Habitats. (4) F

The distribution, ecological characteristics, identification of key plants, and values of habitats of western rangelands and forests. Laboratory emphasis on grass identification. Lecture, lab. Prerequisite: PLB 310 or equivalent.

#### ERS 410 Wildlife Habitat Relations. (4) N

Interactions among animal populations and their habitat. Systems simulation of population dynamics as influenced by competition and management strategies. Lecture, lab, 1 weekend field trip. Prerequisite: ERS 360.

#### ERS 415 Wildlife Life Histories. (3) S

Life histories of the major mammal, reptile/amphibian, and avian species found in the Southwest, with emphasis on management. Lecture, lab. Prerequisites: BIO 370 or 385 and ERS 360.

#### ERS 420 Ecological Restoration. (3) S

Techniques of ecological restoration applied for the improvement of arid and semi-arid land and sensitive habitats. Weekend field trips. Prerequisite: ERS 360.

#### ERS 425 Soil Classification and Management. (3) N

Principles of soil genesis, morphology, and classification. Management and conservation practices will be presented. Prerequisite: ERS 225.

#### ERS 433 Riparian Ecosystem Management. (3) N

Examination of the functions and components that make up riparian ecosystems and the management of these ecosystems. Lecture, field trip. Prerequisite: ERS 225 or instructor approval.

#### ERS 434 Wetland Ecosystems and Soils. (3) N

Wetland ecosystems structure and function including hydrology and biogeochemistry with special emphasis on soils. Lecture, weekend field trip. Prerequisite: ERS 225 or instructor approval.

#### ERS 446 Soil Fertility. (3) N

Ability of soils to retain and supply plant nutrients. Reactions of fertilizers in soils. Prerequisites: ERS 225, 226.

#### ERS 448 Soil Ecology. (3) N

Soils viewed in an ecosystem context, soil-plant relationships, nutrient budgets, and abiotic factors that influence soil processes. Prerequisites: BIO 320 and ERS 225 and 226 or instructor approval.

#### ERS 452 Soil, Water, and Irrigation. (3) N

Water measurement, conveyance, and conservation, with emphasis on crop production and soil-plant water relations. Prerequisite: ERS 225.

#### ERS 460 Applied Systems Ecology. (3) N

The systems approach applied to analysis and management of natural resource ecosystems. Use of simulation models. 2 hours lecture, 3 hours lab. Prerequisites: ERS 350 or equivalent; 1 course in ecology.

#### ERS 470 Land Reclamation. (3) N

Problems of reestablishing vegetation on disturbed sites. Special revegetation techniques, surface modifications, and government regulations. 1 weekend field trip. Prerequisites: ERS 407 and 420 and 446 and 448 or instructor approval.

#### ERS 475 Wildlife and Range Animal Management. (3) S

Principles and techniques for management of domestic and nondomestic animals using rangeland ecosystems. Emphasis on practical applications of management. Weekend field trips. Prerequisite: instructor approval.

#### ERS 480 Ecosystem Management and Planning. (3) S

Planning for management and conservation of wildland ecosystems. Ecological, economic, and social constraints on long-term sustainable resource development. Computer tools for resource planning. Lecture, 1 weekend field trip. Prerequisites: ERS 402 or equivalent; senior standing. *General Studies: L2.*

#### ERS 485 GIS in Natural Resources. (3) F

Principles of Geographic Information Systems (GIS) utilized in natural resource management. Use of computers for spatial analysis of natural resources. Lecture, lab. Prerequisite: CSE 180 or equivalent.

#### ERS 486 Remote Sensing in Environmental Resources. (4) S

Principles and application of remote sensing technologies in natural resource management. Integration of computerized data from aerial photography and Landsat imagery in resource management. Lecture, lab. Prerequisite: ERS 485 or equivalent.

**ERS 490 Recent Advances in Environmental Resources. (1) F, S** Current literature and significant developments involving environmental resources. May be repeated for credit.

#### ERS 533 Riparian Ecology. (3) N

Review of recent literature, developments, and methods related to riparian ecology. Applications of soil and landscape ecology to riparian systems. Lecture, discussion, field trips.

#### ERS 540 Plant Responses to Environmental Stresses. (3) N

Reaction of plants to environmental stresses; aerial pollutants, fire, herbivores, mechanical treatments, pesticides, and soil amendments. 1 weekend field trip. Prerequisite: ERS 360 or instructor approval.

#### ERS 548 Plants, Soils, and Environmental Quality. (3) N

Effects of air quality on plants and soils, and their role in removing contaminants from the atmosphere. Prerequisite: ERS 225.

#### ERS 550 Vegetation Dynamics Studio. (4) F

Dynamics of vegetation emphasizing ecological succession, applications of landscape ecology and GIS, and analysis of vegetation data. Field trips, studio. Prerequisite: introductory statistics course.

**ERS 551 Environmental Statistics Studio.** (4) S

Advanced statistical procedures for environmental resources. Techniques for analyzing research data that do not meet assumptions. Studio. Prerequisite: ERS 350 or equivalent.

**ERS 553 Advanced Animal Nutrition.** (4) N

Metabolic and physiological interactions of nutrients in wild and domesticated animals consuming natural feeds. Lecture, lab.

**ERS 560 Systems Ecology.** (3) N

Quantitative description and mathematical modeling of ecosystem structure and function. Techniques for model construction and simulation. Lecture, lab. Prerequisites: ERS 350 or equivalent; computer programming; 6 hours in ecological studies.

**ERS 585 Spatial Modeling with GIS.** (3) F

GIS technology for spatial modeling of natural resources. Practical application of GIS technology for problem solving. Lecture, lab. Prerequisites: ERS 485 or equivalent or instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Exercise Science

### Interdisciplinary Doctoral Program

**Daniel M. Landers**

*Director, Executive Committee*

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mattingl@asu.edu

[www.asu.edu/clas/espe/ExScPhD.htm](http://www.asu.edu/clas/espe/ExScPhD.htm)

#### Anthropology

Associate Professor: Marzke

#### Biology

Professors: Hazel, Satterlie;  
Associate Professor: Harrison

#### Chemical, Bio, and Materials Engineering

Associate Professors: He, Sweeney, Yamaguchi

#### Exercise Science and Physical Education

Regents' Professor: Landers;  
Professors: Krahenbuhl, Martin, Stelmach, Stock;  
Associate Professors: Hinrichs, Matt, Pagliassotti, Willis;  
Assistant Professors: Etnier, Gerritsen, Robertson, Treasure

#### Family Resources and Human Development

Associate Professor: Manore

#### Psychology

Professors: Karoly, Linder, McBeath

#### Psychology in Education

Regents' Professor: Kulhavy;  
Professor: Glass

The Committee on Exercise Science offers an interdisciplinary graduate program leading to the Ph.D. degree in Exercise Science. The committee functions in setting guidelines and supervising programs of study. One of the unique features of this interdisciplinary program is that, because it utilizes faculty research and teaching interests from a number of academic units, a student may tailor a course of study to fit individual needs and goals. The present committee is composed of members from the following academic units: Anthropology; Biology; Chemical, Bio, and Materials Engineering; Exercise Science and Physical Education; Family Resources and Human Development; Psychology; and Psy-

chology in Education. Courses, however, are not limited to these academic units. Concentrations are available in biomechanics, motor behavior/sport psychology, and physiology of exercise.

### DOCTOR OF PHILOSOPHY

The Ph.D. degree in Exercise Science is an individualized interdisciplinary degree that integrates graduate courses from a variety of academic units to provide a sound foundation for research leading to a dissertation in Exercise Science. Topics for these dissertations come from one of three research areas: biomechanics, physiology of exercise, and motor behavior/sport psychology.

**Admission.** In addition to meeting Graduate College requirements, students must submit a letter designating a potential area of interest, the name of a potential mentor (from the list of faculty above), and a statement of career goals to the director of the Committee on Exercise Science. Graduate Record Examination (GRE) scores (verbal, quantitative, and analytical), a professional résumé, and three letters of recommendation must also be submitted. All applicants whose native language is not English must submit a Test of English as a Foreign Language score. Preference is given to applicants already holding a master's degree, although exceptional students possessing only a baccalaureate degree may apply. Admission decisions are based on the compatibility of the applicant's career goals with the purpose of the degree program, previous academic training and performance, GRE scores, recommendations, and the ability of the potential mentor to devote time to an additional student. To be considered for research or teaching assistantships, all application materials should be received before February 1.

**Program of Study.** The program of study consists of a minimum of 54 semester hours of graduate work beyond the master's degree (84 hours of graduate credit for applicants holding only the baccalaureate degree). Of the 54 hours, 24 are research and dissertation credit to be completed at ASU. The student should expect to devote at least one to two years to completing the dissertation. At least 30 hours of the approved Ph.D. program in which the student is enrolled, exclusive of dissertation and research hours, must be completed at ASU. An individual program of study is selected in consultation with the student's supervisory committee. The program of study reflects the interdisciplinary nature of the degree program. Students are expected to have fulfilled a majority of the foundational course work before admission. Prerequisites that have not been completed must be taken as remedial work in addition to the program of study.

**First-Year Evaluation.** The student must pass an examination given the fifth week of the first semester. The examination covers the area of concentration as well as statistics/research design and allied areas. The examination is both diagnostic and qualifying in the concentration area. If the student passes the written examination in the concentration area, the results in the allied areas serve as a guide to the supervisory committee in formulating a program of study. If the student's performance on the written examination in the area of concentration is marginal or unsatisfactory, the student must take an oral examination or another written examination within one semester. Failure to qualify on the second

examination results in a recommendation to the Graduate College for dismissal.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Upon completion of course work and before commencing dissertation research, the student is given written and oral examinations. After the student has passed the comprehensive examinations, a dissertation committee is appointed by the dean of the Graduate College. After the dissertation committee has approved the dissertation prospectus, the student is eligible to apply for admission to candidacy.

**Dissertation Requirements.** The dissertation must consist of a fully documented written analysis of a problem that extends the knowledge and/or theoretical framework of the field. The research should demonstrate the student's creativity and competence for independent research.

**Final Examinations.** A final oral examination in defense of the dissertation is required. The candidate must take the final oral examination in defense of the dissertation within five years after passing the comprehensive examinations. Any exception must be approved by the supervisory committee, the director of the Committee on Exercise Science, and the dean of the Graduate College and ordinarily involves repetition of the comprehensive examinations.

## RESEARCH ACTIVITY

Faculty composing the Committee on Exercise Science are engaged in a variety of research activities. The following list includes some of the most recent research interests.

*Biomechanics.* Decrements in the mechanics and economy of walking in the elderly, kinematic and kinetic determinants of walking and running patterns in below knee amputees, anatomical and mechanical determinants of carpal tunnel syndrome; factors affecting throwing and vertical jumping performance; hydrodynamics of swimming propulsion and resistance, cycling biomechanics and physiology—factors influencing pedaling rates; computer simulation of locomotion in clinical and sport applications; and neuromusculo-skeletal modeling.

*Motor Behavior/Sport Psychology.* Autonomic and central nervous system mediators of behavior; exercise and mental health; affective state as a function of exercise; self-talk, self-evaluation, imagery and other processes related to competitive performance; perceptual factors associated with sport; stress and burnout; social physique anxiety; psychophysiological/cognitive/motor processes; attention; feedback; motor learning; coordination; force production; neuromotor impairments; control and coordination of movement; arousal and attention in skilled performance; mental preparation strategies; coping and adaptation; aging and motor coordination; cognitive factors and motor skill performance; development of motor expertise; and development of gender differences in sport and motor behavior.

*Physiology of Exercise.* Thermal adaptation; oxygen consumption; body composition; endocrine responses to exercise; cell membrane lipid metabolism; mitochondrial and cellular bioenergetics; muscle physiology; hepatic exercise metabolism; free radical production during exercise; exercise and aging; physiological, biochemical, and hormonal aspects of stress; physiological aspects of the exercising

female; athletic amenorrhea; effects of exercise on osteoporosis and arthritis; and nutrition in sport and exercise.

**Exercise Science.** For courses which are available to support the interdisciplinary degree program in exercise science, refer to the course listings under the following majors: Anthropology, Bioengineering, Biology, Chemical Engineering, Chemistry, Educational Psychology, Family Resources and Human Development, Exercise Science/Physical Education, and Psychology. A limited number of applicable courses are also available through other departments.

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## Exercise Science/Physical Education

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### REGENTS' PROFESSOR LANDERS

**PROFESSORS**  
 BURKETT, CORBIN, DARST, KRAHENBUHL, MARTIN,  
 PANGRAZI, STELMACH, STONE

**ASSOCIATE PROFESSORS**  
 HINRICHS, MATT, PAGLIASOTTI, WILLIS

**ASSISTANT PROFESSORS**  
 CHEN, ETNIER, GERRITSEN, PHILLIPS, ROBERTSON,  
 SWAN, TREASURE

The faculty in the Department of Exercise Science and Physical Education offer graduate programs leading to the M.S. degree in Exercise Science/Physical Education, and the Master of Physical Education. Faculty also participate in two interdisciplinary Ph.D. programs: (1) Exercise Science with concentrations in biomechanics, motor behavior/sport psychology, and physiology of exercise, and (2) Curriculum and Instruction with concentrations in exercise and wellness, and physical education.

The Committee on Exercise Science offers an interdisciplinary graduate program leading to the Ph.D. degree in Exercise Science. The present committee is composed of members from several academic units. For more information about this program, see "Exercise Science," page 199.

The Committee on Curriculum and Instruction offers an interdisciplinary graduate program leading to the Ph.D. degree in Curriculum and Instruction. For more information, see "Curriculum and Instruction—Interdisciplinary Doctoral Program," page 164.

## MASTER OF SCIENCE

Applicants for the M.S. degree program in Exercise Science/Physical Education may choose from five areas of study: biomechanics, exercise physiology, exercise and wellness, physical education (elementary, secondary, and adapted), and motor behavior/sport psychology (motor

learning and control, motor development, and sport psychology). All applicants are required to submit scores from the Graduate Record Examination (GRE). Admission decisions are based upon previous academic training and performance, GRE scores, recommendations, and the ability of potential mentors to devote time to an additional student. International applicants whose native language is not English must also submit a Test of English as a Foreign Language score. Applications are reviewed by department faculty only once a year. To be considered for admission in the fall semester, all application materials must be received by the department by February 1. The program requires a minimum of 30 semester hours, at least 21 of which must be EPE courses. Required courses with corresponding semester hours include EPE 500, EPE 501, and EPE 599. Remaining course work is selected by the student in consultation with an advisor and supervisory committee.

**Deficiencies.** All applicants recommended for admission are evaluated for deficiencies in their academic preparation. Deficiencies are divided into two areas: (1) those associated with the discipline of exercise science and physical education (human anatomy and physiology, biomechanics, exercise physiology, motor learning and development, and psychosocial aspects of physical activity) and (2) those associated with the area of study (a maximum of six deficiency semester hours pertinent to study in the area may be specified).

**Foreign Language Requirements.** None.

**Thesis Requirements.** A thesis is required.

**Final Examinations.** A final oral examination in defense of the thesis is required.

## MASTER OF PHYSICAL EDUCATION

The faculty in the Department of Exercise Science and Physical Education offer a program leading to the Master of Physical Education (M.P.E.) degree. The M.P.E. degree is designed to prepare scholarly professionals (i.e., teachers of physical education). Emphasis is placed on improving instructional effectiveness and developing a quality physical education curriculum in a school setting. Three areas of study are available: elementary, secondary, and adapted physical education.

**Admission.** Applicants who hold a bachelor's degree in education and who are certified to teach may apply to the M.P.E. degree directly. Applicants with a bachelor's degree in physical education but who are not certified to teach will apply to the postbaccalaureate/M.P.E. degree. Deficiencies will be assessed where applicable.

**Program of Study.** A minimum of 33 semester hours of course work is required for the M.P.E. program, with 18 hours of required core courses, six hours of cognate area, and nine hours of recommended electives. A total of 58 semester hours is required of students completing both the postbaccalaureate program and the M.P.E.

**Foreign Language Requirements.** None.

**Final Examinations.** A final written comprehensive examination is required.

## RESEARCH ACTIVITY

Laboratory research has been enhanced by the development of a 13,500-square-foot laboratory, the Exercise and Sport Research Institute, which is considered internationally as one of the finest facilities of its kind. The institute includes laboratories dedicated to exercise physiology, biomechanics, sport psychology, motor learning and control, and motor development. Another well-equipped facility is the Physical Education Research Laboratory. This 1,114-square-foot laboratory is dedicated to research on teaching and coaching as well as physical fitness education and programming.

The nature and scope of research activities in the various areas of study follow.

**Biomechanics.** Mechanical determinants of economical gait, gait impairments, and postural control of the aged; repetitive strain syndrome in computer keyboard operators; upper extremity contributions during walking and running; estimation of segment inertial properties; mechanics of swimming techniques; and mechanics of overhand throwing.

**Exercise Physiology.** Exercise and cardiovascular disease, thermal adaptation, exercise prescription, oxygen consumption, body composition, endocrine responses to exercise, cell membrane lipid metabolism, epithelial transport of ions, cellular enzyme activity, exercise and aging, physiological and biochemical aspects of stress, physiological aspects of the exercising female, cardiovascular and metabolic aspects of wheelchair training, and optimization of physical training programs.

**Exercise and Wellness.** Methods of effective exercise and health promotion, effectiveness of fitness programs, fitness testing, exercise adherence, motivation and fitness, physical self-perception, and fitness/exercise knowledge and attitudes.

**Motor Behavior/Sport Psychology.** Autonomic and central nervous system mediators of behavior, psychophysiological and cognitive correlates of information processing, arousal and attention in skilled performance, competitive anxiety, mental preparation strategies, interpersonal attraction and conflict, coping and adaptation, motor programming, spatial orientation, aging and motor coordination, cognitive factors and sport skill performance, and development of gender differences in sport and motor performance.

**Physical Education.** Analysis and measurement of teaching in the environments of elementary schools, secondary schools, and athletic coaching; attitudes and values of children and youth; curriculum models for secondary schools; effectiveness of adapted programs; preschool physical education programs; and analysis of motor patterns in young children.

## EXERCISE SCIENCE/PHYSICAL EDUCATION (EPE)

A \$5.00 towel and locker fee is required each semester by students using towel and locker facilities for physical education classes and intramural activities.

**EPE 413 Qualitative Analysis in Sport Biomechanics.** (3) S Developing systematic approach for detecting and correcting errors in human performance using anatomical and mechanical principles. Lecture, lab. Prerequisite: EPE 335.

**EPE 414 Electromyographic Kinesiology.** (3) F

Muscular contributions to human movement, muscle mechanics, electrophysiological basis, and practical application of electromyography. Lecture, discussion. Prerequisites: EPE 335, 340; instructor approval.

**EPE 442 Physical Activity in Health and Disease.** (3) F

The role of physical activity and physical fitness in the development of morbidity and mortality throughout the human life span. Prerequisites: BIO 201, 202; EPE 340. *General Studies: L2.*

**EPE 444 Metabolic Adaptations to Exercise Training.** (3) F, S, SS

Examination of physiologic adaptations to exercise training as they relate to metabolism and tissue functions. Prerequisite: EPE 340.

**EPE 452 Exercise Psychology.** (3) S

Contemporary research and theory as related to human behavior and health in an exercise setting. Prerequisite: EPE 352.

**EPE 460 Theory of Strength Training.** (3) S

Research and theories on developing muscular strength; programs for developing muscular strength. Lecture, discussion. Prerequisites: EPE 335, 340. *General Studies: L2.*

**EPE 500 Research Methods.** (3) F

An introduction to the basic aspects of research, including problem selection, literature review, instrumentation, data handling, methodology, and the writing of research reports and articles.

**EPE 501 Research Statistics.** (3) S

Statistical procedures; sampling techniques; exercise testing, exercise prescription, hypothesis testing, and experimental designs as they relate to research publications.

**EPE 505 Applied Exercise Physiology Techniques.** (3) F

Investigative techniques used in the applied exercise physiology laboratory. Emphasis on pulmonary function, body composition, and cardiorespiratory assessment. Lecture, lab. Prerequisite: EPE 340.

**EPE 510 Introduction to Biomechanics Research Methods.** (3) F

Application of mechanics to human movement analysis. Includes consideration of two-dimensional imaging techniques, force measurement, electromyography, and data processing methods. Lecture, discussion, some labs. Prerequisite: EPE 335 or instructor approval.

**EPE 520 Sport Psychology.** (4) F

Current research in sport psychology. Includes questionnaire, psychophysiological, and behavioral research techniques. Lecture, discussion. Prerequisites: EPE 448, 500.

**EPE 521 Motor Development, Control, and Learning.** (4) S

Theory and research on motor skill acquisition, including learning/control and development (i.e., growth, children and exercise, and development learning). Lecture, discussion, some labs. Prerequisites: EPE 345, 500, 501.

**EPE 522 Exercise Psychology.** (3) S

Contemporary research and theory as related to human behavior and health in an exercise setting. Lecture, discussion. Prerequisite: EPE 500.

**EPE 530 Exercise Physiology.** (3) F

Immediate and long-term adaptations to exercise with special reference to training and the role of exercise in cardiovascular health. Prerequisite: EPE 340.

**EPE 531 Physiology of Women in Sport.** (3) S

Physiological aspects of women engaging in physical activity. Factors affecting performance and health throughout life are emphasized. Prerequisite: EPE 340.

**EPE 534 Sports Conditioning.** (3) F

Bases of sports conditioning, including aerobic and anaerobic power, strength, flexibility, and analysis of conditioning components for sports.

**EPE 535 Factors Influencing Exercise Performance.** (3) S

Physiological factors that can affect the ability to exercise, and the body's response to exercise. Lecture, seminar. Prerequisite: EPE 530.

**EPE 536 Physiology of Physical Activity, Exercise and Chronic Disease.** (3) F, S

Role of physiological mechanisms associated with acute and long-term physical exercise and its influence on chronic disease and wellness.

**EPE 542 Health Promotions.** (3) S

Theory and research concerning fitness and wellness programs in nutrition, physical activity, smoking cessation, and stress management.

**EPE 544 Fitness/Wellness Management.** (3) F

Development of the fitness/wellness industry. Planning, organizing, promoting, and managing fitness/wellness programs.

**EPE 561 Administration of Athletics.** (3) N

Managing an athletic program, including financing, budget policies, staging, and promotion of athletic contests, schedules, travel insurance, and current athletic trends.

**EPE 570 Programs and Special Topics in Adapted Physical Education.** (3) F

Contemporary adapted, developmental, remedial, and corrective physical education programs; understanding of principles, problems, and recent developments in this area.

**EPE 571 Improving Sport Skills.** (3) SS

Factors in successful motor performance in skills used in individual, dual, and team sports.

**EPE 572 Trends and Issues in Physical Education.** (3) S

Literature, research, and practices in contemporary physical education, including finances, Title IX, teaching and coaching philosophies, school organization, and nonteaching physical education programs.

**EPE 573 Curriculum and Instruction in Secondary Physical Education.** (3) F

Current curriculum and instruction practices and research in secondary school physical education. Prerequisite: ESPE major or teaching experience.

**EPE 574 Analysis of Teaching Behavior in Sport and Physical Education.** (3) N

Use of systematic, direct observation techniques in analyzing and evaluating instruction in sport and physical education. Lecture, lab.

**EPE 575 Teaching Lifetime Fitness.** (3) S

Organizing and implementing physical fitness programs in the schools with emphasis on individual problem solving.

**EPE 576 Physical Education for Elementary School Children.** (3) F

Current practices and research pertaining to elementary school physical education programs.

**EPE 578 Student Teaching in Secondary Schools.** (6–12) F, S

The practice of teaching. Relationship of theory and practice in teaching. Prerequisite: completion of all required coursework or equivalent prior to student teaching.

**EPE 610 Advanced Topics in Biomechanics.** (3) S

Three-dimensional imaging techniques, data analysis theory, and integration of biomechanics research tools; includes original research project. Lecture, discussion, some labs. Prerequisite: EPE 510 or instructor approval.

**EPE 620 Developmental Motor Skill Acquisition.** (3) S 2001

Cognitive-motor theories of learning/performance applied to children's motor skill acquisition. Study of knowledge development and research analysis/techniques. Lecture, discussion. Prerequisite: EPE 521.

**EPE 621 Motor Learning/Control.** (3) F

Discussion of contemporary research issues in motor learning and control. Includes behavioral and neurophysiological issues. Lecture, discussion. Prerequisite: EPE 521.

**EPE 642 Exercise Epidemiology.** (3) S

Physical activity, exercise, and physical fitness and the development of chronic disease. Not open to students who have taken EPE 442. Prerequisites: EPE 340, 500, 501.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.



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## Family Resources and Human Development

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### PROFESSORS

CHRISTOPHER, FABES, HOOVER, MANORE, C. MARTIN,  
 MERMIS, MORGAN, PETERSON, ROOSA

### ASSOCIATE PROFESSORS

BALCAZAR, BOULIN-JOHNSON, DUMKA, GRIFFIN,  
 JOHNSTON, MONTE, VAUGHAN, WILSON

### ASSISTANT PROFESSORS

ESTRADA, HAMPL, HANISH,  
 MADDEN-DERDICH, UPDEGRAFF

### LECTURERS

BODMAN, R. MARTIN, WEIGAND

The faculty in the Department of Family Resources and Human Development offer a graduate program leading to the M.S. degree in Family Resources and Human Development. Two concentrations are available: (1) family studies with areas of study in child development or family relationships and (2) general family resources and human development with an area of study in human nutrition and foods. Within the family relationships area, students may take courses in marriage and family therapy (MFT) sufficient to meet MFT certification requirements for the state of Arizona.

Students applying to this program are required to submit scores on the Graduate Record Examination (verbal and quantitative sections).

### MASTER OF SCIENCE

**Admission.** Applications for admission, teaching assistantships, and Cowden Fellowships are accepted until January 15 preceding the fall semester to which the applicant is seeking admission.

**Program of Study.** Courses are selected by the student along guidelines of the specific areas, after consultation with the supervisory committee. The program of study should be completed and approved by the supervisory committee by the end of the second semester of full-time graduate study upon completion of 12 semester hours. A program of study may include more than 30 semester hours, and the exact number will be determined by program requirements and the student's supervisory committee. Acceptance of the proposed program of study must be verified by signature of the student and committee members. After approval within the department, the program of study is submitted to the Graduate College for final approval. The following requirements must be met for the two concentrations.

**Family Studies.** The required courses are CDE 531, FAS 500, and FAS 531; two statistics courses, one basic and one

advanced, selected with the approval of the student's advisor; and six semester hours of thesis/research. A minimum of 34 semester hours is required for this degree program; however, 37 hours are recommended.

Additional requirements must be fulfilled in the chosen area of study.

**Child Development.** The required courses are CDE 533, six semester hours of CDE electives, and one FAS course selected in consultation with the advisor.

**Family Relationships.** The required courses are FAS 539, six semester hours of FAS electives, and one CDE course selected in consultation with the advisor.

Within the family relationships area of study, students may take courses in marriage and family therapy to meet certification requirements for the state of Arizona. A separate application and acceptance is required for admission to the MFT specialization which includes clinical practice and supervision. Typically, the MFT specialization is a three-year program.

### General Family Resources and Human Development.

As part of the program of study, 20–23 semester hours of approved graduate course work emphasizing human nutrition and foods are required. Required courses are FAS 500, a 500-level statistics course (three to six semester hours) approved by an advisor, six semester hours of thesis/research credit, and two graduate seminars selected from the following: FON 531, 532, 533, 538, and/or 598. The student may select courses from the following upon consultation with an advisor: FON 540, 541, 542, 544, 545, 548, 550, 551, and 580. Other courses may be selected upon consultation with the advisor. The prerequisites for graduate work in this area are as follows: anatomy and physiology and laboratory, biochemistry and laboratory, general chemistry and laboratory, introductory statistics, microbiology and laboratory, organic chemistry and laboratory, and general nutrition.

**Thesis Requirements.** A thesis is required.

**Final Examinations.** A final oral examination in defense of the thesis is required.

### RESEARCH ACTIVITY

Recent faculty and student research include the following subjects: nutrition and public health problems of Hispanics, ethnic families; police family-work stress; gender issues, social support; premarital sexual influence strategies, sexual expression, and relationship development; prevention programs for families, process in MFT, client expectancies, sexual enhancement; social-emotional development, peer relationships, temperament; behavioral observation of marital and family interaction; women's role as caregivers to elderly mothers; cross-cultural perspectives; family relations of mid- and later life; physician counseling; vitamin C metabolism; vegetarian nutrition; lactation/infant formula research; postdivorce relationships between former spouses; coparental relationships after divorce; nutrition and exercise, energy balance and obesity; nutrition assessment (especially vitamin B6), women's health issues (amenorrhea, subclinical eating disorders, chronic dieting, female athlete triad), development of stereotypes, gender roles; employee assistance and wellness programs, work and the family; community mental health and consultation; development of

nutritionally sound food products, food additive safety; parent-adolescent relationships, adolescent social competence, adolescent autonomy and connectedness, adolescent risk-taking, family theory; adolescent sexuality, pregnancy, parenting; parental influences; child development and mental health; prevention program development and evaluation; nutrition assessment of geriatric populations; adolescent sexuality; and adolescent educational aspirations.

### CHILD DEVELOPMENT (CDE)

#### **CDE 430 Infant/Toddler Development in the Family.** (3) F

An examination of the development of infants/toddlers, the socialization processes of families, and the interactions of these processes. Prerequisite: CDE 232 or equivalent. *General Studies: SB.*

#### **CDE 437 Observational and Naturalistic Methods of Studying Children.** (3) N

In-depth examination of implementing observational and naturalistic studies of children in a variety of settings. 2 hours lecture, 3 hours lab. Prerequisites: CDE 430; 6 hours of psychology. *General Studies: L2/SB.*

#### **CDE 444 Children and Poverty.** (3) F

The impact that poverty has on children and their families. 2 hours lecture, 3 hours lab. Prerequisites: CDE 232 (or equivalent); 6 hours of upper-division social science credits.

#### **CDE 531 Theoretical Issues in Child Development.** (3) S

Major developmental theories, related research, and their application to family interaction. Prerequisites: CDE 430 and 437 (or equivalent) or instructor approval.

#### **CDE 533 Research Issues in Child Development.** (3) S

An in-depth exploration and critique of research focusing on child development in a family setting. Prerequisites: CDE 531; FAS 500.

#### **CDE 534 Applied Child Development.** (3) S

Integration of child development research and theory to understand developmental problems and their relevance to intervention strategies. Prerequisites: CDE 531; FAS 500.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### FAMILY STUDIES (FAS)

#### **FAS 431 Parent-Adolescent Relationships.** (3) F

Dynamics of the relationships between parents and adolescents. Developmental characteristics of adolescence and the corresponding adult stage. Prerequisites: CDE 232; FAS 331.

#### **FAS 432 Family Development.** (3) N

Normative changes in families over time from formation until dissolution. Emphasis on the marital subsystem in middle and later years. Prerequisites: CDE 232 and FAS 331 or instructor approval.

#### **FAS 435 Advanced Marriage and Family Relationships.** (3) F

Recent research, issues, and trends relating to marriage and family interaction. Influence of family composition, physical environment, family patterns, and values on family dynamics. Prerequisites: FAS 331, 361. *General Studies: L2/SB.*

#### **FAS 436 Conceptual Frameworks in Family Studies.** (3) S

Approaches to study families focusing on systems, interactional, exchange, conflict, and developmental frameworks. Applications to diverse individual and family situations. Prerequisites: CDE 232; FAS 331, 361.

#### **FAS 440 Fundamentals of Marriage and Family Therapy.** (3) S

Introduction to the fundamental orientations of marriage and family therapy.

#### **FAS 457 Third-World Women.** (3) F

Economic, sociopolitical, and demographic context for understanding the roles of third-world women in health, family, work, education, and community. Prerequisite: 6 hours of social science credit or instructor approval.

#### **FAS 500 Research Methods.** (4) F

Purposes of research. Experimental design, methods of data collection, and thesis proposal development. Includes practical application research laboratory. 3 hours lecture, 3 hours lab.

#### **FAS 530 Introduction to Marriage and Family Therapy.** (3) F

Introduction of major marriage and family therapy orientations. Review history, theory, application, and outcome research for each orientation. Prerequisite: admission to graduate program in FRHD with a concentration in family studies or instructor approval.

#### **FAS 531 Family Theory Development.** (3) S

Historical and current approaches to theory development, evaluation, and application in family studies. Prerequisite: FAS 435 or instructor approval.

#### **FAS 536 Dysfunctional Marriage and Family Relationships.** (3) N

A critical review of current theory and empirical evidence connecting marital and family interaction patterns with aberrant behavior. Prerequisite: PGS 466 or PSY 573 (or equivalent) or instructor approval.

#### **FAS 537 Interpersonal Relationships.** (3) F

Critical examination of current theoretical and research developments in the area of interpersonal relationships. Applications for research and intervention emphasized. Prerequisite: FAS 435 (or equivalent) or instructor approval.

#### **FAS 538 Advanced Techniques in Marriage and Family Therapy.** (3) N

An in-depth review of assumptions and advanced techniques associated with contemporary marriage and family therapy approaches. Prerequisite: a graduate-level course in marriage and family therapy or instructor approval.

#### **FAS 539 Research Issues in Family Interaction.** (3) F

Critical review of current and past research in the area of family dynamics. Emphasizes interactional processes within the family. Prerequisite: FAS 435 (or equivalent) or instructor approval.

#### **FAS 540 Assessment in Marriage and Family Therapy.** (3) S

Instruction in the assessment and outcome evaluation of couples and families involved in marital and family therapy. Lecture, lab. Prerequisites: FAS 500 (or equivalent); PSY 530; instructor approval.

#### **FAS 580 Marriage and Family Therapy Practicum.** (3) F, S

Supervised clinical experience in marriage and family therapy; includes development of assessment and outcome evaluation skills. Lecture, lab. Prerequisite: instructor approval.

(a) First semester (3)

(b) Second semester (3)

(c) Third semester (3)

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### FOOD AND NUTRITION (FON)

#### **FON 440 Advanced Human Nutrition I.** (3) F

Metabolic reactions and interrelationships of vitamins, minerals, and water. CHM 332 recommended. Prerequisites: BIO 202; CHM 361; FON 241 (or equivalent).

#### **FON 441 Advanced Human Nutrition II.** (3) S

Metabolic reactions and interrelationships of carbohydrate, lipid, and protein. CHM 331 and 332 recommended. Prerequisites: BIO 202; CHM 361; FON 241 (or equivalent).

#### **FON 442 Experimental Foods.** (3) F

Food product development techniques, food evaluation and testing, and investigation of current research into food composition. 2 hours lecture, 3 hours lab. Prerequisites: CHM 231; FON 142.

#### **FON 444 Diet Therapy.** (3) S

Principles of nutritional support for prevention and treatment of disease. Prerequisites: BIO 202; FON 241 (or equivalent).

#### **FON 445 Quantity Food Production.** (3) S

Standard methods of food preparation in quantity; operation of institutional equipment and menu planning for institutions. Experience in quantity food service. 1 hour lecture, 6 hours lab. May require field trips. Prerequisites: FON 241 (or equivalent) and 344 or instructor approval.

#### **FON 446 Human Nutrition Assessment Lecture/Laboratory.** (3) S

Clinical and biochemical evaluation of nutritional status. 2 hours lecture, 3 hours lab. Prerequisites: CHM 367; FON 440 (or 441).

#### **FON 448 Community Nutrition.** (3) F

Food-related behaviors; community organization and delivery of nutrition services; program design, implementation, and evaluation strategies; nutritional assessment of population groups. PGS 100 and SOC 101 are recommended. Prerequisite: FON 241 or equivalent. *General Studies: L2.*

**FON 450 Nutrition in the Life Cycle I.** (3) F

Emphasis on nutritional needs and problems during pregnancy, lactation, infancy, and childhood. Prerequisite: FON 241 or equivalent.

**FON 451 Nutrition in the Life Cycle II.** (3) S

The nutritional requirements and nutrition-related disorders of adolescence, middle adulthood, and later life. Prerequisite: FON 241 or equivalent.

**FON 531 Recent Developments in Nutrition.** (3) N

Survey of research. Prerequisites: 1 course each in advanced nutrition and biochemistry.

**FON 532 Current Research in Nutrition I.** (3) S

Vitamins and minerals. Prerequisites: 1 course each in advanced nutrition and biochemistry.

**FON 533 Current Research in Nutrition II.** (3) F

Carbohydrates, lipids, and proteins. Prerequisites: 1 course each in advanced nutrition and biochemistry.

**FON 538 Recent Developments in Foods.** (3) N

Discussion and critique of current research. Prerequisite: FON 142.

**FON 540 Advanced Micronutrient Metabolism.** (3) F

The metabolism of vitamins and minerals, primarily as applied to humans, with research literature emphasized. Prerequisites: 1 course each in basic nutrition and biochemistry.

**FON 541 Advanced Macronutrient Metabolism.** (3) S

The metabolism of protein, fat, and carbohydrate, primarily as applied to humans, with research literature emphasized. Prerequisites: 1 course each in basic nutrition and biochemistry.

**FON 542 Experimental Foods.** (3) F

Food product development techniques, food evaluation and testing, and investigation of current research into food composition. 2 hours lecture, 3 hours lab. Prerequisites: CHM 231; FON 142.

**FON 544 Therapeutic Nutrition.** (3) S

Current theories of the nutritional prevention or treatment of various diseases. Prerequisites: 1 course each in basic nutrition and physiology.

**FON 545 Recent Developments in Institutional Feeding.** (3) S

Current practices in institutional feeding, including supervised practicum with local quantity food operation. 1 hour lecture, 6 hours lab. Prerequisites: FON 142 and 344 or instructor approval.

**FON 548 Nutrition Program Development.** (3) F

The planning, development, implementation, and evaluation of community nutrition programs, including the process of grant applications. Prerequisites: 1 course each in basic nutrition and sociology.

**FON 550 Advanced Maternal and Child Nutrition.** (3) F

Metabolic characteristics and nutritional needs of the pregnant woman, lactating woman, infant, and child are reviewed in-depth. Prerequisites: 1 course each in basic nutrition, physiology, and biochemistry.

**FON 551 Advanced Geriatric Nutrition.** (3) S

Metabolic characteristics and nutritional requirements of the elderly are reviewed in depth. Prerequisites: 1 course each in basic nutrition and physiology and biochemistry or instructor approval.

**FON 580 Dietetics Practicum.** (3–9) F, S, SS

Structured practical experience in the Preprofessional Practice Program (AP4), supervised by practitioners with whom the student works closely. Practicum. Prerequisite: acceptance into the AP4 program.

**FON 598 ST: Special Topics.** (1–4) N

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### FAMILY RESOURCES AND HUMAN DEVELOPMENT (FRD)

**FRD 451 Field Experience.** (1–12) N

Supervised field placement in the area of student's concentration with a community business or agency. Students must make arrangements with instructor 1 semester in advance of enrollment. Prerequisites: completion of 60 hours; instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Family Science

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*Chair*

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### PROFESSORS

CHRISTOPHER, FABES, HOOVER, MARTIN, MERMIS,  
MORGAN, PETERSON, ROOSA

### ASSOCIATE PROFESSORS

BALCAZAR, BOULIN-JOHNSON, DUMKA,  
GRIFFIN, WILSON

### ASSISTANT PROFESSORS

ESTRADA, HANISH,  
MADDEN-DERDICH, UPDEGRAFF

The faculty in the Department of Family Resources and Human Development offer a degree program leading to the Ph.D. degree in Family Science. An area of concentration is available in marriage and family therapy (MFT), with additional programs of study available in the nonclinical aspects of family studies.

### DOCTOR OF PHILOSOPHY

The Ph.D. degree in Family Science prepares clinicians and researchers in marriage and family therapy, family processes, family relationships, and human development within the context of families. Students receive advanced training in theory, clinical strategies (MFT), research methodology, and several substantive fields that are part of family science.

The program is designed for graduates to assume leadership roles as directors or clinicians in public or privately funded mental health agencies, private practice, or government, or as researchers and academicians in universities. The MFT concentration also prepares students for state certification to practice as certified marriage and family therapists.

A description of the program, along with opportunities for assistantships and fellowships, may be obtained from the director of the program.

**Admission.** Admission to the Ph.D. in Family Science is determined by the following criteria:

1. official transcripts of all undergraduate and graduate course work;
2. verbal, quantitative, and analytical Graduate Record Examination scores;
3. statement of goals relevant to the Ph.D. program;
4. three letters of recommendation; and
5. an application for admission to the Graduate College.

A Test of English as a Foreign Language score of at least 600 is required of all applicants whose native language is not English.

**Program of Study.** Each student must prepare and submit a program of study in conjunction with the chair and members of his or her supervisory committee during the first year in the program. The program of study consists of a minimum of 105 semester hours for students entering after the bachelor's degree and 63 semester hours for students entering after the master's degree. Of the 105 semester hours for a postbaccalaureate program, six are thesis credit and 24 are research and dissertation credit. Correspondingly, the 63 semester hours of the postmaster's program include 24 semester hours of research and dissertation credit. The additional hours in both the postbaccalaureate and postmaster's tracks involve

1. family science courses,
2. clinical approaches and clinical supervision courses (MFT),
3. statistics and research methods, and
4. a collateral area of study relating to family science taken outside the Department of Family Resources and Human Development.

**Foreign Language Requirements.** None.

**Evaluation and Comprehensive Examinations.** Progress through the program involves (1) annual evaluations of the student's performance and (2) comprehensive written examinations at the end of the student's course work.

**Practicum and Internship Requirements.** For the MFT concentration, a total of 14 hours (postbaccalaureate) is required in clinical supervision, practicum, and internship. Practicum is for one year, and the internship lasts nine months.

**Dissertation Requirements.** The doctoral dissertation must be a work of original scholarship, make a significant contribution to knowledge about families, and reflect a mastery of systemic research methods.

**Final Examinations.** A final oral examination in defense of the dissertation is required.

## RESEARCH ACTIVITY

The Department of Family Resources and Human Development provides advanced graduate training in marital and family therapy, family science, and child development. Specific areas of faculty research include marital and family therapy approaches, evaluation of marital therapy, marital and family relationships, marital interaction, parent-child relationships, parent-adolescent relationships, prevention research on children and families, children's social and emotional development, children's gender-role development, sexuality, dating relationships, and ethnic and socioeconomic diversity in marital and family relationships. Strong emphasis is placed on the acquisition of sophisticated theoretical, methodological, and statistical skills necessary to acquire research funding, publish in professional journals, and make significant contributions to existing knowledge.

**Research and Clinical Facilities.** The department's clinical and research facilities include a marriage and family clinic, marital interaction laboratory, children's social development laboratory, child development laboratory, and col-

laborative arrangements with the ASU Prevention Intervention Research Center. The Department of Family Resources and Human Development also provides access to sophisticated microcomputing technology within the department as well as to centralized computing services at ASU. The department offers several fellowships that provide students with collaborative research experiences under the supervision of faculty members.

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## French

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See "Languages and Literatures," page 231.

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## Geography

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### REGENTS' PROFESSOR

GRAF

### PROFESSORS

ARREOLA, BALLING, BRAZEL, BURNS, COMEAUX,  
 DORN, GOBER, Ó hUALLACHÁIN, PASQUALETTI

### ASSOCIATE PROFESSORS

ALDRICH, CERVENY, FALL, KUBY, McHUGH

### ASSISTANT PROFESSORS

ELLIS, SIERRA-MALDONADO, WENTZ

### LECTURER

HUMBECK

The faculty in the Department of Geography offer graduate programs leading to the M.A. and Ph.D. degrees in Geography. Departmental research and graduate education focuses upon seven areas of study: climatology, earth-surface processes, natural resources and environment, urban-economic geography, population, Latin America and the Southwestern United States, and spatial analysis methods.

Students admitted to the Master of Education degree program with a major in Secondary Education may also elect geography as the subject matter field. See "Master of Education," page 174, for information on the Master of Education degree.

## MASTER OF ARTS

The M.A. program is designed to offer a specialized program of academic and professional training in geography so that the student may secure a sound graduate background for further specialization or for immediate employment. The program has sufficient flexibility to allow for individual needs and interests of the student. A minimum of 30

semester hours beyond the bachelor's degree is required. At least 24 hours must be in geography.

**Admission.** Applications for the M.A. program must be accompanied by the applicant's scores on the Graduate Record Examination (verbal and quantitative) and three letters of recommendation from professors. All applications are reviewed by the Graduate Committee and the chair of the Department of Geography. In order to be considered for financial assistance for the next academic year, students must be admitted by February 15.

It is presumed that all students entering the master's program have an adequate background in geography, including course work that is the equivalent of GPH 371 Cartography and GCU 495 Quantitative Methods in Geography. Additional prerequisite course work is required of students insufficiently prepared in geography. The program of study consists of the following elements:

GCU 529 Contemporary Geographic Thought .....	3
or GCU 596 History of Geographic Thought (3)	
GCU 585 Advanced Research Methods in Geography .....	3
GCU/GPH 591 Seminar .....	3
GCU/GPH 599 Thesis .....	6
Total .....	15

The remaining 15 hours are composed of a suitable combination of course work and/or research.

A student in the M.A. program is required to pass an oral and a written examination administered by the student's supervisory committee. The written examination consists of questions from the area of interest. The oral examination serves as a defense of the thesis.

## DOCTOR OF PHILOSOPHY

Admission to the Ph.D. program requires a completed master's degree in Geography or equivalent preparation. At a minimum this preparation should include competence in cartography and quantitative methods and basic course work in human and physical geography. Students who have not already acquired these basic skills or taken these basic courses must do so during the first year of their graduate program. These courses are considered prerequisites.

To be considered for financial assistance for the next academic year, students must be admitted by February 15.

The specific academic program is carefully planned by the student in consultation with a supervisory committee. Special efforts are taken to plan a course of study compatible with the student's career objectives.

See "Doctor of Philosophy," page 101, for general requirements.

**Program of Study.** A minimum of 30 semester hours of course work at ASU beyond the master's degree is required, plus a minimum of 24 semester hours of credit in research and dissertation. All Ph.D. students are required to take GCU 585 and GCU 529 or 596.

**Foreign Language Requirements.** At the discretion of the student's supervisory committee, a reading proficiency in a foreign language may be required.

**Field Examination.** The Department of Geography requires Ph.D. students to pass a two-week field problem examination before taking the comprehensive examination.

**Comprehensive Examinations.** Written and oral comprehensive examinations are required. These are taken at the completion of all course work. After students have passed the comprehensive examinations and satisfied the other requirements, they are eligible to apply for candidacy.

**Dissertation Requirements.** A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required.

**Final Examinations.** A final oral examination in defense of the dissertation is required.

## RESEARCH ACTIVITY

The university's location in the arid Southwest provides an ideal setting for research into arid land processes and fluvial geomorphology. In conjunction with the department's Office of Climatology, activities pursued include past climate reconstruction, climate monitoring, climate theories and models, and environmental studies from local to global scales. The Phoenix metropolitan area, populated by 2.8 million people, is an excellent setting for the investigation of land use and transportation conflicts, diverse communities, migration patterns, and other issues associated with urban development in rapidly growing sunbelt cities. The region also offers the opportunity to study historical and cultural geography associated with, for example, Hispanic populations and Native American communities. Northern Mexico is within easy reach for those interested in field studies in Latin America.

## CULTURAL GEOGRAPHY (GCU)

**GCU 421 Geography of Arizona and Southwestern United States.** (3) F, S

Geography of the Southwest with an emphasis on Arizona. Divided into physical geography, history, people, and economy. *General Studies: SB, C.*

**GCU 423 Geography of South America.** (3) S

Prerequisite: GCU 323 or instructor approval. *General Studies: SB, G.*

**GCU 424 Geography of Mexico and Middle America.** (3) A

Central America and Mexico. Prerequisite: GCU 323 or instructor approval. *General Studies: SB, G.*

**GCU 425 Geography of the Mexican American Borderland.** (3) S

Geography of a binational and bicultural region. Examination of settlement, boundary issues, ethnic subregions, population change, industrial development, and urban growth. *General Studies: L2/SB, G.*

**GCU 426 Geography of Russia and Surroundings.** (3) N

Examines the geography of Russia and other post-Soviet states. Prerequisite: GCU 121 or instructor approval. *General Studies: SB, G.*

**GCU 433 Geography of Southeast Asia.** (3) S

Examines the biophysical and social features of Southeast Asian nations and peoples. Prerequisite: GCU 326 or instructor approval.

**GCU 441 Economic Geography.** (3) A

Spatial distribution of primary, secondary, and tertiary economic and production activities. Prerequisite: GCU 141 or instructor approval.

**GCU 442 Geographical Analysis of Transportation.** (3) S

Networks, modes, economics, and flows at the urban, national, and international scales. Prerequisite: GCU 141 or 441. *General Studies: SB.*

**GCU 444 Geographic Studies in Urban Transportation.** (3) S

Current urban transportation issues in metropolitan Phoenix. Lecture, team project. Prerequisite: GCU 361.

**GCU 453 Recreational Geography.** (3) N

Examination of problems surrounding the organization and use of space for recreation. Introducing geographic field survey methods of data collection and analysis. Saturday field trips may be required.

**GCU 455 Historical Geography of U.S. and Canada.** (3) N

Geographical perspective on the evolution of the United States and Canada from pre-Columbian times to early 20th Century. *General Studies: H.*

**GCU 474 Public Land Policy.** (3) F

Geographic aspects of federal public lands, policy, management, and issues. Emphasis on western wilderness and resource development problems.

**GCU 495 Quantitative Methods in Geography.** (3) F, S

Statistical techniques applied to the analysis of spatial distributions and relationships. Introduction to models and theory in geography. Prerequisite: MAT 119. *General Studies: N2.*

**GCU 496 Geographic Research Methods.** (3) F, S

Scientific techniques used in geographic research. Prerequisites: GCU 495; GPH 371, 491. *General Studies: L2.*

**GCU 515 Human Migration.** (3) F

Economic, political, social, and geographic factors underlying population movements. Migration selectivity, streams and counter-streams, labor migration, and migration decision making. Lecture, seminar. Prerequisite: GCU 351 or instructor approval.

**GCU 526 Spatial Land-Use Analysis.** (3) N

Determination, classification, and analysis of spatial variations in land-use patterns. Examination of the processes affecting land-use change. Prerequisite: 15 hours of geography or instructor approval.

**GCU 529 Contemporary Geographic Thought.** (3) S

Comparative evaluation of current philosophy concerning the nature and trends of geography. Prerequisites: 15 hours of geography; instructor approval.

**GCU 585 Advanced Research Methods in Geography.** (3) F

Specialized research techniques and methodologies in economic, political, or cultural geography.

**GCU 591 Seminar.** (1–3) F, S, SS

Selected topics in economic, political, or cultural geography. Field trips may be required.

**GCU 596 History of Geographic Thought.** (3) S

Historical development of geographic thought from pre-Greek days to the early 20th century.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## PHYSICAL GEOGRAPHY (GPH)

**GPH 401 Topics in Physical Geography.** (1–3) A

Open to students qualified to pursue independent studies. Field trips may be required. Prerequisite: instructor approval.

**GPH 405 Energy and Environment.** (3) S

Sources, regulatory and technical controls, distribution, and consequences of the supply and human use of energy. Prerequisite: courses in the physical or life sciences or instructor approval.

**GPH 409 Synoptic Meteorology I.** (4) F 1999

Diagnostic techniques and synoptic forecasting. Includes techniques of weather analysis, map interpretation, and satellite and radar analysis. Prerequisites: MAT 270; PHY 131, 132.

**GPH 410 Synoptic Meteorology II.** (4) S

Diagnostic techniques and synoptic forecasting. Includes techniques of weather analysis, map interpretation, and satellite and radar analysis. Prerequisite: GPH 409.

**GPH 411 Physical Geography.** (3) A

Introduction to physiography and the physical elements of the environment. Open only to students who have not taken GPH 111. Field trips.

**GPH 412 Physical Climatology.** (3) A

Physical processes in the earth-atmosphere system on regional and global scales; concepts and analysis of energy, momentum, and mass balances. Prerequisites: GPH 212 and 213 or instructor approval.

**GPH 413 Meteorological Instruments and Measurement.** (3) A

Design and operation of ground-based and aerological weather measurement systems. Collection, reduction, storage, retrieval, and analysis of data. Field trips are required. Prerequisites: GPH 212 and 213 or instructor approval.

**GPH 414 Climate Change.** (3) S

Survey of three climate research areas: paleoclimatology, theories (e.g., greenhouse warming), numerical modeling. Prerequisite: GPH 212 or instructor approval.

**GPH 418 Landforms of the Western United States.** (3) A

Study landforms and geomorphic processes in the western United States, including lecture, topographical maps, aerial photographs, satellite imagery, and field trips. Lecture, critical inquiry, laboratory, field work. Prerequisites: GPH 211 (or equivalent); completion of L1 class. *General Studies: L2.*

**GPH 422 Plant Geography.** (3) N

Plant communities of the world and their interpretation, emphasizing North American plant associations. Cross-listed as PLB 422. Credit is allowed for only GPH 422 or PLB 422. Prerequisite: BIO 182 or GPH 111.

**GPH 433 Alpine and Arctic Environments.** (3) N

Regional study of advantages and limitations of the natural environment upon present and future problems involving resource distribution, human activities, and regional and interregional adjustments. Field trips are required. Prerequisite: GPH 111 or instructor approval. *General Studies: G.*

**GPH 471 Geographic Information Systems.** (3) F, S

GIS as a basis for microcomputer spatial analysis and synthesis. Includes digitizing, database organization, spatial retrieval, and graphics. Prerequisite: instructor approval. *General Studies: N3.*

**GPH 474 Dynamic Meteorology I.** (3) F

Large-scale atmospheric motion, kinematics, Newton's laws, wind equation, baroclinics, vorticity, and the midlatitude depression. Prerequisites: GPH 213, 215; MAT 271; PHY 131, 132.

**GPH 475 Dynamic Meteorology II.** (3) S

Topics in climate dynamics. General circulation, numerical modeling, teleconnection phenomena, and surface-atmosphere interaction. Prerequisite: GPH 474 or instructor approval.

**GPH 481 Environmental Geography.** (3) A

Problems of environmental quality, including uses of spatial analysis, research design, and field work in urban and rural systems. Field trips are required. Prerequisite: instructor approval.

**GPH 491 Geographic Field Methods.** (6) S, SS

Field techniques, including use of aerial photos, large-scale maps, and fractional code system of mapping; urban and rural field analysis to be done off campus. Travel fees required. Prerequisites: GCU 102, 121; GPH 111.

**GPH 511 Fluvial Processes.** (3) A

Geographical aspects of processes of river erosion, transportation, sedimentation: emphasizing spatial characteristics of forces, resistance, landforms, sediment; includes computer applications. Prerequisites: GPH 111 (or GLG 101) and 211 (or GLG 362) or instructor approval.

**GPH 533 Snow and Ice.** (3) S

Processes, distribution, climatic interactions of snow/ice emphasizing mass balance, snow stratigraphy/metamorphism and glacier/snowpack climatology. Lecture, field work. Prerequisite: instructor approval.

**GPH 571 Computer Mapping and Graphics.** (3) N

Utilization of the digital computer in analysis and mapping of geographic data. Includes plotting, surficial display, compositing, and graphics. Field trips. Prerequisites: GPH 371; instructor approval.

**GPH 575 Geographic Applications of Remote Sensing.** (3) N

Use of imaging and nonimaging methods of remote acquisition of data, including satellite sensors, airborne radar, multiband scanning, conventional photographic sensors, and ground-based equipment. Field trips are required. Prerequisites: GCU 585 (or GPH 491); GPH 372.

**GPH 591 Seminar.** (1–3) F, S

Selected topics in physical geography. Field trips may be required.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Geology

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### REGENTS' PROFESSORS

BUSECK, GREELEY, MOORE

### PROFESSORS

BURT, CHRISTENSEN, FARMER, FINK, HOLLOWAY,  
 KNAUTH, LARIMER, PEACOCK, REYNOLDS, STUMP,  
 TYBURCZY, WILLIAMS

### ASSISTANT PROFESSORS

ARROWSMITH, GARNERO, LESHIN, O'DAY, SHARP, TANG

The faculty in the Department of Geology offer graduate programs leading to the M.S. and Ph.D. degrees in Geology.

Students admitted to the Master of Education degree program in Secondary Education may also elect geology as the subject matter field. See "Master of Education," page 174, for information on the Master of Education degree.

The faculty also participate in the programs leading to the Master of Natural Science degree when one of the concentrations is geology. See "Master of Natural Science," page 257, for information on the Master of Natural Science degree.

Students applying for admission to the M.S., M.N.S., or Ph.D. degree program must submit scores on the Graduate Record Examination (GRE) Aptitude Test. Submission of Advanced Geology GRE scores is encouraged. The deadline for applications for the fall term is February 15.

### FIELD CAMP REQUIREMENT FOR M.S. AND PH.D. STUDENTS

All Geology graduate students must have completed the equivalent of the department's six semester hours of Geology Field Camp (GLG 450). A summer field mapping course completed as part of the student's undergraduate course work may fulfill this requirement. Upon the student's admission to the graduate program, the graduate committee will evaluate previous field course work and will determine whether the student must take a field course while a graduate student at ASU. The purpose of this requirement is to ensure that all geology graduate students possess basic geological mapping skills, whatever their ultimate specialty.

### MASTER OF SCIENCE

The M.S. degree consists of a minimum of 30 semester hours of work beyond the bachelor's degree; 20 or more semester hours consist of course work other than research and thesis. The program is designed to provide fundamental graduate training in geology and to prepare the student for certain careers in geology or for further graduate study.

**Breadth Requirement.** All students must demonstrate breadth in Geology by achieving a minimum score on the

Advanced Geology GRE examination or by taking graduate courses covering a range of subdisciplines.

**Program of Study.** The student, with the approval of the advisor, selects courses that make a coherent program of study. Each M.S. candidate must include on the program of study one hour of GLG 500 Geology Colloquium and six hours of GLG 592 Research and GLG 599 Thesis, at least three of which must be GLG 599 Thesis. A maximum of six hours of thesis may appear on a program of study. One-half of the credits applicable toward the degree must be in geology courses; the remainder may include work either in geology or related fields.

**Thesis Requirements.** A thesis based on field, laboratory, and library study is required.

**Final Examinations.** A final oral examination in defense of the thesis is required.

### DOCTOR OF PHILOSOPHY

The Ph.D. degree consists of a minimum of 54 semester hours of work beyond the master's degree. At least 25 hours must consist of course work other than research and dissertation. The program is designed to develop creative scholarship and to prepare the student for a professional career in geology.

See "Doctor of Philosophy," page 101, for general requirements.

**Breadth Requirement.** All students must demonstrate breadth in Geology by achieving a minimum score on the Advanced Geology GRE examination or by taking graduate courses covering a range of subdisciplines.

**Program of Study.** The program of study is selected with the recommendation of the student's supervisory committee. Each Ph.D. candidate must include on the program of study one hour of GLG 500 Geology Colloquium and at least 24 hours of a combination of GLG 792 Research and GLG 799 Dissertation.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** The student's supervisory committee must determine the content of the comprehensive examination, consisting of a written and an oral examination. Students are required to take the comprehensive examination during their third semester in residence in the Ph.D. program.

**Dissertation Requirements.** A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required.

**Final Examinations.** A final oral examination in defense of the dissertation is required.

### RESEARCH ACTIVITY

Recent faculty and student research topics include the following.

*Geochemistry.* Isotope geochemistry and the geology of authigenic silica; environmental and aqueous geochemistry; geochemistry and microbiology of hydrothermal systems; paleoclimate records; thermodynamics of fluid-mineral interfaces; synchrotron-based X-ray spectroscopies;

analytical and theoretical chemical studies of meteorites with application to Mars and early solar system evolution; geochemical exploration for ore deposits; trace element partitioning between minerals, fluids, and magmas; atmospheric geochemistry; paleoceanography; and stable isotopic applications in geobiology.

**Geomorphology.** Fault zone landforms and structure; earthquake surface rupture and paleoseismology; theoretical studies of faulting and hillslope development; engineering geologic field methods.

**Geophysics.** Earthquake surface rupture and paleoseismology; environmental geophysics; physics and chemistry of earth and planetary interiors; high pressure experimental geophysics; thermal modeling of subduction zones.

**Mineralogy.** High-resolution transmission electron microscopy; order/disorder in clays and related minerals; amorphous to crystalline transitions; graphitic carbon and the structures of poorly crystalline materials; polytypism and stacking sequences in sheet silicates (micas, chlorites, clays); mechanisms of phase transitions; surface studies: scanning tunneling and atomic force microscopy of mineral surfaces; determination of oxidation states and specific site environments through electron energy-loss spectroscopy (EELS); TEM cathodoluminescence studies of defects; airborne minerals: small airborne particles, air quality, air pollution; mineral thermodynamics and spectroscopy; high pressure mineralogy; phase transformation studies.

**Mineral Physics.** Electrical properties of silicate minerals, melts, and partial melts; effects of shock on hydrous minerals; shock-induced metamorphism and phase transitions in meteorites; grain boundary diffusion; kinetic processes and reaction mechanisms; mineral deformation and deformation microstructures; high temperature, high pressure studies of mantle materials.

**Paleontology/Paleoecology.** Geobiology and the role of organisms in sedimentary processes; early biosphere evolution and the fossil record of early multicellular life; invertebrate paleontology; evolutionary paleoecology; stable isotopic and geochemical techniques; biological response to global change; ichnology; exopaleontology and the exploration for fossil records of extraterrestrial life.

**Planetary Studies.** Compositional and physical properties of the terrestrial planets; comparative geomorphology of the moon, Earth, Mars, Mercury, Venus, and the outer planet satellites; Venus tectonics; thermal infrared spectroscopy of planetary materials; planetary volcanic processes; laboratory simulation of eolian processes on Venus, Mars, and Earth; impact cratering experiments; meteorite studies.

**Petrology.** High temperature, high pressure phase equilibrium experiments, and models for the origin of major igneous rock types; volatile diffusion in silicate melts; experimental determination of mantle minerals and melts; field and analytical studies of temperature, pressure, and fluids during metamorphism; computer modeling of heat and mass transfer at convergent plate margins; subduction zones; continental extension; mineral equilibria in ore deposits.

**Remote Sensing.** Geologic mapping based on integrated field and remote sensing studies; multispectral mineralogical investigations; urban environmental studies.

**Structure and Tectonics.** Structural and tectonic evolution of Arizona and the North American Cordillera; regional geology of the Transantarctic Mountains; Cordilleran tectonics; relation between fluid and tectonic processes; active tectonic processes.

**Volcanology.** Explosive eruption processes; mechanisms of dike intrusion; structures in lava flows; multiphase flow in volcanic and geothermal systems; textures and volatile contents of volcanic domes; mineralization related to rhyolite domes; laboratory simulation of lava flow processes; field studies throughout the western United States, Hawaii, and Central and South America.

**Astrobiology Institute.** Astrobiology is broadly defined as “the study of the origin, evolution, and distribution of life in the universe.” ASU is one of 11 partnering institutions in the United States composing the NASA Astrobiology Institute (NAI). In addition to supporting basic research in astrobiology, the NAI seeks to enhance opportunities for graduate students desiring cross-disciplinary training in such areas as the organic chemistry of extraterrestrial materials, origin of life studies, early biosphere evolution, and the exploration for life elsewhere in our solar system and beyond. The ASU Astrobiology Program is made up of a distributed faculty drawn from the Departments of Geology, Chemistry and Biochemistry, Biology, and Physics and Astronomy. The ASU Astrobiology Program also provides opportunities for regular interactions with other institute partners around the country through the use of advanced telecommunications and the next generation Internet.

**Center for Solid-State Science, Materials Research Science and Engineering Center, and Affiliated Departments.** Analytical equipment routinely used by Geology students includes: a JEOL JSX-8600 electron microprobe analyzer/SEM equipped with an image analysis system; 10 transmission electron microscopes specialized for high-resolution imaging ( $\leq 1.7$  Å resolution), EELS and EDS chemical analysis; surface analytical microscopies (XPS, Auger and probe microscopies). Automated X-ray diffraction and fluorescence facilities are available, as is an ion microprobe. The high-pressure laboratory for experimental petrology is equipped with a complete range of vessels for investigations ranging from hydrothermal alteration to partial melting of planetary mantles.

**Space Photography Laboratory.** The Space Photography Laboratory contains an extensive research collection of photographs of the moon, Mars, Mercury, and outer planet satellites. A dedicated image processing facility with interactive and hardcopy capabilities is available for research utilizing spacecraft images.

**Center for Meteorite Studies.** The Department of Geology houses one of the largest collections of meteorites in the world. Geochemical and cosmochemical research is being undertaken in the Center for Meteorite Studies, including the following topics: trace element geochemistry, nature of asteroidal interiors, computer models of condensation in the nebula, meteorite mineralogy, organic compound investigations, chemical fractionation in meteorites, elemental partitioning in meteoritic minerals, transmission electron microscopy of chondritic meteorites, and fluid-rock interactions on asteroids and Mars.



**GEOLOGY (GLG)****GLG 405 Geology of the Moon.** (3) N

Current theories of the origin and evolution of the moon through photogeological analyses and consideration of geochemical and geophysical constraints. Possible weekend field trip. Prerequisite: GLG 105 or 305 or instructor approval.

**GLG 406 Geology of Mars.** (3) N

Geological evolution of Mars through analyses of spacecraft data, theoretical modeling, and study of terrestrial analogs; emphasis on current work. Possible weekend field trip to Northern Arizona. Prerequisite: GLG 105 or 305 or instructor approval.

**GLG 412 Geotectonics.** (3) F

Earthquakes, earth's interior, formation of oceanic and continental crust, and plate tectonics. Emphasis on current work. Prerequisite: GLG 310.

**GLG 416 Field Geophysics.** (3) S

Methods of applied geophysical exploration; seismic refraction, gravity, electrical resistivity, geomagnetics. Includes survey planning, data acquisition, processing, analysis, and interpretation. Lecture, field exercises. Prerequisite: one course in geology or instructor approval.

**GLG 418 Geophysics.** (3) F

Solid earth geophysics; geomagnetism, gravity, seismology, heat flow. Emphasis on crust and upper mantle. Prerequisites: GLG 310 and MAT 272 and PHY 131 or instructor approval.

**GLG 419 Thermal-Mechanical Processes in the Earth.** (3) F

Emphasis on applied mathematical techniques, heat conduction problems in geology, thermal convection, stresses in the lithosphere, and viscoelastic processes in the Earth. Prerequisite: PHY 131.

**GLG 420 Volcanology.** (3) A

Distribution of past and present volcanism, types of volcanic activity, mechanism of eruption, form and structure of volcanoes, and geochemistry of volcanic activity. Possible weekend field trips. Prerequisite: GLG 424.

**GLG 424 Petrology.** (3) F

Origin of igneous and metamorphic rocks. Optical mineralogy, hand specimen identification, and thin-section analysis. 2 hours lecture, 3 hours lab, possible weekend field trips. Prerequisite: GLG 321.

**GLG 435 Sedimentology.** (3) S

Origin, transport, deposition, and diagenesis of sediments and sedimentary rocks. Physical analysis, hand specimen examination, and interpretation of rocks and sediments. 2 hours lecture, 3 hours lab, possible weekend field trips. Prerequisites: GLG 102, 321.

**GLG 436 Principles of Stratigraphy.** (3) N

Principles of interpreting lithostratigraphic, magnetostratigraphic, biostratigraphic, seismostratigraphic, and chronostratigraphic units; correlation and facies relationships in stratified rocks. Applied stratigraphy project(s). Lecture, possible field trips. Prerequisites: GLG 102; instructor approval.

**GLG 441 Ore Deposits.** (3) N

Origin, occurrence, structure, and mineralogy of ore deposits. Possible weekend field trips. Prerequisite: GLG 424 or instructor approval.

**GLG 450 Geology Field Camp.** (6) SS

Geological mapping techniques on aerial photos and topographic maps. Field based with excursions. Prerequisites: GLG 310, 321. *General Studies: L2.*

**GLG 455 Advanced Field Geology.** (3–4) F, S

Geologic mapping in igneous, sedimentary, and metamorphic terrains of the Basin and Range province of Arizona. Weekend field trips. May be repeated for credit. Prerequisite: GLG 450 or instructor approval.

**GLG 456 Cordilleran Regional Geology.** (3) F

Systematic coverage through space and time of the geological development of western North America, emphasizing the western United States. Prerequisite: senior major or graduate student in Geology or instructor approval.

**GLG 470 Hydrogeology.** (3) S

Geology of groundwater occurrence, aquifer and well hydraulics, water chemistry and quality, contaminant transport, remediation. Emphasis on quantitative methods. Prerequisites: GLG 101 (or 103); MAT 270; PHY 121.

**GLG 481 Geochemistry.** (3) F

Origin and distribution of the chemical elements. Geochemical cycles operating in the earth's atmosphere, hydrosphere, and lithosphere. Cross-listed as CHM 481. Credit is allowed for only CHM 481 or GLG 481. Prerequisite: CHM 341 (or 441) or GLG 321.

**GLG 485 Meteorites and Cosmochemistry.** (3) N

Chemistry of meteorites and their relationship to the origin of the earth, solar system, and universe. Cross-listed as CHM 485. Credit is allowed for only CHM 485 or GLG 485.

**GLG 490 Topics in Geology.** (1–3) F, S, SS

Special topics in a range of fields in geology. May be repeated for credit. Prerequisite: instructor approval.

**GLG 500 Geology Colloquium.** (1) F, S

Presentation of recent research by faculty and invited guests. 1 semester required for all geology graduate students. May be repeated for total of 2 semesters. Research paper required. Prerequisite: instructor approval.

**GLG 501 Geology of Arizona.** (3) A

Basic and historical geology, fossils, mining, energy resources, environmental problems, landscape development, and meteorites, cast in examples from Arizona. Research paper required.

**GLG 504 Geology of the Grand Canyon.** (2) S

Review of the discovery, history, origin, and geology of the Grand Canyon of the Colorado River in Arizona. 6-day field trip down the river (first 6 days after commencement in May) required at student's expense. Field research and term paper on trip also required.

**GLG 510 Advanced Structural Geology.** (3) N

Mechanics of rock deformation, emphasizing relationship between field observation, theory, and experiment. Stress, strain, simple constitutive relationships, failure criteria, and the basis of continuum methods. Possible field trips. Prerequisites: GLG 310 and 424 or instructor approval.

**GLG 520 Advanced Physical Volcanology.** (2–3) A

Selected volcanologic topics, including explosive eruption processes, lava flow mechanics, and intrusive mechanisms. Field trips possible. Prerequisite: GLG 420 or instructor approval.

**GLG 524 Advanced Igneous Petrology.** (3) N

Theoretical and practical aspects of the genesis of igneous rocks. Study of selected sites. Modern laboratory techniques. 2 hours lecture, 3 hours lab, possible weekend field trips. Prerequisite: GLG 424.

**GLG 525 Advanced Metamorphic Petrology.** (3) N

Theoretical and laboratory study of metamorphic rocks. Processes of contact and regional metamorphism. Advanced methods and instrumentations. 2 hours lecture, 3 hours lab, possible weekend field trips. Prerequisite: GLG 424.

**GLG 562 Quaternary Geology.** (3) N

Geology of the Quaternary Period in both glaciated and unglaciated areas. Stratigraphy, correlation, and environmental application of Quaternary deposits. Special reference to the Southwest. 2 hours lecture, 3 hours lab, some field trips during lab, possible weekend field trips. Prerequisite: GLG 362 or instructor approval.

**GLG 581 Isotope Geochemistry.** (3) N

Geochemistry and cosmochemistry of stable and radioactive isotopes; geochronology; isotope equilibria. Prerequisite: instructor approval.

**GLG 582 Physical Geochemistry.** (3) N

Application of thermodynamic and kinetic principles to geochemical processes. Prerequisite: CHM 341 (or 441) or GLG 321.

**GLG 583 Phase Equilibria and Geochemical Systems.** (3) N

Natural reactions at high temperatures and pressures; silicate, sulfide, and oxide equilibria. Cross-listed as CHM 583. Credit is allowed for only CHM 583 or GLG 583. Prerequisites: GLG 582; instructor approval.

**GLG 591 Seminar.** (1–3) F, S, SS

Topics in a range of fields in geology. May be repeated for credit. Prerequisite: instructor approval.

**GLG 598 ST: Special Topics.** (1–3) F, S, SS

Special topics in geology. May be repeated for credit. Prerequisite: instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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**German**


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See "Languages and Literatures," page 231.

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## Gerontology

### Interdisciplinary Certificate Program

**William E. Arnold**  
*Director, ASU Main*  
 (WHALL 116) 480/965-3225  
 Fax 480/965-9008  
 william.arnold@asu.edu

**Janet H. Shirreffs**  
*Director, ASU West*  
 (FAB N290-1) 602/543-6600  
 Fax 602/543-6612  
 jans@asu.edu  
 www.asu.edu/graduate/gerontology

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#### Communication

Professor: Arnold

#### Exercise Science and Physical Education

Professors: Landers, Stelmach;  
 Assistant Professor: Swan

#### Family Resources and Human Development

Associate Professor: Vaughan

#### Geography

Associate Professor: McHugh

#### Health Administration and Policy

Professors: Kronenfeld, Schneller, Williams;  
 Assistant Professor: Rivers

#### Music

Professor: Crowe

#### Nursing

Associate Professors: Killeen, Komnenich

#### Psychology

Professors: Okun, Reich, Zautra

#### Psychology in Education

Professor: Strom

#### Recreation Management and Tourism

Professor: Shirreffs

#### Recreation and Tourism Management (ASU West)

Professor: Searle

#### Social and Behavioral Sciences (ASU West)

Lecturer: Luken

#### Sociology

Associate Professors: Keith, Miller-Loessi, Sullivan

#### Speech and Hearing Science

Professor: LaPointe

An interdisciplinary, 24-semester-hour Certificate in Gerontology may be earned by graduate students who wish to study the psychological, sociological, biological, and policy-related aspects of aging and the health, economic, and social concerns of older people. Graduate students enrolled in the certificate program simultaneously pursue a major in an academic unit offering an advanced degree, whereas non-degree graduate students, typically, are either working with or seeking to work with older people. The Certificate in

Gerontology provides a broad academic foundation for students who wish to apply the knowledge and skills acquired in their major and/or work experience to a variety of aging-related pursuits. Course work is evenly divided between required and elective courses. For their electives, students choose courses from the gerontology-related offerings of several departments. For more information, contact the Director, Gerontology Program, Main, 480/965-3225 or West, 602/543-6612.

#### GERONTOLOGY (GRN)

**GRN 580 Graduate Practicum.** (3) F, S

**GRN 590 Graduate Reading and Conference.** (3) F, S, SS

**GRN 591 Graduate Seminar.** (3) F, S

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Health Services Administration

**Eugene Schneller**

*Director*

(BAC 554) 480/965-7778

Fax 480/965-6654

asuhap@asu.edu

www.cob.asu.edu/hap/degree.html

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#### PROFESSORS

FORSYTH, JOHNSON, KIRKMAN-LIFF, KRONENFELD,  
 RIVERS, SCHNELLER, WESBURY, WILLIAMS

#### ASSISTANT PROFESSOR

RIVERS

The faculty in the School of Health Administration and Policy (HAP), College of Business, offer a graduate program leading to the Master of Health Services Administration degree.

The faculty also participate in the programs leading concurrently to the Master of Business Administration/Master of Health Services Administration (M.B.A./M.H.S.A.), Master of Health Services Administration/Juris Doctor (M.H.S.A./J.D.), and Master of Health Services Administration/Master of Science in Nursing (M.H.S.A./M.S. in Nursing with a concentration in nursing administration). See "Concurrent Degree Programs," page 213.

The faculty also offer a concentration in health services research under the Ph.D. degree in Business Administration. (Applications for the Ph.D. degree in Business Administration with a concentration in health services research are not being accepted at this time.) See "Master of Business Administration," page 128, for information on the Ph.D. in Business Administration degree.

#### MASTER OF HEALTH SERVICES ADMINISTRATION

The Master of Health Services Administration (M.H.S.A.) degree program is designed to prepare qualified individuals for management careers in hospitals, group practices, health maintenance organizations, consulting firms, long-term care facilities, associations, government

agencies, and other health services organizations. This preparation is carried out by providing the students with selected theories, tools, and techniques, which are the understanding, analysis, and application essential for effective health services administration.

**Admission.** For the general requirements, see “Admission to the Graduate College,” page 89. Applicants are required to submit evidence of their ability to pursue a graduate degree program in health services administration successfully. All students must take the GMAT. For more information, call 609/771-7330 or write

EDUCATIONAL TESTING SERVICE  
PO BOX CN 6108  
PRINCETON NJ 08541-6108

Students applying to the M.H.S.A. degree program should submit an application for admission and two copies of all transcripts directly to the Graduate Admissions Office. Three recommendations commenting on the student’s motivation, commitment, achievements, work experience, and opportunity for success in the program should be addressed directly to the School of Health Administration and Policy. In addition, applicants are required to submit a statement of personal objectives for the degree program addressing commitment, goals, qualifications, and reasons for interest in the program. Application deadlines are December 15, February 15, March 1, and April 1. Preference for financial assistance will be given to applicants applying by the March 1 deadline. It is required that students visit the campus for a personal interview. In cases where this creates a hardship, a student may ask for a telephone interview with an M.H.S.A. faculty member when the application file is complete. Brochures describing the Master of Health Services Administration are available by calling 480/965-7778 or writing

SCHOOL OF HEALTH ADMINISTRATION AND  
POLICY  
COLLEGE OF BUSINESS  
ARIZONA STATE UNIVERSITY  
PO BOX 874506  
TEMPE AZ 85287-4506

Questions may be sent by e-mail to [asuhap@asu.edu](mailto:asuhap@asu.edu).

**Program of Study.** The program of study consists of a minimum of 48 semester hours: 15 hours of business administration, 27 hours of health services administration, and six hours of electives. Additional semester hours (prerequisites) may be required to strengthen preparation in a given specialty. Subject to availability, students may complete an optional residency/fellowship for a period of up to one year (following completion of the degree program). While each student’s program of study is individually tailored, a typical program is as follows:

<b>Business Administration Component</b>	
ACC 502 Financial Accounting .....	3
ACC 503 Managerial Accounting .....	3
FIN 502 Managerial Finance .....	3
MGT 502 Organization Theory and Behavior .....	3
QBA 502 Managerial Decision Analysis .....	3
Total .....	15

**Health Services Administration Component**

HSA 502 Health Care Organization .....	3
HSA 505 Community Health Care Perspectives .....	3
HSA 512 Health Care Economics .....	3
HSA 520 Health Care Organizational Structure and Policy .....	3
HSA 522 Health Care Management Systems .....	3
HSA 532 Financial Management of Health Services .....	3
HSA 542 Health Care Jurisprudence .....	3
HSA 589 Integrative Seminar .....	3
HSA 591 PS: Human Resources Management .....	3
Total .....	27

**Electives Component.** Six semester hours of electives intended to provide interdisciplinary breadth or specialization are taken in consultation with the student’s supervisory committee. These six hours must be earned in graduate courses offered in health care administration, business administration, economics, nursing, political science, social work, sociology, or other appropriate disciplines.

**Prerequisites.** Students lacking sufficient background in business fundamentals are encouraged to take a basic financial accounting course. Those without a basic course in computer skills are required to complete CIS 200. Students must demonstrate strong quantitative ability. This may be accomplished by taking either a calculus course (MAT 210) or quantitative business statistics (QBA 221).

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** All students must successfully complete the comprehensive requirement established by the College of Business and Graduate College for the M.H.S.A. degree.

**Thesis Requirements.** None.

**Concurrent Degree Programs**

A Master of Health Services Administration/Master of Business Administration concurrent degree program is offered through cooperative arrangement between the faculty of the College of Business and the School of Health Administration and Policy. Students must be admitted to both programs and may complete the course work for both degrees in two years of full-time study by meeting the requirements of each degree program. Separate applications are required and admission requirements of *both programs* must be met. Once admitted, in consultation with their respective faculty advisors, students develop programs of study that meet degree requirements.

The College of Law and the School of Health Administration and Policy offer graduate students a program in Law and Health Services Administration that leads concurrently to the degrees of Juris Doctor/Master of Health Services Administration. Students in the concurrent degree program must be regularly admitted to both the J.D. and the M.H.S.A. degree programs. It is recommended that application to the concurrent degree program be made no later than the end of the first year of law school or first year of enrollment in the M.H.S.A. program. All applicants must comply with the minimum requirements and admission procedures of the Graduate College. Full-time students can expect to complete the concurrent J.D./M.H.S.A. program in four years.

The College of Nursing and the School of Health Administration and Policy offer a concurrent M.H.S.A./M.S. in Nursing (with a concentration in nursing administration) degree program enabling students to pursue concurrent work in health services administration and nursing administration. The concurrent program is designed for nurses whose career goals are focused on management in complex health care delivery systems and offers nurses the opportunity to develop advanced skills in both financial resource management as well as nursing management. Graduates assume leadership positions in hospitals, group practices, HMOs, consulting firms, long-term care facilities, and other health services organizations. Students must be admitted to both programs and may complete the course work for both degrees in three years of full-time study by meeting the requirements of each degree program. Separate applications are required and admission requirements of both programs must be met.

### MASTER OF PUBLIC HEALTH

The School of Health Administration and Policy (HAP), College of Nursing, and the Department of Anthropology at ASU, in conjunction with the University of Arizona and Northern Arizona University, offer courses leading to the Master of Public Health degree. Three concentrations are offered at ASU (community health nursing, cultural and behavioral dimensions of public health, and health administration and policy). For general information, contact the M.P.H. Program Coordinator at ASU at 480/965-6633.

**Admission.** Applicants must hold a bachelor's degree or equivalent from an accredited college or university, provide three letters of recommendation, and submit an official Graduate Record Examination (GRE) or Medical College Admissions Test (MCAT) score or the GMAT, if the applicant is applying to the HAP concentration. For applicants with a doctoral degree, test scores are recommended but not required. A minimum of two years of full-time 40 hour work week, postbaccalaureate work experience is required.

The GRE or MCAT must be taken within five years of the application date. Applicants whose native language is not English are required to submit a score on the Test of English as a Foreign Language. Students should submit their application to the University of Arizona by February 1 for fall admission. Applications are accepted only for fall admission.

**Program of Study.** The program of study for *community health nursing* requires 36 semester hours: 15 semester hours of core courses, 18 semester hours of concentration courses, and three semester hours of electives. The *cultural and behavioral dimensions of public health* concentration requires 39 semester hours: 15 semester hours of core courses, 18 concentration hours, and six semester hours of electives. The *health administration and policy* concentration requires 39 semester hours: 15 semester hours of core courses, 18 concentration hours, and six semester hours of electives. All concentrations require the student to successfully complete an internship. In addition, each student will be required to produce a comprehensive, analytical, problem solving report integrating the in-class learning into the internship experience. The student will also be required to

make an oral presentation before a student and faculty colloquium, reporting on activities during the internship and relating those activities to broader public health issues.

### Arizona Graduate Program in Public Health: Core Courses\*

EPI 596	Epidemiology .....	3
HSA 560	Health Services Administration and Policy .....	3
HSA 561	Biostatistics .....	3
PHL 575	Environmental and Occupational Health.....	3
PHL 577	Social and Behavioral Aspects of Public Health.....	3
Total.....		15

\* These courses, offered at ASU, are not ASU courses per se and are not found in this catalog.

### RESEARCH ACTIVITY

The School of Health Administration and Policy is a major teaching and research component of the College of Business at ASU. The school is committed to an active program in research and development, promoting a deeper understanding of the delivery of health services at the local, state, and national level. Faculty at the school are frequent contributors to health services research and disciplinary journals. It is the goal of the school to serve as a focal point for addressing the problems confronting practitioners in the health care field. Faculty frequently advise policy makers in major health care organizations, state and federal governments, and corporations.

Current faculty research endeavors include assessment of Arizona's Health Care Cost Containment System, enhancing care of the elderly, assessment of organizational modeling for multi-hospital systems, the changes facing physicians in American society, the public policy implications of AIDS, analysis of causes and consequences of medical malpractice, discrimination against persons with disabilities, the health care costs of work injuries, and studies of behavioral factors in health care and health services utilization.

### HEALTH SERVICES ADMINISTRATION (HSA)

#### HSA 502 Health Care Organization. (3) A

Concepts, structures, functions, and values which characterize contemporary health care systems in the United States.

#### HSA 505 Community Health Care Perspectives. (3) A

Epidemiological, sociological and political perspectives, and techniques for analyzing health problems and responding to health care needs in communities. Prerequisite: HSA 502.

#### HSA 512 Health Care Economics. (3) A

Economics of production and distribution of health care services, with special emphasis on the impact of regulation, competition, and economic incentives. Prerequisite: HSA 502.

#### HSA 520 Health Care Organizational Structure and Policy. (3) A

Functional relationships among managerial elements of health care institutions with major focus on hospital governance and policy dynamics. Prerequisite: HSA 502.

#### HSA 522 Health Care Management Systems. (3) A

Systems concepts, quantitative methods, and information systems applied to management problems in health institutions and community health planning. Prerequisites: HSA 505; QBA 502.

#### HSA 532 Financial Management of Health Services. (3) A

Acquisition, allocation, and management of financial resources within the health care enterprise. Budgeting, cost analysis, financial planning, and internal controls. Prerequisites: ACC 503; FIN 502; HSA 502.

**HSA 542 Health Care Jurisprudence.** (3) A

Legal aspects of health care delivery for hospital and health services administration. Legal responsibilities of the hospital administrator and staff. Prerequisites: HSA 505, 520.

**HSA 560 Health Services Administration and Policy.** (3) F

Introduction to organizational theory and management of complex organization within the historical and contemporary contexts of the U.S. public health.

**HSA 561 Biostatistics.** (3) F

Aspects of descriptive statistics and statistical inference most relevant to health issues, including data, rates, and confidence intervals.

**HSA 562 Health Care Organization and Systems.** (3) F

Functional relationships among managerial elements of health care institutions with major focus on hospital governance and policy dynamics.

**HSA 563 Health Care Economics.** (3) S

Introduction to concepts and methods used to direct and understand production and distribution of health care services.

**HSA 564 Health Care Finance.** (3) S

Overview of the acquisition, allocation, and management of financial resources by health care providers. Focuses on economic, financial, and accounting principles.

**HSA 565 Policy Issues in Health Care.** (3) F

Current policy issues in health through concepts of access, cost, and quality; issues relating to disease trends and policy formulation.

**HSA 571 Managed Care.** (3) N

Trends in managed care/integrated systems, complexities of balancing objectives (e.g., financial and quality). A two-trimester-long marketplace simulation. Prerequisite: HSA 502.

**HSA 573 Comparative Health Systems.** (3) A

Comparison of health care financing and delivery in industrialized countries; covers insurance, hospital management and physician payment. Lecture, discussion.

**HSA 575 Chronic Care Administration.** (3) A

Management of long-term care services and facilities, including behavioral health and rehabilitation programs.

**HSA 589 Integrative Seminar.** (3) A

Capstone assessment of current policies, problems, and controversies across the broad spectrum of health services administration. Prerequisites: HSA 505, 520, 522, 532.

**HSA 591 Seminar.** (3) A

Seminar topics such as the following may be offered:

- (a) Behavioral Health
- (b) Cost Containment and Quality Assurance
- (c) Health Care Economic Outcomes
- (d) Health Care Policy
- (e) Managing Physicians
- (f) Topics in Health Services Research

**HSA 593 Applied Project.** (3) F, S, SS

Optional on-site experience in advanced development of managerial skills in health services administration and policy. Minimum of 10 weeks. Prerequisites: 18 hours of credit toward program of study; director approval.

**HSA 598 ST: Special Topics.** (3) A

Special topics such as the following may be offered:

- (a) Epidemiology

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Higher and Postsecondary Education

**Howard L. Simmons**

*Program Coordinator*

**(ED 108) 480/965-6248**

**hlsimmons@asu.edu**

**tikkun.ed.asu.edu/elps/highered.html**

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### PROFESSORS

APPLETON, FENSKE, RENDÓN,

RICHARDSON, SIMMONS

### ASSOCIATE PROFESSORS

HARTWELL-HUNNICUTT, WILKINSON

The faculty in the Division of Educational Leadership and Policy Studies offer graduate programs leading to the Master of Education and Doctor of Education degrees in Higher and Postsecondary Education. The concentration currently available is in higher education.

Candidates for the M.Ed. and Ed.D. program may be required to take certain College of Education core courses depending upon previous experience and education. Pre-approval by an advisor is required. The M.Ed. program requires 33 semester hours of course work, including a practicum. Candidates for all degrees must pass a written comprehensive examination, and candidates for the Ed.D. must also pass a final oral examination in defense of the dissertation.

Students interested in the Ph.D. degree with a field of study encompassing higher education should refer to the major in "Educational Leadership and Policy Studies," page 178. See "Doctor of Philosophy," page 101, for information on the Ph.D. degree.

### MASTER OF EDUCATION

Applicants for admission to the M.Ed. degree program must submit scores on either the Graduate Record Examination (GRE) or the Miller Analogies Test; scores on the GRE are preferred.

For more information, see "Master of Education," page 174.

### DOCTOR OF EDUCATION

Applicants for admission to the Doctor of Education program must submit scores on the GRE.

See "Doctor of Education," page 175, for information on the Doctor of Education degree.

### RESEARCH ACTIVITY

Faculty members in higher education are conducting research on a variety of significant topics according to their areas of special research interest. These include student access and retention, student financial assistance, marketing/institutional advancement in higher education, organizational influences on community college faculty teaching practices, Hispanic studies, legal aspects of higher education, and policy analysis.

The program has access to all of the current longitudinal data produced by the federal Center for Educational Statis-

tics. Several databases created for a national study of state and institutional influences on baccalaureate attainment by underrepresented minorities support a number of dissertations and faculty research projects.

#### HIGHER AND POSTSECONDARY EDUCATION (HED)

##### HED 510 Introduction to Higher Education. (3) F

An overview of American higher education, including philosophical, political, and social aspects.

##### HED 527 Seminar: Student Affairs Administration. (3) F

Organizational models, administrative competencies and skills, and emerging challenges of student affairs administration. Lecture, discussion, group projects, written assignments.

##### HED 533 The Community-Junior College. (3) F, S

History, functions, organization, and current issues. Meets Arizona community college course requirement for certification.

##### HED 602 Institutional Research/Strategic Planning. (3) F

Provides an overview of policy research and planning in higher education at the campus system and governing/coordinating agency levels. Lecture, group discussion, and research projects. Prerequisite: HED 510.

##### HED 603 Computer-Assisted Qualitative Data Analysis. (3) S

Emphasizes the applied and computing aspects of qualitative research design, data analysis, and reporting of results. Lecture, lab, demonstrations. Prerequisite: COE 503 or equivalent.

##### HED 611 Curriculum and Instruction. (3) S

Curriculum development, instructional organization, and improvement of instruction in higher education. Prerequisite: HED 510.

##### HED 644 Higher Education Finance and Budgeting. (3) S

Financial planning and budgeting in higher education institutions. Issues related to financing public and private colleges and universities. Prerequisite: HED 510.

##### HED 649 Law of Higher Education. (3) F

Analysis of legal issues related to higher education; examination of key court decisions. Prerequisite: HED 510.

##### HED 679 The American College Student. (3) S

Provides overview of American college student from demographic, background characteristics and values/attitudes/perspectives. Includes access, persistence, and degree completion. Lecture, group discussion, and research projects. Cross-listed as CED 656. Credit is allowed for only CED 656 or HED 679. Prerequisite: CED 510.

##### HED 687 Governance, Coordination and External Influences in Higher Education. (3) S 2001

Study of governance and coordination in higher education systems and the impact of external forces on them. Lecture, discussion.

##### HED 688 Organizational Theory. (3) S

Major views of organizations and their influence on role definition and participant behaviors in educational organization. Seminar, discussion. Cross-listed as SPF 622. Credit is allowed for only HED 688 or SPF 622.

##### HED 689 Leadership in Higher Education. (3) F

Theory and practice of leadership and administration in higher education institutions.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## History

Noel J. Stowe

*Chair*

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#### PROFESSORS

ADELSON, BATALDEN, BURG, DAVIS, DELLHEIM, FUCHS, GIFFIN, GRATTON, IVERSON, KLEINFELD, LAVRIN, LUCKINGHAM, MacKINNON, PYNE, ROSALES, ROTHSCHILD, RUIZ, SIMPSON, STOWE, TAMBS, TILLMAN, TRENNERT, WARNICKE

#### ASSOCIATE PROFESSORS

BARNES, CARROLL, GRAY, HENDRICKS, KAHN, LONGLEY, RUSH, L. SMITH, R. SMITH, SOERGEL, STONER, VANDERMEER, WARREN-FINDLEY

#### ASSISTANT PROFESSORS

GULLETT, McKEE, RAMEY, THORNTON

#### SENIOR INSTRUCTIONAL PROFESSIONAL

LUEY

#### CHICANO/CHICANA STUDIES ASSOCIATE PROFESSOR

ESCOBAR

The faculty in the Department of History offer graduate programs leading to the M.A. and Ph.D. degrees in History. M.A. candidates are offered an opportunity to develop knowledge of a specific historical field, to study comparative history, and to learn research techniques. Students with various goals benefit from this degree program, including those planning to advance to Ph.D. study, those seeking positions in academe, in the public sector, or in business, and those now holding or looking for educational posts in elementary and secondary schools or community colleges.

Students admitted to the Master of Education degree program with a major in Secondary Education may elect history as the subject matter field.

#### MASTER OF ARTS

See "Master's Degrees," page 98, for general requirements.

**Admission.** Applications for the master's program must be accompanied by the applicant's scores on the Graduate Record Examination (GRE) (Master of Education applicants must report scores from both the GRE aptitude and advanced history tests). Examination scores more than five years old are not accepted. Three letters of recommendation from faculty members or others who are qualified to judge the applicant's potential for advanced study in history, a writing sample, and a statement of purpose must be forwarded to the department. Forms and instructions are available from the departmental secretary.

All applications and supporting materials are reviewed by the graduate committee of the department which then recommends to the Graduate College that the student be

granted regular or provisional admission or be denied admission.

**Areas of Concentration.** In consultation with the supervisory committee, the candidate may select a field of history from the following: Asian, British, European, Latin American, United States, and U.S. Western. Under the United States concentration, students may choose from the following four areas of study: American Indian, Chicana/Chicano, U.S. Western, or women. Candidates in any field may apply for admission to the public history concentration.

**Program of Study.** The candidate must complete a minimum of 30 semester hours of graduate courses, including the following program requirements:

1. A minimum of 24 hours of history courses is required. With the approval of the supervisory committee, the candidate may include within the minimum 30-hour program six semester hours of closely related graduate course work taken in another academic unit.
2. A minimum of 18 hours selected from graduate courses at the 500 level is required. If 400-level courses are included in the program of study, documented proof must be provided that they were taken for graduate credit. Please contact the department for specific details.
3. Two comparative courses are required. The comparative courses are not required of students in the public history concentration.
4. At least one research seminar (HIS 591), normally in the major field of study, is required.

Degree candidates in the public history concentration must complete HIS 502 and at least two short courses. Other core requirements specific to each emphasis are listed in the department's graduate handbook. The various emphases require the completion of a differing minimum number of hours for each program: business, 41 semester hours; community history, 40; historic preservation, 40; historical administration, 37; historical editing and publishing, up to 44; public sector, 39. Course work taken outside the department for inclusion in a program of study must be approved in advance by the appropriate program director.

Candidates for the Master of Education degree must take 15 hours of HIS courses, of which three hours must be in HIS 512 or 515 and three hours in HIS 591 or in a comparative course (HIS 551 to 555); 12 of the 15 hours must be graduate courses at the 500 level. If 400-level courses are included in the program of study, documented proof must be provided that they were taken for graduate credit. Contact the department for specific details. The candidate must maintain at least a 3.00 GPA in HIS courses.

**Foreign Language Requirements.** The student is expected to have a reading knowledge of one foreign language, but some other research skills may be substituted for this requirement by the supervisory committee.

**Thesis Requirements.** A thesis or equivalent is required.

Students must enroll in six hours of HIS 599 to prepare a thesis based on original research. The M.A. thesis must be approximately 100 pages long, prepared according to Graduate College requirements, defended and approved, bound,

and placed in the university library. A copy is also kept in the history department.

In lieu of preparing a traditional thesis under HIS 599, a student may elect a two-part thesis equivalent: (1) two three-hour seminars (HIS 591) on a broad topic and (2) two three-hour research courses (HIS 592) on a topic derived from the first research course. Courses leading to the thesis equivalent give the student experience with historical research and writing in the form of historiographical essays similar to those published in a journal. The two papers must meet Graduate College thesis requirements and be bound as a single volume and placed in the University Library.

**Final Examinations.** A final oral examination in defense of the thesis or equivalent is required.

## DOCTOR OF PHILOSOPHY

The Ph.D. degree in History offers candidates the opportunity to study past and contemporary civilizations and to learn research and writing techniques that may be used in scholarly careers at leading academic institutions, in historical societies and agencies, in the public sector, and in business.

Major emphasis is placed upon developing a disciplined and inquiring mind, expertise in a chosen subject area, and competence in research methodology. The program is composed of small classes that bring students into a close working relationship with faculty and other students and offers flexibility in designing degree programs.

The five areas of concentration are Asian history, British history, European history, Latin American history, and United States history. Students must select a minimum of three historical fields for examination.

See "Doctor of Philosophy," page 101, for general requirements.

**Admission.** Applications for the Ph.D. in History program must be accompanied by the applicant's scores on the Graduate Record Examination, three letters of recommendation from faculty members or others who are qualified to judge the applicant's potential for doctoral study, a writing sample, and a statement of purpose. GRE scores may not be more than five years old. All applications and supporting materials are reviewed by the graduate committee of the Department of History, which then recommends to the Graduate College that the student be granted regular or provisional admission or be denied admission.

**Program of Study.** After admission to the program, the student, in consultation with the graduate director, selects a faculty advisor in the student's area of concentration. Together the faculty advisor and student select a Ph.D. committee consisting of at least three faculty members. The committee draws up a program of study that normally includes at least 60 graduate semester hours of history, 36 of which must be in 500-level or above courses, and 24 semester hours of dissertation. If 400-level courses are included in the program of study, documented proof must be provided they were taken for graduate credit. Contact the department for specific details. Two courses selected from the graduate offerings in historiography are required. The student must take at least three research seminars, two of which must be in the primary area of study, and one comparative course.

**Foreign Language Requirements.** Demonstration of a satisfactory reading knowledge of two foreign languages is required before the student may take the comprehensive examinations. For the second language, the student's program committee may approve substituting the demonstration of other research capabilities, such as quantitative or statistical analysis, archival research, historical preservation, or computer skills.

**Preliminary Reviews.** During the first academic year of residence the student is required to schedule the department's preliminary review. Students who fail this review must withdraw from the program. It is recommended that the student have demonstrated a satisfactory reading knowledge of at least one foreign language before scheduling the review.

**Comprehensive Examinations.** The program committee examines the student's competence in the fields chosen. Normally these oral and written examinations are taken after the student has completed at least 60 graduate semester hours of credit.

**Dissertation Committee.** Upon satisfactory completion of the comprehensive examination, the supervisory committee for the dissertation is selected. In consultation with the candidate, the director of graduate study recommends a chair; the recommended chair, after consultation with the candidate (and with approval of the director), then recommends at least two other members to the chair of the department. The dissertation committee is appointed by the dean of the Graduate College upon the recommendation of the department chair. The role of this committee is to approve the subject and title of the dissertation and advise the candidate during the completion of the research and the dissertation.

**Dissertation Prospectus.** Each doctoral candidate will prepare a prospectus of four to seven pages for the dissertation. The format and design of the prospectus will be determined by the candidate and committee chair. The topic will be in one of the candidate's fields of study and should include the following:

1. a thesis statement,
2. a discussion of relevant literature,
3. a discussion of possible research material and availability of sources,
4. a secondary bibliography, and
5. a historiographical statement.

This prospectus must be presented to the committee for its review by the end of the semester following the comprehensive examination. The committee must approve the proposal before the candidate may be admitted to candidacy and proceed with the research.

**Dissertation Requirements.** The dissertation must be an original contribution to knowledge and demonstrate the student's proficiency in independent research.

**Final Examinations.** A final oral defense of the dissertation is required.

### Graduate Preparation in Public History

The department offers several public history emphases preparing students to apply the skills of the historian in

careers beyond the classroom. Public historians focus their historical insight, expertise, and critical abilities in the broad—that is, public—community. Six areas of emphasis are offered within public history: business, community history, scholarly publishing, historic preservation, historical administration, and the public sector. Graduate course work in public history may be included in both master's and doctoral programs of study.

The public history core combines specially designed course work and specific program requirements with traditional degree requirements. The public history area imposes additional admission requirements and includes periodic evaluations of its students' progress. (The business emphasis requires prerequisites in the business field.) Enrollment is limited to provide careful preparation and advisement. The curriculum integrates required course work in a public history component with courses in a geographic area concentration. As a special feature of the program, short courses are taught each year by visiting public historians. Each emphasis requires completion of two short courses. Courses from other disciplines, such as anthropology, business, public administration, fine arts, geography, political science, and architecture (architectural history and preservation planning) may be included in a program of study when students have the necessary prerequisites and if the courses meet particular student needs or are required within the various emphases of the concentration. Students who select the scholarly publishing option must be admitted to the Scholarly Publishing Certificate program and complete all certificate requirements. (See "Scholarly Publishing," page 280, for a description of the certificate program.)

Course work for all areas of the program *begins each fall semester* with a *required* special workshop during the fall orientation week before classes start. Students are admitted for the fall semester, though some class work outside the public history field may be started earlier. With concentrated full-time study, the master's public history component may be completed in four semesters, depending on the public history area selected for emphasis. In some instances, the mandatory internship or other program requirements must be completed during the *summer* months.

Each student in the program completes a core of courses appropriate to an area of emphasis. Basic to each core is the completion of HIS 502 Public History Methodology during the first semester of study. The work introduced in this methodology class is continued in the public history research seminar (HIS 591), required or optional, depending on the area of emphasis.

At the satisfactory completion of the training work and upon the recommendation of the appropriate director and the department, a certificate of completion is issued by the Department of History. Assistance is provided in job placement.

Students interested in this curriculum should consult the department's graduate handbook, which provides detail about public history work.

### RESEARCH ACTIVITY

Recent faculty research includes the following subjects. *Women's History:* women in 19th-century France; women of the English Renaissance and Reformation; feminism in modern Cuba; Mexican American women in the 20th-century; African American women in slavery; African



American women in the 20th-century; women, feminism, and social change in Argentina, Chile, and Uruguay; South-western U.S. women; women in the 19th- and 20th-century U.S.; women in medieval Japan.

*Social and Cultural History:* social history of the elderly in America; history of sexuality; history of welfare states; cultural history of the Space Age; Confucianist thought; social and cultural history of Tudor England; cultural history of world fire; business cultures in Europe; migration in the U.S.; U.S. labor history; community formation in medieval Japan; colonial missions in Nigeria; race and gender in the 19th-century U.S.; fiction and travelers' accounts in south-east Asia; religious identity in Russia, the Ukraine, and Georgia; European Jewish history; religion in Latin America; the family in Europe; European intellectual cultural history; American Indians in the 20th-century.

*Western United States:* the history of Phoenix; 20th-century Arizona; urban growth in Texas and Oklahoma; the Mexican American civil rights movement; Latino demographic history; the Navajos; American Indian ranching and rodeo; frontier and region; race relations and reform movements in 20th-century California; cultural history of the Grand Canyon.

*Political and Legal History:* U.S. constitutional history; the history of the legal profession in America; the political and military history of 20th-century China; modern German political history; the presidency during the U.S. Civil War and Reconstruction; U.S. politics during the Progressive Era; Margaret Thatcher's Britain; U.S. political biography; the newly independent states of Eurasia.

*International Relations:* U.S./China Japan relations; Britain and the Middle East in the 20th-century; U.S. perceptions of the Soviet Union; U.S./Latin American relations; colonialism and nationalism in Southeast Asia; Europe since 1945.

*Public History:* History of the book and the publishing industry; community development in Arizona and the West; historical interpretation; environmental and cultural resources; organizational history; public practice.

### HISTORY (HIS)

#### **HIS 502 Public History Methodology.** (3) F

Introduction to historical research methodologies, techniques, and strategies used by public historians. Readings, short papers, and guest speakers. Required for students in the public history concentration.

#### **HIS 512 Historians of Early Europe.** (3) N

A study of the history of European historical writing from the Greeks to the 18th century.

#### **HIS 513 Historians of Modern Europe.** (3) N

A study of 19th- and 20th-century European historical writing.

#### **HIS 514 Historians of the United States.** (3) N

A study of the history of American historical writing from the early colonial days to the 20th century.

#### **HIS 515 Studies in Historiography.** (3) F, S

Methods and theories of writers of history. May be repeated for credit.

#### **HIS 525 Historical Resource Management.** (3) F

Identification, documentation, and interpretation of historic period buildings, sites, and districts. Emphasis on interdisciplinary efforts among historians, architects, and anthropologists.

#### **HIS 526 Historians and Preservation.** (3) S

Preparation of historians for public and private historic preservation programs. Prerequisite: HIS 525 or instructor approval.

#### **HIS 527 Historical Administration.** (3) F

Preparation of historians in administration of archives, historical sites, historical museums, historical societies, and historical offices in government agencies.

#### **HIS 532 Community History.** (3) N

Techniques and methods of community history emphasizing local resources. Required for community history option. Seminar.

#### **HIS 551 Comparative Histories of War and Revolution.** (3) A

A comparative field course of the themes of war and revolution.

#### **HIS 552 Comparative History of Family and Community.** (3) N

A comparative course with a focus on family, including minority and ethnic groups, in society.

#### **HIS 553 Comparative History of State and Institutions.** (3) N

A comparative course that explores the changing nature of central institutions and government.

#### **HIS 554 Comparative Historical Population Studies: Ethnicity, Economy, and Migration.** (3) N

A comparative course that explores the impact of social, cultural, or economic changes in the population.

#### **HIS 555 Comparative Historical Topics.** (3) N

This course analyzes a variety of specific social, political, cultural, and intellectual topics.

#### **HIS 591 Seminar.** (3) N

May be repeated for credit.

#### **HIS 598 ST: Special Topics.** (3) N

Reading courses designed to increase students' familiarity with a particular topic and the important writing concerning it. The following areas may be included:

- (a) Asian History
- (b) English and British History
- (c) European History
- (d) Latin American History
- (e) U.S. History

May be repeated for credit.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## History and Theory of Art

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A Ph.D. degree in History and Theory of Art is offered jointly with the University of Arizona. For more information, contact the School of Art at 480/965-3468.

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## Humanities

### Interdisciplinary Master's Program

**Charles Dellheim**

*Director*

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humanities@asu.edu

www.asu.edu/clas/humanities

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#### CORE FACULTY

##### Humanities

Professors: Dellheim, Kugelmass;

Associate Professor: Privateer;

Assistant Professors: Baker, Ballew, Lopez-Lazaro, Lund,  
Romeyn, Wright

##### Languages and Literatures

Professor: Foster

#### AFFILIATED FACULTY

##### Anthropology

Professor: Bahr

##### Architecture

Regents' Professor: Cook;

Professor: Boyle;

Associate Professor: Krolloff

##### Art

Professor: Codell;

Assistant Professor: Wolfthal

##### Communication

Associate Professor: Nakayama

##### Dance

Assistant Professor: Jackson

##### English

Professors: Bjork, Brink;

Associate Professors: Castle, Horan, Sensibar

##### History

Professors: Fuchs, Iverson, Simpson, Stowe, Tillman;

Associate Professor: Rush

##### Languages and Literatures

Professors: Losse, Volek;

Associate Professor: Williams;

Assistant Professor: Vitullo

##### Philosophy

Professor: White

##### Planning and Landscape Architecture

Assistant Professors: Ewan, Fish-Ewan

##### Religious Studies

Professor: Foard;

Associate Professors: Coudert, Gereboff

The Graduate Committee on Humanities offers an interdisciplinary program leading to the M.A. degree in Humanities. One of the unique features of this interdisciplinary program is that, because it uses faculty research/teaching interests from a number of academic units, a student may tailor a course of study to fit individual needs and goals. The

committee is composed of members from several departments, as shown in the faculty list at the beginning of this section. At the same time, the individualized program is balanced by a required core of several courses emphasizing interdisciplinary methodology and theory. Faculty and courses are not limited, however, to the departments and schools listed, since it is understood that many fields may be approached from a humanistic perspective.

#### MASTER OF ARTS

Among the small number of humanities M.A. programs in the U.S., the ASU program stands out in terms of its substance and breadth. The core of the curriculum, a sequence of three required courses, provides students with an introduction to an extremely wide range of classical and contemporary cultural theory. At the same time, the large number of elective classes at their disposal permits students to fashion a specialized field for themselves, typically combining work in two or more of the traditional humanities disciplines. The thesis—the capstone of the requirements for the degree—gives students the opportunity to make an original and substantial contribution to scholarship in their chosen field. This combination—a solid grounding in cultural theory, interdisciplinary specialization, and advanced research and writing—makes this M.A. program unique among its peers.

**Admission.** Students who fulfill the general requirements of the Graduate College and who have a B.A. in any of the humanities disciplines listed by the National Endowment for the Humanities are invited to apply. This invitation, however, does not preclude students who have bachelor's degrees in the social and natural sciences. In addition to meeting Graduate College requirements, students must submit Graduate Record Examination scores; three letters of academic recommendation; and a brief letter of intent, outlining their academic career to date and suggesting plans for the future, at ASU and beyond. Prospective students should apply by March 1 for admission into the program the following fall. Students whose applications are complete by the March 1 deadline will be notified of their admission status by April 15. Qualified students applying after March 1 will be admitted depending on the availability of space.

**Program of Study.** M.A. students must complete a minimum of 30 hours of course work, including six hours of thesis preparation. In most cases, this involves a two-year program of study, focused on the following requirements:

*Core Courses.* Students take a sequence of three core courses, one in each of their first three semesters. Contact an advisor for details.

*Area of Study.* Beyond the core courses, students use their remaining electives to develop a specific area of study, whose ultimate expression is the thesis, but which is also grounded in course work. The areas of study sponsored by the faculty include, but are not limited to, American studies; art and society; comparative literatures and cultures; film and media studies; gender and sexuality; intellectual history and philosophy; Jewish studies; performance studies; post-colonial studies; science, technology, and culture.

**Foreign Language Exam.** M.A. students are required to pass a foreign language reading examination, typically at some point during their first three semesters.

**Master's Thesis.** The centerpiece of the master's degree is a written thesis that makes an original and substantial contribution to scholarship in the humanities. Most students are expected to work toward a thesis proposal and the formation of a thesis committee (consisting of a chair drawn from the Humanities faculty and two other members) during their first two semesters; to finalize their committee and receive its approval of their proposal in their third semester; and to complete the thesis in the fourth semester. A final oral defense of the thesis is required.

## RESEARCH ACTIVITY

A sample of recent thesis topics includes the following: *The Enigma of Nikola Tesla: A Cultural Studies Analysis of His Legacy*; *Hot and Cold Media with New Messages: A Review and a Revision of (Herbert) Marshall McLuhan*; *The Boy's Room Revisited: Masculinities in Pulp Fiction*; "I Am Marlene-Marlene Is Me": *Marlene Dietrich as Model for Social Empowerment*; *Anthropological Field Rites: Uncovering the Ethnographic Self in Feminist Self-Ethnography*; *Unreality As Condition of Life: A Postmodern View on Andrei Bitov's Pushkin House*; *The Four-Seven Debate between Yi T'oegye and Ki Kobong*; *The Study of an Epidemic: Science, Society, and the (Re)Presentation of AIDS*; *Reading Space: A Question of Resistance*; *Social Peace, Unconstrained Consent, Social Justice, and the So-Called Liberal Tradition*; *Getting Around the Body: The Matter of Race and Gender in Faulkner's Light in August*; *Healing Patterns in Three Ethnic American Novels*; *Sorcery in Colonial Peru: The Cases Held by the Spanish Inquisition at the Tribunal of Lima*; *The Problem of the Artist in the South: William Faulkner's Resistance to Southern Colonization*; *Red Scares and Witch Hunts: Unlikely American Heroes and Identities in Angels in America*; *Imperial Propaganda and Architecture on Coins 27 B.C.–A.D. 180: Edited for Exhibition*.

**Faculty Research Interests.** Social and intellectual history; British history; the Enlightenment; media studies; cultural studies; Latin America; queer theory; gender studies; subaltern studies; ideological approaches to literature; comparative literature; postcolonial studies; Chinese culture; East European and American Jews; Israel; urban studies; humor; technology and culture; intercultural perceptions; colonial Latin American identity construction; law and society in European and modern periods; narratives of European colonialism/exploitation; American studies; science and the humanities; Southeast Asian art history; critical theory; cultural anthropology; culture and organizational theory.

## HUMANITIES (HUM)

**HUM 420 Interpreting Latin America.** (3) S  
Introduction to protocols and methodologies for cultural interpretation of Latin America, with emphasis on four principal cities as cultural space. *General Studies: HU, G, H.*

**HUM 440 Los Angeles and Cultural Theory.** (3) S  
Analysis of representations of Los Angeles in literary, film, and musical texts and broader implications for contemporary American society. *General Studies: L1/HU, C.*

**HUM 450 Technology and Culture.** (3) S  
Explores sociocultural, ideological, postmodern implications of technology and the role technology plays in social constructions as well as the spaces it creates. Seminar discussion. *General Studies: L1/HU.*

**HUM 460 Postmodern Culture and Interpretation.** (3) N  
Currents and interpretations of postmodern culture; international, comparative perspective on the culture and traditions of contemporary "Europes" and "Americas." Seminar discussion. *General Studies: L2.*

**HUM 462 Psychoanalysis and Culture.** (3) F  
Introduction to intellectual history of psychoanalytic movement of twentieth century and its contribution to humanities disciplines. *General Studies: L2/HU/SB.*

**HUM 465 Narrative in the Human Sciences.** (3) F  
Theories of narrative and narrativity in the Humanities, concentrating on the problems of specific disciplines and interdisciplinary solutions. *General Studies: L2/HU.*

**HUM 511 Structures of Knowledge.** (3) F  
Theories and examples of structures of knowledge, including such topics as metaphor, semiotics, and knowledge of the "other."

**HUM 512 Writing Cultures.** (3) S  
Theories and methods of representing Western and non-Western cultures in literature, history, ethnography, and pictorial media.

**HUM 513 Interpretation of Cultures.** (3) A  
Methodologies and comparative theories for the study of relationships between various aspects of culture, the history of ideas, and the arts. May be repeated for a total of 6 semester hours, when topics vary.

**HUM 549 Contemporary Critical Theory.** (3) A  
An advanced survey of major schools of 20th-century literary and critical theory. Lecture, discussion. Cross-listed as ENG 502. Credit is allowed for only ENG 502 or HUM 549.

**HUM 591 Seminar.** (3) A  
Topics include:

- (a) Comedy: Meaning and Form
- (b) Theory and Culture
- (c) Tragedy: Meaning and Form

**HUM 598 ST: Special Topics in the Humanities.** (3) N

Open to all students. Topics include:

- (a) American Fine Arts
- (b) Comparative Fine and Performing Arts
- (c) Cultures of Ethnic Minorities
- (d) Non-Western Cultures
- (e) Western Historical or Contemporary Cultures

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Industrial Engineering

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### PROFESSORS

BAILEY, DOOLEY, HENDERSON, HOGG, HUBELE, KEATS, MONTGOMERY, SMITH, UTTAL, WOLFE

### ASSOCIATE PROFESSORS

ANDERSON-ROWLAND, COCHRAN, MacKULAK, MOOR, ROBERTS, ROLLIER, RUNGER, SHUNK, VILLALOBOS, YE

### ASSISTANT PROFESSORS

CARLYLE, FOWLER, MOU

The faculty in the Department of Industrial and Management Systems Engineering offer graduate programs leading to the M.S., the Master of Science in Engineering, and the Ph.D. degrees in Industrial Engineering.

The overall educational objective of graduate study in industrial engineering is to improve each student's ability to understand, analyze, and resolve problems within complex

organizations. Industrial engineers must develop qualitative and quantitative abilities to assist management in such diverse organizations as banks, government, hospitals, military, and manufacturing operations.

It is required that all students applying for one of the master's or doctoral degree programs submit scores (verbal, quantitative, analytical) on the Graduate Record Examination, a statement of purpose, and three letters of recommendation.

### MASTER OF SCIENCE

See "Master's Degrees," page 98, for general requirements.

### MASTER OF SCIENCE IN ENGINEERING

Students applying for the program leading to the Master of Science in Engineering degree in Industrial Engineering may have a baccalaureate degree in a major or field other than industrial engineering, although engineering, mathematics, or science is recommended. The student's qualifications are reviewed by the faculty.

A dual degree is available. It is designed to enable qualified graduate students to pursue the Master of Science in Engineering (M.S.E.) at ASU and a Master of International Management of Technology (M.I.M.O.T.) at the American Graduate School of International Management (Thunderbird). Thunderbird is an internationally recognized private graduate school located in the Phoenix metropolitan area, offering course work in international studies, modern languages, and world business. Details are available from the departmental office.

See "Master of Science in Engineering," page 186, for more information on the Master of Science in Engineering degree.

### DOCTOR OF PHILOSOPHY

The Ph.D. degree in Industrial Engineering is conferred upon evidence of excellence in research that culminates in a dissertation representing a significant contribution to the field of industrial engineering.

See "Doctor of Philosophy," page 101, for general requirements.

**Program of Study.** The program of study should be developed early in the second semester of Ph.D. study or when the student has completed nine semester hours of courses at ASU. Specific requirements may be obtained from the department.

**Early Evaluation.** Early in the second regular semester in residence, the student's program of study and academic accomplishment to date serve as a basis for evaluation by the supervisory committee. The results of this evaluation are used to assist the student in improving or modifying the program of study, to encourage the continuance of Ph.D. studies or, if necessary, to discourage the student from continuing in the program.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** When the Ph.D. student has essentially completed the course work in the approved program of study and submitted a research proposal to the advisory committee, the student is given a written compre-

hensive examination relating to the research area. The written examination is followed by an oral exam.

**Dissertation Committee.** Upon successful completion of the comprehensive examinations, the student is admitted to candidacy. At this time a dissertation committee is selected to assist in and evaluate the research project and dissertation.

**Dissertation Requirements.** A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required.

**Final Examinations.** A final oral examination in defense of the dissertation is required.

### RESEARCH ACTIVITY

The Industrial and Management Systems Engineering faculty are involved in a wide variety of research projects. Current research includes the following topics:

*Operations Research and Production Systems.* Emergent Behavior Microscopic Representation of Intersection Interactions; Capacity Modeling in Semiconductor Manufacturing; Modeling and Simulation for Productivity Improvement of a Semiconductor Production Line; Cost/Product Analysis for IC Packaging; Cross Training Engineers/Technicians for Semiconductor Manufacturing; Modeling and Analysis of Semiconductor Manufacturing; QS9000 Quality System Implementation; Modeling and Analysis of 300mm Wafer Fabrication Operations; Wafer Fab Operations: Modeling, Analysis, and Design; Introduction to Manufacturing Engineering; Modeling Data Standards; Overall Equipment Effectiveness in Semiconductor Manufacturing; The Role of the Industrial Engineer in Semiconductor Manufacturing; Modeling and Simulation for Productivity Improvement of a Semiconductor Production Line; Support for the Real-Time Product Flow Control in Semiconductor; Manufacturing Project; Productivity Issues in A/P/T Operations; Estimation of the AutoMod Development Drivers in Semiconductor Material Handling Simulations; DMAPS-Business Process Reengineering; A Methodology for Recording the Model Build Cycle; Dynamic Scheduling; Object-Oriented Simulation and Control; Benefit/Cost Analysis for High Technology Man-Machined Systems; Cellular Automata for Traffic Flow Modeling; Methodology for Assessing System Availabilities with Finite Queues; Component Redundancy and Spare Components.

*Manufacturing.* Advancing On-Machine and Post-Process Inspection Techniques for Machine Performance Enhancements, Applying Manufacturing Models to Develop Smart Machine Technology, Sensor-Fusion Methodology for Manufacturing Variation Reduction, A Tool to Optimize RP Quality by Proper Part Orientation, Computer-Aided Process Planning for Optimal Cost, Time and Quality, Automated Repair of STL Files for Rapid Prototyping, Hardware Interfacing for a Virtual Sculpting Tool, Dimensional Verification of Parts by Comparing Digital Scans with Solid Models, Manufacturing Feature Evaluation and Conversion for Designers, Design for the Environment of a Manufacturing Cluster Growth Methodology, Development of a Protocol for Concurrent Engineering, Cost/Quality/Time Tradeoffs in Manufacturing, Environmental Expert

System for Green Product Design, Web-Based Tutor for Enhanced FMA Experiment.

*Quality and Reliability Engineering.* Machined Parts Using Statistical Process Control, Optimization of Industrial Processes Using Response Surface Methodology, Use of Mixture Experiments for Product Formulation, Use of Variable Sampling Interval and Variable Sample Size Schemes for Process Monitoring, Diagnostic Characteristics and a Methodology for a Bivariate Pattern Recognition Scheme in SPC, Parameter Estimation from Probability Plots Using Robust Regression Techniques, Data Structures for Multivariate Quality Control, Response Surface Methods for Experiments Involving Noise Variables, Multivariate Statistical Process Control, Generalized Linear Models for Analyzing Designed Experiments, Methods for Fractionally Sampling Multiple Stream Processes, Adaptive Control Charts, Regression Adjustment Techniques in Multivariate Statistical Process Monitoring, The Process and Outcomes of Implementing Statistical Process Control: Towards an OL-Based Model.

*Virtual Computer Integrated Enterprise.* Configuration Management, Knowledge Supply Chain, Data Warehousing, Rapid Application Development, Collaborative Design Environment for Primes and Subs, Model-Based Enterprise Process Infrastructure, Lean Enterprise Decision Support Systems for the Aerospace Industry, Job Competency Decision Support System, Intranet Infrastructure for Model-Based Systems Development.

*Information Systems/Management of Technology.* Client-Server Relational Database Interface for a Hierarchical Generic Discrete Manufacturing Simulation Model; Taxonomy and a Multiple Criteria Decision Model for the Evaluation of Sourcing Strategies for the Make or Buy Problem; Methodology for the Management of Multi-Facility Virtual Factory Environments; Understanding Corporate Information and Knowledge Supply Chains; Best Practices, Maturity, and Diffusion in New Product Development; Team Network Characterization in Integrated Product Development; Programmer Performance Measurement in a Software Reuse Context; Push and Pull Technologies in New Product Development; Process Knowledge Bases: Facilitating the Application of Deep Knowledge; Using Software Process Simulation for Making "Good Enough Quality" Decisions; Diagnosing Dynamic Organizational Processes; The Measurement of Consumer Attitudes Concerning Software Quality; Legitimate Roles and Enacted Practices in Cross-Functional Product Development Teams; Perceptions of Success and Failure in Total Quality Management Initiatives; Successful Implementation of QFD; Methods for Studying Organizational Change and Development; The Dynamics of Learning to Automaticity; Autonomous Agents and Hospital Room Scheduling; The Nonlinear Dynamics of Innovation; Modeling and Experimentation for Multi-Response Optimization; NLOCKS: A National Laboratory for Organization Communication and Knowledge Studies; Design a Knowledge Management System for a Product Platform Organization; Supplier Involvement in New Product Development; The Behavior of Purchasing Agents when Dealing with Products of Unknown Quality; Convergence and Divergence in the Innovation Process; Hypermanufacturing: The Next Phase; The Stability of Work Routines in Self-Managed Work Teams.

*Human Factors/Ergonomics.* Fundamentals of Psychological Science, Computer Vision, The Design and Utilization of Audio Menus in Relation to Worker Productivity, Ergonomics Applied to Workplace Simulation and Design, Impact of Graphics on User's Performance Within the Human Computer Interaction Environment.

*Education.* The Design, Assessment and Evaluation of an Undergraduate Industrial Engineering Curriculum, Design and Creation of an Industrial Engineering Design Laboratory.

## INDUSTRIAL AND MANAGEMENT SYSTEMS ENGINEERING (IEE)

### IEE 505 Applications Engineering. (3) F

Develop working knowledge of application systems development tools needed for computer integrated enterprise. Includes techniques for application generation in fourth and fifth generation software environments. Topics include client server network systems, decision support systems, and transaction systems in distributed environment.

### IEE 511 Analysis of Decision Processes. (3) S

Methods of making decisions in complex environments and statistical decision theory; effects of risk, uncertainty, and strategy on engineering and managerial decisions. Prerequisite: ECE 380.

### IEE 520 Ergonomics Design. (3) S

Human physiological and psychological factors in the design of work environments and in the employment of people in man-machine systems. Open-shop lab assignments in addition to class work. Prerequisite: IEE 437 or 547.

### IEE 530 Enterprise Modeling. (3) S

Focus on social, economic, and technical models of the enterprise with emphasis on the management of technological resources. Included are organization, econometric, financial, and large-scale mathematical models.

### IEE 531 Topics in Engineering Administration. (3) S 2000

Consideration given to philosophical, psychological, political, and social implications of administrative decisions. Prerequisite: IEE 532 or instructor approval.

### IEE 532 Management of Technology. (3) F

Topics include designing a technical strategy; technological forecasting; interfacing marketing engineering and manufacturing; designing and managing innovation systems; creativity; application of basic management principles to technology management. Prerequisite: IEE 431 or 541 or instructor approval.

### IEE 533 Scheduling and Network Analysis Models. (3) S

Application of scheduling and sequencing algorithms, deterministic and stochastic network analysis, and flow algorithms. Prerequisites: ECE 380; IEE 476 (or 546).

### IEE 541 Engineering Administration. (3) F

Introducing quantitative and qualitative approaches to management functions, engineering administration, organizational analysis, decision making, and communication. IEE 431 students ineligible.

### IEE 543 Computer-Aided Manufacturing and Control. (3) S

Computer control in manufacturing, CIM, NC, logic controllers, group technology, process planning and robotics. IEE 463 students ineligible. Prerequisite: C programming capability.

### IEE 545 Simulating Stochastic Systems. (3) F, S

Analysis of stochastic systems using basic queuing networks and discrete event simulation. Basic network modeling, shared resources, routing, assembly logic. Not open to students with credit in IEE 475. Prerequisites: ASE 485; CSE 100 (or equivalent); IEE 476 (or 546).

### IEE 546 Operations Research Techniques/Applications. (4) F, S

Students model and analyze industrial systems applications with operations research techniques. Resource allocation, product mix, production, shipping, task assignment, market share, machine repair, customer service. Not open to students with credit in IEE 476. Prerequisites: ASE 485; CSE 100.

### IEE 547 Human Factors Engineering. (3) F

Study of people at work; designing for human performance effectiveness and productivity. Considerations of human physiological and psychological factors. Open only to students without previous credit for IEE 437.

**IEE 552 Strategic Technological Planning.** (3) S

Study of concept of strategy, strategy formulation process, and strategic planning methodologies with emphasis on engineering design and manufacturing strategy, complemented with case studies. An analytical executive planning decision support system is presented and used throughout course. Pre- or corequisite: IEE 545 or 566 or 567 or 574 or 575.

**IEE 560 Database Concepts for Industrial Management Systems.** (3) S

Application of object oriented database technology concepts to manufacturing and enterprise systems.

**IEE 561 Production Systems.** (3) F, S

Understanding how factories operate, how performance is measured, and how operational changes impact performance metrics. Operational philosophies, increasing production efficiency through quantitative methods. Prerequisites: ASE 485 (or equivalent); IEE 475, 476.

**IEE 562 Computer-Aided Manufacturing (CAM) Tools.** (3) F

Current topics in automation, distributed control, control code generation, control logic validation, CAM integration, CAD/CAM data structures, planning for control systems. Topics vary by semester. Prerequisite: IEE 463 or 543 or equivalent.

**IEE 563 Systems Analysis for Distributed Systems.** (3) S

Analysis and design of distributed groupware applications for manufacturing and enterprise systems. Prerequisite: ECE 380.

**IEE 564 Planning for Computer-Integrated Manufacturing.** (3) F

Theory and use of IDEF methodology in planning for flexible manufacturing, robotics, and real-time control. Simulation concepts applied to computer-integrated manufacturing planning. Prerequisite: IEE 463 or 543.

**IEE 565 Computer-Integrated Manufacturing Research.** (3) S

Determination and evaluation of research areas in computer-integrated manufacturing, including real-time software, manufacturing information systems, flexible and integrated manufacturing systems, robotics, and computer graphics. Prerequisite: IEE 564.

**IEE 566 Simulation in Manufacturing.** (3) F

Use of simulation in computer-integrated manufacturing with an emphasis on modeling material handling systems. Programming, declarative, and intelligence-based simulation environments. Prerequisite: IEE 545.

**IEE 567 Simulation System Analysis.** (3) S

Simulation modeling of processes involving discrete and continuous system components. Topics include random number generators, output analysis, variance reduction, and statistical issues related to simulation. Prerequisite: IEE 545.

**IEE 569 Advanced Statistical Methods.** (3) F 2000

Application of statistical inference procedures, based on ranks, to engineering problems. Efficient alternatives to classical statistical inference constrained by normality assumptions. Prerequisite: ASE 485 or 500.

**IEE 570 Advanced Quality Control.** (3) S

Economic-based acceptance sampling, multiattribute acceptance sampling, narrow limit gauging in inspector error and attributes acceptance sampling, principles of quality management, and selected topics from current literature. Prerequisite: ASE 485 or 500 or equivalent.

**IEE 571 Quality Management.** (3) F

Total quality concepts, quality strategies, quality and competitive position, quality costs, vendor relations, the quality manual, and quality in the services. Prerequisite: IEE 431 or 541.

**IEE 572 Design of Engineering Experiments.** (3) F, S

Analysis of variance and experimental design. Topics include general design methodology, incomplete blocks, confounding, fractional replication, and response surface methodology. Prerequisite: ASE 485 or 500.

**IEE 573 Reliability Engineering.** (3) S

Nature of reliability, time to failure densities, series/parallel/standby systems, complex system reliability, Bayesian reliability, and sequential reliability tests. Prerequisite: ECE 380.

**IEE 574 Applied Deterministic Operations Research Models.** (3) F, S

Advanced techniques in operations research are developed for the solution of complex industrial systems problems. Goal programming, integer programming, heuristic methods, dynamic and nonlinear programming. Prerequisites: IEE 476 (or 546); MAT 242.

**IEE 575 Applied Stochastic Operations Research Models.** (3) S

Students formulate and solve industrial systems problems with stochastic components using analytical techniques. Convolution, continuous-time Markov chains, queues with batching, priorities, balking, open/closed queuing networks. Prerequisites: ASE 485; IEE 476 (or 546).

**IEE 577 Decision and Expert Systems Methodologies.** (3) F

Application of artificial intelligence methodologies in decision support systems. Topics include neural networks, fuzzy logic systems, and expert systems. Prerequisite: CSE 100 or equivalent.

**IEE 578 Regression Analysis.** (3) F

A course in regression model building oriented toward engineers/physical scientists. Topics include linear regression, diagnostics biased and robust fitting, nonlinear regression. Prerequisite: ASE 485 or 500.

**IEE 579 Time Series Analysis and Forecasting.** (3) F 1999

Forecasting time series by the Box-Jenkins and exponential smoothing techniques; existing digital computer programs are utilized to augment the theory. Prerequisites: ASE 485 (or 500); IEE 461.

**IEE 582 Response Surfaces and Process Optimization.** (3) S

An introduction to response surface method and its applications. Topics include steepest ascent, canonical analysis, designs, and optimality criteria. Prerequisite: IEE 572.

**IEE 672 Advanced Topics in Experimental Design.** (3) S 2000

Engineering applications of factorial and fractional factorial designs with randomization restrictions, analysis techniques in parameter comparison, missing data, unbalanced designs. Prerequisite: IEE 572 or instructor approval.

**IEE 677 Regression and Linear Models.** (3) S 2001

General linear models, applications, theory, including least squares, maximum likelihood estimation, properties of estimators, likelihood ratio tests and computational procedures. Prerequisite: IEE 578 or instructor approval.

**IEE 679 Time Series Analysis and Control.** (3) F 2000

Identification, estimation, diagnostic checking techniques for ARIMA models, transfer functions, multiple time series models for feedback and feedforward control schemes. Prerequisite: IEE 579 or instructor approval.

**IEE 681 Reliability, Availability, and Serviceability.** (3) F 2000

Organizing hardware and software, integrity and fault-tolerant design, maintenance design and strategy, Markov models, fault-free analysis, and military standards. Prerequisite: ECE 380.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Information Management

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*Director*  
**(BA 223) 480/965-3631**  
**asusoa@asu.edu**  
**www.cob.asu.edu/acct/msim.html**

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### PROFESSORS

J.R. BOATSMAN, BOYD, FLAHERTY, JOHNSON, KAPLAN,  
 PANY, PHILIPPAKIS, RECKERS, RENEAU, SCHULTZ,  
 SHRIVER, R. SMITH, STEINBART, TIDWELL, WYNDELTS

### ASSOCIATE PROFESSORS

CHRISTIAN, GOLEN, GOUL, GUPTA, KEIM, KIANG,  
 KULKARNI, MOECKEL, O'DELL, O'LEARY, PEI, REGIER,  
 ROY, ST. LOUIS, VINZE

### ASSISTANT PROFESSORS

CHEN, CHENOWETH, DAVID, DOWLING, HWANG, IYER,  
 MISHRA, SANTANAM, K. SMITH, WHITECOTTON

### SENIOR LECTURERS

MacCRACKEN, SHREDNICK

### LECTURERS

BALOGH, J.L. BOATSMAN, GEIGER, HAYES, TAYLOR

The faculty in the College of Business offers a program leading to the M.S. degree in Information Management.

The faculty also participate in the programs leading to the Master of Business Administration (see "Master of Business Administration," page 128) and Ph.D. degree in Business Administration (see "Business Administration," page 128) degrees.

### MASTER OF SCIENCE

The program leading to the M.S. degree in Information Management educates specialists to develop and apply quantitative and computer methods to support business decision making. Areas of study include strategic cost management, technical foundations of data management, business database concepts, electronic commerce, distributed database systems, information systems development, event based models, decision support systems, and project management.

**Admission.** All applicants must have completed three courses in business, one course in calculus, one course in statistics, and one programming language. Refer to the School of Accountancy and Information Management for a current listing of required course prerequisites for the program. All applicants are also required to submit the supplemental application materials required from the school. A complete advising guide and application packet may be obtained by writing

ARIZONA STATE UNIVERSITY  
 COLLEGE OF BUSINESS  
 SCHOOL OF ACCOUNTANCY  
 AND INFORMATION MANAGEMENT  
 PO BOX 873606  
 TEMPE AZ 85287-3606

Applicants must also submit scores from either the Graduate Management Admission Test (GMAT) or the Graduate Record Examination (GRE). International applicants whose native language is not English must submit scores from the Test of English as a Foreign Language (TOEFL) and Test of Spoken English (TSE) exams.

**Program of Study.** The program of study consists of a minimum of 30 semester hours. A sample program of study might include:

ACC 541 Strategic Cost Management and Uses of Information Technology .....	3
CIS 505 Object-Oriented Modeling and Programming .....	3
CIS 506 Business Database Concepts .....	3
CIS 512 Decision Support Systems.....	3
CIS 530 Information Systems Development .....	3
CIS 535 Distributed Information Systems.....	3
CIS 591 Seminar on selected CIS topics .....	9
CIS 593 Applied Project.....	3
Total.....	30

**Foreign Language Requirements.** None.

**Thesis Requirements.** A thesis is optional.

**Final Examinations.** A final written examination is required of all candidates. In addition, an oral examination in defense of the thesis is required of candidates who elect to write a thesis.

### RESEARCH ACTIVITY

Research activities of Information Management faculty encompass theory and applications in computer information systems and management science. The faculty are actively engaged in research in the following areas: database systems, artificial intelligence, management information systems, decision support systems, model management systems, decision analysis, linear statistical models, panel models, forecasting, productivity and quality management, project management, health care operations, and service operations.

Students and faculty have access to excellent computing facilities, including mainframes, minicomputers, computer workstations, and specialized equipment and software for research in graphics, distributed database systems, group decision support systems, model management systems, management science, operations simulation, and statistics.

### COMPUTER INFORMATION SYSTEMS (CIS)

**CIS 420 Business Database Concepts.** (3) F, S  
 Database theory, design, and application, including the entity-relationship model; the relational, hierarchical, and network database models; and query languages. Prerequisite: professional program business student majoring in Computer Information Systems or Accountancy. Prerequisites with a grade of "C" or higher: ACC 330; CIS 335.

**CIS 430 Networks and Distributed Systems.** (3) F, S  
 Advanced topics such as communications protocols, distributed systems, and client-server systems; applications based on platforms such as networked UNIX. Prerequisite: professional program business student majoring in Computer Information Systems. Prerequisite with a grade of "C" or higher: CIS 335.

**CIS 440 Systems Design and Electronic Commerce.** (3) F, S  
Systems design for organizational and electronic commerce systems; use of project management and systems analysis and design tools. Prerequisites: professional program business student majoring in Computer Information Systems. Prerequisites with a grade of "C" or higher: CIS 410, 420.

**CIS 502 Management Information and Decision Support Systems.** (3) A  
Fundamentals of computer-based management information and decision support systems. Prerequisite: M.B.A. degree program student.

**CIS 505 Object-Oriented Modeling and Programming.** (3) A  
Object-oriented modeling of business information systems, abstract data types and object-oriented programming using a visual language. Prerequisite: M.S. in Information Management or Master of Accountancy degree program student.

**CIS 506 Business Database Systems.** (3) A  
Hierarchical, network, relational, and other recent data models for database systems. Processing issues such as concurrency control, query optimization, and distributed processing. Prerequisite: M.S. in Information Management or Master of Accountancy degree program student.

**CIS 510 Systems Models and Simulation.** (3) N  
Design of computer-based decision systems. Simulation as a research and decision-making tool. Prerequisite: M.S. in Information Management or Master of Accountancy degree program student.

**CIS 512 Decision Support Systems.** (3) A  
Definition, description, construction, and evaluation of computer-based decision systems. Prerequisite: M.S. in Information Management or Master of Accountancy degree program student.

**CIS 515 Management Information Systems.** (3) N  
Systems theory concepts applied to the collection, retention, and dissemination of information for management decision making. Prerequisite: M.S. in Information Management or Master of Accountancy degree program student.

**CIS 520 Systems Design and Evaluation.** (3) N  
Methodologies of systems analysis and design. Issues include project management, interface, organizational requirements, constraints, documentation, implementation, control, and performance evaluation. Prerequisite: M.S. in Information Management or Master of Accountancy degree program student.

**CIS 525 Artificial Intelligence in Business.** (3) N  
Development and application of artificial intelligence approaches to business problem solving. Prerequisite: M.S. in Information Management or Master of Accountancy degree program student.

**CIS 530 Information Systems Development.** (3) A  
Object-oriented and interprocess communication and control concepts for information systems; applications based on languages such as C++ and platforms such as networked UNIX. Prerequisite: M.S. in Information Management or Master of Accountancy degree program student.

**CIS 535 Distributed Information Systems.** (3) A  
Introduction to distributed systems and their impact on information systems in business. Prerequisite: M.S. in Information Management or Master of Accountancy degree program student.

**CIS 591 Seminar on Selected CIS Topics.** (1–12) A  
Topics such as the following are offered:

- (a) Computer Security
- (b) Computing Architectures
- (c) Data Warehouse and Data Mining
- (d) Electronic Commerce
- (e) Enterprise Modeling

Prerequisite: M.S. in Information Management or Master of Accountancy degree program student.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## OPERATIONS AND PRODUCTION MANAGEMENT (OPM)

**OPM 502 Operations Management.** (3) A  
Contemporary management issues, including environmental, project, and supply chain management; new product development; quality control; TQM. Prerequisites: computer literacy; graduate degree program student.

**OPM 540 Quality and Productivity Management.** (3) N  
Organizational factors influencing quality and productivity in the production of goods and services. Quality and productivity strategies, improvement programs, and measurement systems. Prerequisite: OPM 502 or instructor approval.

**OPM 582 Capacity Management and Scheduling.** (3) A  
Decisions regarding management of technology for manufacturing and service firms. Facilities location, layout, process design and selection, and manufacturing strategy. Prerequisite: QBA 561 or instructor approval.

**OPM 585 Facilities Design and Management of Technology.** (3) A  
Decisions regarding management of facilities and technology for manufacturing and service firms. Facilities location, layout, process design, and selection. Prerequisite: QBA 561.

**OPM 587 Project Management.** (3) A  
Planning, scheduling and controlling of projects in R & D, manufacturing, construction and services. Project selection, financial considerations, and resource management. Prerequisite: QBA 502.

**OPM 591 Seminar.** (3) A  
Topics such as the following offered:  
(a) High Performance Management Systems  
(b) Manufacturing Strategy  
(c) New Product and Process Development

**OPM 593 Applied Projects.** (3) A  
Cross-functional teams initiate (possibly implement) organizational change within a local firm. Lecture, discussion, experiential learning. Prerequisite: completion or concurrent enrollment in all core courses in the M.B.A. program.

**OPM 791 Doctoral Seminars in Operations and Production Management.** (1) N  
Short module seminars such as:  
(a) Management of Technology  
(b) Manufacturing Strategy  
(c) Operations Management  
(d) Project Management

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## QUANTITATIVE BUSINESS ANALYSIS (QBA)

### Department of Economics

**QBA 410 Applied Business Forecasting.** (3) N  
Application of forecasting techniques in business and institutional environments. Prerequisite: QBA 321.

**QBA 421 Applied Quality Analysis II.** (3) A  
Applications of statistical tools employed in manufacturing and experimental research. Applications focus on design and improvement of processes. Prerequisite: QBA 321.

**QBA 511 Sampling Techniques in Business.** (3) N  
Planning, execution and analysis of surveys in business research. Prerequisite: QBA 502.

**QBA 525 Applied Regression Models.** (3) A  
Simple linear regression, multiple regression, indicator variables, and logistic regression. Emphasis on business and economic applications. Prerequisite: MAT 210.

**QBA 527 Categorical Data Analysis.** (3) A  
Discrete data analysis in business research. Multidimensional contingency tables and other discrete models. Prerequisite: QBA 525.

**QBA 530 Experimental Design.** (3) A  
Experimental designs used in business research. Balanced and unbalanced factorial designs, repeated measures designs, and multivariate analysis of variance. Prerequisite: QBA 525 or equivalent.

**QBA 535 Multivariate Methods.** (3) A  
Advanced statistical methods used in business research. Multivariate analysis of association and interdependence. Prerequisite: QBA 525.

**QBA 540 Forecasting.** (3) N  
Foundation of statistical forecasts and forecast intervals; application of classical and computer-assisted forecasting methods to business forecasting problems. Prerequisites: MAT 210; QBA 502.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.



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## Justice Studies

### Master's Program

**David Goldberg**  
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#### REGENTS' PROFESSORS ALTHEIDE, PALUMBO

**PROFESSORS**  
 CAVENDER, FIGUEIRA-McDONOUGH, GOLDBERG,  
 HAYNES, HEPBURN, JOHNSON, JURIK, LAUDERDALE,  
 MUSHENO, ROMERO, SCHNEIDER, ZATZ

**ASSOCIATE PROFESSORS**  
 BORTNER, LUJAN, RIDING IN, SCHADE

**ASSISTANT PROFESSORS**  
 ADELMAN, BERNSTEIN, MENJIVAR

The faculty in the School of Justice Studies offer a program leading to the M.S. degree in Justice Studies.

Graduate students in the School of Justice Studies and the Department of Anthropology are able to receive a concurrent M.S. degree in Justice Studies and M.A. degree in Anthropology with a concentration in social-cultural anthropology. The principal purpose of the program is to prepare individuals with complementary knowledge and skills for basic and applied research and to provide administrative and educational activities related to justice studies and anthropology. Students must be admitted separately to each program, following the guidelines of the Graduate College, Department of Anthropology, and School of Justice Studies. Additional information on the M.A. degree in Anthropology and the M.S. degree in Justice Studies may be obtained from each academic unit.

Information about the interdisciplinary Ph.D. degree in Justice Studies may be obtained from the graduate coordinator's office. See "Justice Studies," page 229.

#### MASTER OF SCIENCE

The faculty in the School of Justice Studies offer a program leading to the M.S. degree in Justice Studies. The study of justice is an interdisciplinary field of scholarship, research, and teaching, embracing those aspects of social and behavioral sciences relevant to an understanding of law, justice, crime, and social deviance. It includes a critical examination of the policies and organizational processes that have evolved for handling attendant problems. The M.S. degree has been designed to prepare students for professional positions in justice-related agencies, for teaching in community colleges, and for further study and research in the justice field.

**Admission.** In addition to meeting Graduate College requirements, the applicant must submit Graduate Record Examination (GRE) scores, a one- or two-page statement outlining the applicant's educational and career goals

related to Justice Studies, and three letters of recommendation, preferably from academic referees. Because of enrollment limits, candidates who meet minimum requirements are not automatically admitted into the program.

*Selection Criteria.* In selecting promising candidates, the admissions committee evaluates past academic performance, scores from the GRE and potential for success as indicated by recommendations and personal statements.

Applications to the program may be made at any time; however, complete files must be submitted to the Graduate College by January 1 for fall admission.

*International Applicants.* In addition to admission material, international applicants whose native language is not English must submit scores from the Test of English as a Foreign Language. Evidence that sufficient funds are available for financing the student's academic program also must be submitted. See "Admission to the Graduate College," page 89, for more information.

**Advisory Committee.** Upon admission of the applicant, a temporary advisor is appointed. The temporary advisor is a faculty member who assists students in the selection of courses for the first semester until an advisory committee is formed. Typically, by the end of the first year, students form an advisory committee consisting of a chair and two members. The chair and at least one member must be faculty of the School of Justice Studies.

The committee members must be appointed by the dean of the Graduate College upon the recommendation of the director of the School of Justice Studies. The advisory committee works with the student to establish a program of study, to direct the thesis, and to administer the oral examination.

**Program of Study.** The M.S. degree in Justice Studies has two options: a thesis or an applied project. The thesis option requires the completion of 36 semester hours, of which six are thesis hours. The applied project option requires the completion of 42 semester hours, of which three are JUS 593 Applied Project. Each student's program is developed in concert with the advisory committee, in accord with the student's background of preparation and educational and career objectives. The program of study has three major categories: foundation courses, elective courses, and thesis requirements.

*Foundation Courses.* The required foundation courses provide students with a fundamental understanding of the theories, methods, and analytic techniques associated with the study of justice. Foundation Courses include:

JUS 500 Justice Research Methods.....	3
JUS 501 Justice Theory .....	3
JUS 509 Statistical Problems in Justice Research.....	3
JUS 521 Qualitative Data Analysis and Evaluation .....	3

*Elective Courses.* Offered by the School of Justice Studies and other academic units, elective courses develop a unique research area in justice studies. Students may choose these courses in consultation with their advisory committees. Alternatively, students may choose one of the following areas within justice studies:

1. adolescence and justice;
2. American Indian justice;
3. comparative justice;

4. crime and justice;
5. dispute resolution;
6. gender and justice;
7. law, ecology, and society;
8. law, policy, and evaluation;
9. race, ethnicity, and justice; or
10. social and economic justice.

**Thesis Requirements.** To satisfy the research requirement for the Master of Science degree, candidates must present a thesis and defend it in an oral examination.

**Applied Project Requirements.** Candidates pursuing the applied project option must present their applied project and defend it in an oral examination conducted by the faculty member who supervises the project. The project should be an analytical report based on field experience.

**Foreign Language Requirements.** None.

**Financial Assistance.** A limited number of assistantships are available on a competitive basis for well-qualified students at the master's level. To be eligible for an assistantship, students must be admitted to a graduate degree program with regular admission status. Application should be made directly to the School of Justice Studies.

## RESEARCH ACTIVITY

The School of Justice Studies has a strong commitment to ongoing research programs. Graduate students have ample opportunities to participate in these pursuits through paid research assistantships as well as research apprenticeships and independent studies at the graduate level.

Areas of faculty research include the following: administration and management in justice-related agencies; adolescence and justice; American Indians and justice; analyses of criminal justice reforms; community crime prevention; community risk assessment; comparative justice; corrections; criminological theory; critical race theory; deviant behavior; dispute resolution; distributive justice; domestic violence; ethical theory; female criminality; feminist sociolegal theories; gangs; gender, justice and inequality; grievance processes; immigration and migration; justice and the media; juvenile justice; law and society; legal studies; organizational theory and behavior; police; political deviance; program evaluation; race, gender and class; social control and conflict; social movements; social policy; victimization; white collar and corporate deviance; workplace inequality; and world systems.

## JUSTICE STUDIES (JUS)

### JUS 500 Justice Research Methods. (3) A

Theories and methods of research with emphasis on development of designs most relevant to justice data and problems.

### JUS 501 Justice Theory. (3) A

Theories and philosophies of social, economic, political and criminal justice. Applications of theories to contemporary justice issues. Lecture, discussion.

### JUS 503 Crime and Social Causation. (3) A

Theories of deviance and crime as they relate to social policies and specific response of the justice complex.

### JUS 509 Statistical Problems in Justice Research. (3) A

Methodological problems of research design and statistical methods specific to justice studies.

### JUS 510 Understanding the Offender. (3) A

Survey of learning, personality, and biological theories of causation and their relevance to understanding criminal and delinquent behavior.

### JUS 514 Justice Policy. (3) A

Assessment of the politics of justice policy as well as an understanding of the basic tools available to social scientists for analyzing the formulation, implementation, and evaluation of justice policy.

### JUS 515 Comparative Justice. (3) A

Focuses on justice, legality, and human rights cross-culturally, examining both theoretical and methodological issues. Seminar.

### JUS 520 Qualitative Theory and Data Collection. (3) A

The basic theoretical rationale and perspectives for justice related qualitative research, e.g., symbolic interactionism. Techniques for data collection, e.g., ethnography and depth interviewing.

### JUS 521 Qualitative Data Analysis and Evaluation. (3) A

Analysis of qualitative data, e.g., field notes, depth interview transcripts, document analysis, coding, and retrieval with a microcomputer; qualitative evaluation.

### JUS 542 American Indian Justice. (3) A

Designed to provide a broad overview of American Indian and Alaskan Native issues of justice and injustice in contemporary society.

### JUS 547 Program Evaluation. (3) A

Nature/role of program evaluation; types, program monitoring, impact and process assessment, evaluability assessment, methods, utilization, and politics of evaluation. Lecture, lab. Pre- or corequisite: JUS 500 recommended.

### JUS 550 Alternatives to Incarceration. (3) A

Investigation of various alternatives to incarceration; advantages/disadvantages; major issues including net widening, cost effectiveness, risk assessment, community crime prevention. Lecture, research.

### JUS 560 Women, Law, and Social Control. (3) A

Gender issues in the exercise of formal and informal mechanisms of social control, including economic, social, legal factors, both violent and nonviolent.

### JUS 570 Juvenile Delinquency. (3) A

Study of delinquency, including causation theories. Alternative definitions of delinquency, official statistics, and the critique and analysis of the interaction between social institutions and youth.

### JUS 571 Juvenile Justice System. (3) A

Graduate-level introduction to juvenile justice system, including historical development, philosophical orientation, organizational structure, and contemporary controversies.

### JUS 579 Political Deviance. (3) A

The seminar examines the politics of deviance by integrating the study of conflict with aspects of social organization, especially state formation.

### JUS 584 Internship. (3 or 6) F, S, SS

Assignments in a justice agency designed to further the student's integration of theory and practice. Placements are arranged through consultation with students and agencies.

### JUS 588 Justice and the Mass Media. (3) A

An analysis of the nature and impact of mass media messages about justice concerns for social order. Lecture, discussion.

### JUS 591 Seminar. (1-3) A

Topics chosen from various fields of justice studies. May be repeated for credit.

**Omnibus Graduate Courses:** See pages 51-52 for omnibus graduate courses that may be offered.

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## Justice Studies

### Interdisciplinary Doctoral Program

Marjorie S. Zatz  
*Director, Executive Committee*  
 (WILSN 370) 480/965-7083  
 justice@asvm.inre.asu.edu  
 www.asu.edu/copp/justice

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#### Anthropology

Professor: Brandt;  
 Associate Professor: Aguilar

#### Communication

Professor: Kastenbaum;  
 Assistant Professor: Trethewey

#### Curriculum and Instruction

Professor: Edelsky

#### Economics

Professors: Mayer, McPheters

#### English

Professor: Sands;  
 Assistant Professor: Stevens

#### History

Professor: Fuchs;  
 Associate Professor: Hurtado

#### Journalism and Telecommunications

Professor: Watson

#### Justice Studies

Regents' Professors: Altheide, Palumbo;  
 Professors: Cavender, Figueira-McDonough, Goldberg,  
 Haynes, Hepburn, Johnson, Jurik, Lauderdale, Musheno,  
 Romero, Schneider, Zatz;  
 Associate Professors: Bortner, Lujan, Riding In;  
 Assistant Professors: Adelman, Bernstein, Menjivar

#### Languages and Literatures

Regents' Professor: Foster;  
 Professor: Baldini

#### Law

Regents' Professor: Murphy  
 Professors: Bartels, Kader, Lowenthal, Stanton, Strouse,  
 Tesón, Tsosie

#### Philosophy

Regents' Professor: Murphy  
 Associate Professors: de Marneffe, McGregor

#### Political Science

Associate Professors: Ashley, Dantico, Doty

#### Psychology

Regents' Professor: Russo;  
 Professor: Lanyon

#### Psychology in Education

Associate Professor: Moore

#### Public Affairs

Professor: Weschler

#### Recreation Management and Tourism

Professor: Allison

#### Religious Studies

Associate Professor: Gereboff

#### Social Work

Professor: Ashford

#### Sociology

Professors: Nagasawa, Thomas;  
 Associate Professor: Benin

#### Women's Studies

Associate Professor: Ferraro

The Committee on Law and Social Sciences (COLASS) offers an interdisciplinary graduate program leading to the Ph.D. degree in Justice Studies. The Ph.D. degree in Justice Studies integrates philosophical, legal, and historical approaches with social science training. The committee is interdisciplinary, and sets guidelines and supervises programs of study. Faculty from a number of academic units enable a student to tailor a course of study to fit individual needs and goals. The committee is composed of members from the Departments of Anthropology, Communication, Economics, Languages and Literatures, History, Management, Philosophy, Political Science, Psychology, Recreation Management and Tourism, Religious Studies, Sociology, the College of Law, and the Schools of Justice Studies, Public Affairs, and Social Work. An executive committee, appointed by the dean of the Graduate College from this larger body of faculty, has the primary responsibility for the operation of the Ph.D. program.

#### DOCTOR OF PHILOSOPHY

The focus of the Ph.D. degree in Justice Studies is the study of law and justice in society and the creation of new knowledge. Subject matter includes assessing the impact of legal systems and other institutions on the distribution of rights, benefits, and burdens on citizens.

This interdisciplinary program aims to produce scholars whose research activities contribute to the knowledge and understanding of conflicts and dilemmas surrounding social change. Courses on the study of justice are a part of the curriculum of many academic disciplines, and academic books and journals increasingly stress issues of justice and injustice. In addition to the interdisciplinary programs featuring justice, students may enter academic programs that focus on gender, race, ecology, class, law, and public and business administration. Justice Studies graduates from the interdisciplinary Ph.D. program will have a strong theoretical background, interdisciplinary training in law, humanities, and the social sciences, and may possess the technical skills associated with both qualitative and quantitative research methodologies. These qualifications can provide graduates with the opportunity to successfully compete for a variety of positions in academic and justice-related fields.

**Admission.** Applications are reviewed on an annual basis by an admissions committee representing COLASS. Recommendations for admission are made by the director of the Executive Committee to the dean of the Graduate College. In addition to meeting minimum Graduate College admission requirements, each applicant must provide a statement of educational and career goals and the reasons for seeking the interdisciplinary Ph.D. in Justice Studies, a Graduate Record Examination test score or the Law School Admission Test score, a sample of written work, and three letters

of recommendation, preferably from academic referees. Because of enrollment limits, candidates who meet minimum requirements cannot automatically be admitted.

**Advisory Committee.** An advisory committee consisting of at least three persons, a committee chairperson and two other faculty members, is appointed by the dean of the Graduate College upon the recommendation of the director of the Committee on Law and Social Sciences. The advisory committee advises the student in developing a program of study and assumes primary responsibility for assessing the student's progress in the program. The advisory committee prepares and evaluates the comprehensive examination.

**Core Courses.** Five core courses are required of all students in the program. The core courses are taken within the first three semesters of the student's program of study. Each core course is interdisciplinary in nature. The core courses are as follows:

JUS 610 Law and the Social Sciences.....	3
JUS 620 Justice Research and Methods.....	3
JUS 630 Data Analysis for Justice Research.....	3
JUS 640 Theoretical Perspectives on Justice.....	3
JUS 650 Advanced Qualitative Data Analysis.....	3
Total .....	15

**Areas of Concentration.** Students use elective courses to develop a specialization in an area relevant to justice studies from a law and social sciences perspective. The specialization is developed through consultation with the student's advisory committee. Five areas of concentration have been established, based on the research and teaching expertise of participating faculty. These formalized concentrations are:

1. criminal and juvenile justice;
2. dispute resolution;
3. law, justice, and minority populations;
4. law, policy, and evaluation; and
5. women, law, and justice.

From these broad concentrations, students can develop areas of study emphasizing:

1. adolescence and justice;
2. American Indian justice;
3. comparative justice;
4. crime and justice;
5. dispute resolution;
6. gender and justice;
7. law, ecology, and society;
8. law, policy, and evaluation;
9. race, ethnicity, and justice; and
10. social and economic justice.

Students may develop other areas of study in consultation with their advisory committee. Courses are not limited to those departments and schools participating in the Committee on Law and Social Sciences.

**Program of Study.** Students entering the program with a master's degree in the social sciences, philosophy, a relevant interdisciplinary field, or a Juris Doctorate (J.D.), must complete a minimum of 54 semester hours of study beyond

the master's or J.D. degree, including 24 semester hours of dissertation and research. Applicants holding only the baccalaureate degree are required to complete an additional 30 hours of graduate credit for a total of 84 semester hours. The student should expect to devote at least one to two years to complete the dissertation. At least 30 hours of dissertation and research hours must be taken at ASU. After students are admitted to the Ph.D. program, they must spend at least two consecutive semesters in full-time residence at ASU.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Upon completion of course work and before the start of dissertation research, the student is given a written examination. The examination evaluates the student's accumulation of interdisciplinary knowledge and ability to communicate across disciplines. The exam is developed and administered by the student's advisory committee.

**Dissertation Committee.** After passing the comprehensive examination, a dissertation committee is formed and approved by the dean of the Graduate College upon the recommendation of the director of the executive committee. The dissertation committee must consist of at least three faculty members, including the dissertation committee chairperson. The committee must represent an interdisciplinary faculty, with demonstrated interdisciplinary knowledge and skills to advise the student during the formulation of the research topic and during the completion of the research and dissertation. The three-membered committee must represent at least two disciplines and two different academic units. The dissertation and advisory committees may have different memberships.

**Advancement to Candidacy.** Ph.D. students will achieve candidacy status in a letter from the Graduate College dean upon (1) passing the comprehensive examination, and (2) successfully defending the dissertation prospectus.

**Dissertation Requirements.** The dissertation consists of a fully documented written analysis demonstrating an appropriate level of interdisciplinary skills and competence associated with a justice issue. Each student must register for a minimum of 24 semester hours of dissertation and research; 12 of these semester hours must be completed after candidacy.

**Final Examinations.** The dissertation must be defended in an oral examination. A candidate must pass the final examination within five years after completing the comprehensive examination.

**Concurrent Ph.D. in Justice Studies/J.D. Degree.** The purpose of the concurrent Ph.D. in Justice Studies/J.D. degrees is to provide a rigorous education for highly qualified students interested in pursuing academic careers in law, law and the social sciences, or law and philosophy. In order to seek concurrent degrees, the prospective student must first gain separate admission to the College of Law and the interdisciplinary Ph.D. program in Justice Studies. The student must then obtain special approval to pursue concurrently the J.D. and Ph.D. degrees. No more than three students per year are admitted into the concurrent degree program.

**RESEARCH ACTIVITY**

Faculty making up the COLASS are engaged in a variety of research activities. Faculty research interests are as follows: alternative organizations and social services; American and European women's history; American Indian history; American Indian repatriation; bureaucratic power; comparative legal studies; corporate crime; corrections, including privatization and alternatives; domestic violence; ecological justice; economic models of crime; educational reforms for inner city schools; environmental law; environmental racism; ethics theory; European social institutions; feminist theories; gender and sexuality; gender justice; indigenous law; informal justice and dispute resolution; international law; judicial administration; judicial behavior; jurisprudence; justice for the physically challenged; justice and minority populations; juvenile justice and law; juveniles and status offenses; law and ecology; law and social control; law and society; logic of policy inquiry; migration and immigration; nature and law; official information and deviance; organizational ethics; philosophy and the law; political deviance; psychology, law, and public policy; race, class, and gender; racism; religion and moral issues; rights of AIDS victims and AIDS educational strategies; rights of older adults; services equity; social inequality and ethnicity; social theory; women and crime; women and work; and world system's theory.

**JUSTICE STUDIES (JUS)****JUS 610 Law and the Social Sciences.** (3) A

Analysis of the theoretical grounds underlying diverse studies of law and society; creation and administration of law; and jurisprudence and politics.

**JUS 620 Justice Research and Methods.** (3) A

Concept development, research design, data collection strategies, legal research, and building computer databases relevant to the study of justice.

**JUS 630 Data Analysis for Justice Research.** (3) A

Bivariate and multivariate techniques of data analysis and hypothesis testing for justice-related research and use of information and statistical programs.

**JUS 640 Theoretical Perspectives on Justice.** (3) A

Analysis of philosophical perspectives of justice; linkages between social science theory and justice constructs; application of justice to social issues.

**JUS 650 Advanced Qualitative Data Analysis.** (3) S

Advanced qualitative data collection and analysis techniques, including ethnography, in-depth interviews, field notes, coding, transcribing, content analysis, textual analysis. Seminar.

**JUS 669 Political Trials and Indigenous Justice.** (3) A

Focuses upon research on political trials, deviance, and conceptions of indigenous and contemporary justice. Lecture, discussion.

**JUS 691 Seminar.** (1–3) F, S, SS

Topics chosen from various fields of justice studies. May be repeated for credit.

**Omnibus Graduate Courses:** See pages 51–52 for omnibus graduate courses that may be offered.

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**Languages and Literatures****David William Foster***Chair***(LL 440) 480/965-6281****languages@asu.edu****www.asu.edu/clas/dll**

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**REGENTS' PROFESSORS**

FOSTER, KELLER

**PROFESSORS**

ALEXANDER, BALDINI, BALLON-AGUIRRE, CHAMBERS, COUCH, CROFT, CURRAN, EKMANIS, FLYS, GUNTERMANN, HORWATH, LOSSE, VALDIVIESO, VOLEK, WETSEL, WIXTED, WONG

**ASSOCIATE PROFESSORS**

COTA-CÁRDENAS, GARCIA-FERNANDEZ, W. HENDRICKSON, HERNÁNDEZ-G., LAFFORD, OSSISOV, REIMAN, SANCHEZ, SENNER, WILLIAMS

**ASSISTANT PROFESSORS**

ACEREDA, BURTON, CANDELA, CHOI, COLINA, GROVE, GRUZINSKA, MARSHALL, NISHIMURA-JENSEN, REES, SUWARNO, TIPTON, URIOSTE-AZCORRA, VITULLO

**LECTURERS**

BERNIER, CRISTO, FOARD, S. HENDRICKSON, LIONTAS, McMILLAN, SCOTT, SONANDRES, STIFTEL

**INSTRUCTORS**

HABERMAN, KORET, LE, TU

**ASSISTANT RESEARCH PROFESSIONAL**

ORLICH

**ACADEMIC ASSOCIATE**

GLESSNER

The faculty in the Department of Languages and Literatures offer graduate programs leading to the M.A. degree in French, German, and Spanish. Concentrations are available in the following areas:

1. comparative literature (in cooperation with the faculty in the Department of English),
2. language and culture,
3. linguistics (in Spanish only), and
4. literature.

Students admitted to the Master of Education degree program in Secondary Education may elect foreign languages as the subject matter field. See "Master of Education," page 174, for information on the Master of Education degree.

The faculty also offer a graduate program with a major in Spanish leading to the Ph.D. degree. See "Doctor of Philosophy," page 101, for general requirements.

It is recommended, but not required, that students applying for admission to the M.A., M.Ed., or Ph.D. program submit scores on the Graduate Record Examination.

## MASTER OF ARTS

Candidates for the M.A. degree should, upon entrance, present the equivalent of an undergraduate major in the language in which the degree is sought. Those who lack this background, but who show strong potential and meet Graduate College admissions requirements, may be admitted to a graduate program on a provisional basis, pending removal of specified deficiencies. These deficiencies must be completed in addition to the regular program of study for the master's degree.

Students in all graduate programs are expected to maintain a high level of linguistic fluency acceptable to a native speaker. Before acceptance in the program, applicants may be requested to furnish evidence of their proficiency.

The program of study for the M.A. degree includes a minimum of 30 semester hours of graduate-level work, as approved by the candidate's supervisory committee. The program must include a 500-level Bibliography and Research Methods course offered by the department. It is recommended that the course be taken, if possible, in the first semester of the candidate's graduate career. (Students in the Spanish program [literature concentration] also are required to enroll in SPA 545 Concepts of Literary Criticism.) When approved by the candidate's supervisory committee, nine hours in another language or in closely related courses may be included in the program.

Students pursuing their graduate studies in a program with a concentration in literature, comparative literature, or linguistics present an acceptable thesis for which six hours of credit are granted.

Students who are primarily interested in teaching on the secondary or community college levels may select, with the approval of the supervisory committee, a program of study with a concentration in language and culture. Students in this program present a thesis for which six hours of credit are granted.

**Comprehensive Examinations.** All candidates are required to pass a comprehensive written or oral examination designed to evaluate the candidate's knowledge in the area of specialization. A reading list is provided as a guide to preparation for this examination.

**Thesis Requirements.** A thesis is required.

**Final Examinations.** A final oral examination in defense of the thesis is required.

## DOCTOR OF PHILOSOPHY

The Ph.D. degree is offered with a major in Spanish.

**Program of Study.** The student's individual program of courses covering the various periods of Spanish and Latin American literature, as well as the historical and political background of both areas, is determined in consultation with the supervisory committee. Specifically required are SPA 500 Bibliography and Research Methods, SPA 540 History of the Spanish Language, and SPA 545 Concepts of Literary Criticism.

At least 15 graduate credits must be earned in the subfield, and the candidate's program of study in the subfield must be approved by the subfield department. Normally the comprehensive examination on the subfield, administered by the subfield department, must be satisfied before the

comprehensive in Spanish. Students are urged to consult the *Handbook for Spanish Graduate Students*.

**Foreign Language Requirements.** Each candidate is expected to demonstrate a reading knowledge of two languages other than Spanish. The language requirements must be satisfied before the candidate is eligible to take the comprehensive examination.

**Comprehensive Examinations.** A written and oral comprehensive examination, designed to ascertain the candidate's knowledge and orientation in the field of study and competency to proceed with the dissertation, is required at or near the end of course work.

**Dissertation Requirements.** The candidate must present an acceptable dissertation based on original investigation. The dissertation must represent a significant contribution to knowledge and demonstrate the candidate's ability to do independent, scholarly research.

**Final Examinations.** A final oral examination is required. This examination covers the subject matter of the dissertation and appropriate field.

## RESEARCH ACTIVITY

Commitment to professional research in the Department of Languages and Literatures is evidenced by the large number of faculty publications and conference papers. Faculty members are engaged in editorial work for scholarly presses and journals. The Bilingual Press is now based at the university. The ASU Library collection has extensive holdings in all the fields of foreign languages. Both faculty and students have access to computer aids for research. In addition, the Latin American Studies Center coordinates Latin American research programs for faculty and students involved in Latin American research. The Hispanic Research Center focuses on the Spanish-speaking population of the U.S. Faculty in all Romance languages are active in the Arizona Center for Medieval and Renaissance Studies, the Interdisciplinary Humanities Program, and the Interdisciplinary Committee on Linguistics.

Specific topics of faculty research are described below.

*French.* In addition to the presentation of the general range of French and Francophone civilization, language, and literature, faculty members are engaged in research projects on the following topics: interpretation; literary translation; stylistics; critical text and textbook preparation; the *chanson de geste*; medieval lyric poetry; Renaissance narrative (Rabelais, Marguerite de Navarre); classical aesthetics; the Philosophical Tale; the relationship of 19th-century literature, art, music, and criticism; the contemporary novel; Romanian authors in France; French African and French Canadian narrative; sociolinguistics and French syntax; 18th-century literature; philosophical approaches to literature and autobiography; French women in literature and art; French and Francophone film.

*German.* In addition to general coverage of German literary topics, faculty members are engaged in research on the following topics: literary theory and stylistics, Old Norse, the Baroque novel and drama, the epoch of Goethe and Schiller, Romanticism, Austrian literature, individual figures such as Kleist and Kafka, and women's role in German literature.

*Spanish.* In addition to broad coverage of Spanish and Spanish-American literary topics, particular regional emphases lie with the U.S. Southwest, Mexico, the Caribbean, the Andes, and the River Plate. Specific research projects by Spanish faculty members include topics in Chicano literature, literary translation, Hispanic literary bibliography, literary theory, Argentine narrative, contemporary Spanish poetry, Hispanic women writers, Latin American popular culture, prose narrative of the Golden Age, contemporary Spanish and Spanish-American theatre, Hispanic linguistics and bilingualism/sociolinguistics, and various topics in Brazilian literature.

#### FOREIGN LANGUAGES (FLA)

- FLA 515 Second Language Acquisition.** (3) S  
Discussion and application of theories of second language acquisition. Prerequisite: FLA 400 or equivalent.
- FLA 525 Trends and Issues in Foreign Language Teaching.** (3) N  
Advanced methods seminar, designed for experienced teachers.
- Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

#### FRENCH (FRE)

- FRE 416 French Civilization II.** (3) S  
Political, intellectual, social, economic, and artistic development of France from the 18th century to present. Prerequisite: 6 hours of upper-division French. *General Studies: HU, G.*
- FRE 421 Structure of French.** (3) F  
Phonology, morphology, syntax, semantics, and varieties of French. Prerequisites: FRE 311 and 312 or instructor approval.
- FRE 422 Applied French Linguistics.** (3) S  
Application of linguistic theory and second language acquisition theory to teaching of French. Prerequisite: ASB 480 or ENG 213 or FLA 400.
- FRE 423 French Syntax.** (3) F  
The analysis of French syntactic structure by contemporary theoretical models. Prerequisite: ASB 480 or ENG 213 or FLA 400.
- FRE 424 French Phonology.** (3) S  
Introduction to phonological theory and its application to French. Prerequisites: FRE 311 and 312 or instructor approval.
- FRE 441 French Literature of the 17th Century.** (3) N  
From 1600 to 1660. Prerequisite: 9 hours of 300-level French, including FRE 321 or instructor approval. *General Studies: HU.*
- FRE 442 French Literature of the 17th Century.** (3) N  
From 1660 to 1700. Prerequisite: 9 hours of 300-level French, including FRE 321 or instructor approval. *General Studies: HU, H.*
- FRE 445 French Literature of the 18th Century.** (3) N  
Contributions of the philosophers and the development of the novel and drama. Prerequisite: 9 hours of 300-level French, including FRE 321 or instructor approval. *General Studies: L2/HU.*
- FRE 451 French Poetry of the 19th Century.** (3) N  
From Romanticism to Parnassian poetry to Symbolism. Prerequisite: 9 hours of 300-level French, including FRE 322 or instructor approval.
- FRE 452 French Novel of the 19th Century.** (3) N  
From Constant, Hugo, Balzac, Stendhal, and Sand to Flaubert and Zola, with emphasis on major literary movements. Prerequisite: 9 hours of 300-level French, including FRE 322 or instructor approval. *General Studies: HU.*
- FRE 453 Theater of the 19th Century.** (3) N  
From Romantic drama to the Symbolist Theater. Representative plays of Hugo, Musset, Vigny, Dumas, Becque, Rostand, Feydeau, and Mirbeau. Prerequisite: 9 hours of 300-level French, including FRE 322 or instructor approval. *General Studies: L2/HU.*
- FRE 461 Preatomic Literature.** (3) F  
Representative authors from Proust and Malraux to Sartre from 1900 to 1945. Prerequisite: 9 hours of 300-level French, including FRE 322 or instructor approval. *General Studies: HU.*
- FRE 462 Postatomic Literature.** (3) S  
Representative authors including Camus, Duras, and Robbe-Grillet from 1945 to present. Prerequisite: 9 hours of 300-level French, including FRE 322 or instructor approval. *General Studies: HU.*

- FRE 471 The Literature of Francophone Africa and the Caribbean.** (3) N  
Selected prose, poetry, and drama of black authors from Africa and the Caribbean. Prerequisite: 9 hours of 300-level French, including FRE 322 or instructor approval. *General Studies: L2/HU.*
- FRE 472 Franco-Canadian Civilization.** (3) S  
A study of the civilization of Quebec in particular through its history, language, literature, music, and customs. Prerequisite: 9 hours of 300-level French or instructor approval.
- FRE 500 Bibliography and Research Methods.** (3) F  
Required of all graduate students.
- FRE 510 Explication de Textes.** (3) N  
Detailed analysis of literary texts.
- FRE 515 Intellectual Currents in France, from the Middle Ages to the 18th Century.** (3) N  
Significant social, aesthetic, philosophic, and scientific ideas as presented by major writers of fiction and nonfiction.
- FRE 516 Intellectual Currents in France, from the 19th Century to the 20th Century.** (3) N  
See FRE 515.
- FRE 521 History of the French Language.** (3) N  
Principal phonological, morphological, and semantic developments of French from Latin to present, with emphasis on old and middle French. Some familiarity with Latin is recommended.
- FRE 531 Medieval French Literature.** (3) F  
Readings in the epics, early drama, roman courtois, and other representative literary genres of the Middle Ages.
- FRE 535 French Literature of the 16th Century.** (3) S  
Readings in French Renaissance literature with special attention to the humanist movement and to Rabelais, Montaigne, and the Pleiade.
- FRE 591 Seminar.** (3) N  
Topics may be selected from the following:  
(a) Advanced Problems in French Literature  
(b) Balzac  
(c) Corneille, Molière, and Racine  
(d) Diderot, Voltaire, and Rousseau  
(e) Flaubert  
(f) French Existential Literature  
(g) French Literary Criticism  
(h) Proust  
(i) Realism and Naturalism  
(j) Romanticism  
(k) Stendhal and Zola

**Omnibus Graduate Courses:** See page 54 for omnibus graduate courses that may be offered.

#### GERMAN (GER)

- GER 421 German Literature.** (3) F  
From the beginning to classicism. Prerequisite: 6 hours of 300-level German. *General Studies: HU.*
- GER 422 German Literature.** (3) S  
From Romanticism to the present. Prerequisite: 6 hours of 300-level German. *General Studies: L2/HU.*
- GER 453 German Literary Masterpieces on Film.** (3) F, S, SS  
Film and literature in their correlation to each other and to cultural, political, and social trends in German-speaking countries. Special arrangements for graduate students and those without a knowledge of German. Lecture, discussion. *General Studies: HU, G, H.*
- GER 500 Bibliography and Research Methods.** (3) N  
Required of all graduate students.
- GER 511 German Stylistics.** (3) N  
Art of writing literary German, comparative stylistics.
- GER 521 History of German Language.** (3) N  
Linguistic development of German from the earliest records to the present.
- GER 523 German Drama.** (3) N  
Drama of the 19th and 20th centuries.
- GER 525 German Novel.** (3) N  
Special studies in the German novel.
- GER 527 The Novelle.** (3) N  
Special studies in the German short story.

**GER 531 Middle High German Language and Literature.** (3) N  
Reading and discussion of specimens of the Middle High German epics, romances, and other literary genres.

**GER 551 Romanticism.** (3) N  
Treatment of early and late Romanticism.

**GER 555 Modern German Literature.** (3) N  
Major works from the period of Expressionism to 1945.

**GER 591 Seminar.** (3) N  
Special topics are concerned with a figure, theme, or work in German literature or Germanic studies. Topics may be selected from the following:

- (a) Faust
- (b) Germanic Studies
- (c) Goethe
- (d) Grass and Böll
- (e) Hesse
- (f) Kafka
- (g) Kleist
- (h) Schiller

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### SPANISH (SPA)

**SPA 500 Bibliography and Research Methods.** (3) F  
Required of all graduate students.

**SPA 536 Generation of 1898.** (3) N  
Works of Unamuno, Baroja, Azorín, and their contemporaries, studied against the ideological background of the turn of century in Spain. Prerequisite: SPA 325.

**SPA 540 History of the Spanish Language.** (3) S  
Analysis and discussion of the development of Spanish from Vulgar Latin to the present day. Prerequisite: FLA 400 or equivalent.

**SPA 541 Spanish Language in America.** (3) F  
Discussion and analysis of various regional and social varieties of Spanish in the Americas. Prerequisite: FLA 400 or equivalent.

**SPA 542 Studies in the Spanish of the Southwest.** (3) S  
Examination of bilingualism and the social and regional dialects of Spanish in the Southwest. Prerequisite: FLA 400 or equivalent.

**SPA 543 Structure of Spanish.** (3) S  
Analysis and discussion of data on selected topics in Spanish morphology, semantics, and syntax. Prerequisite: FLA 400 or equivalent.

**SPA 545 Concepts of Literary Criticism.** (3) S  
Aims and methods of modern literary scholarship. Discussion of major theories of literary analysis.

**SPA 555 Spanish American Modernism.** (3) N  
Principal works and figures of literary Modernism, 1880–1920, with emphasis on international literary context of the movement. Prerequisite: SPA 325.

**SPA 557 Contemporary Spanish American Poetry.** (3) N  
Major works and problems in contemporary poetry and poetics, with emphasis on Paz, Parra, Cardenal, and new poetry since 1960. Prerequisite: SPA 325.

**SPA 560 Medieval Spanish Literature.** (3) N  
Major figures and works of the Middle Ages in Spain.

**SPA 561 Golden Age Spanish Prose Fiction.** (3) N  
Major figures and works of the 16th and 17th centuries, with emphasis on the picaresque novel.

**SPA 562 Golden Age Spanish Poetry.** (3) N  
Major figures and works of the 16th and 17th centuries, with emphasis on lyric poetry.

**SPA 563 Spanish Romanticism.** (3) N  
Principal figures and works of the Spanish Romanticism, with emphasis on international literary context of the movement.

**SPA 564 19th-Century Spanish Prose Fiction.** (3) N  
Principal figures and works of Realism in the 19th-century novel, with emphasis on Galdós.

**SPA 565 20th-Century Spanish Drama.** (3) N  
Principal figures and works of Spanish dramatic literature from the Generation of 1898 to the present.

**SPA 566 Generation of 1927.** (3) N  
Major poets of the Generation of 1927, with emphasis on works of Lorca, Guillén, Salinas, and Aleixandre.

**SPA 567 Contemporary Spanish Novel.** (3) N  
Major works of post-Civil War Spanish fiction.

**SPA 568 Cervantes.** (3) N  
An extensive analysis of the prose and theater of Cervantes as a key figure of the Spanish Golden Age. Lecture, seminar.

**SPA 570 Indigenous Literatures of Spanish America.** (3) N  
The indigenous literary traditions, with emphasis on Nahuatl, Mayan, and Quechua literatures through readings in Spanish translations.

**SPA 571 Colonial Spanish American Literature.** (3) N  
The major figures and works from Conquest to Independence.

**SPA 572 Spanish American Drama.** (3) N  
Major contributions of Spanish American drama, with emphasis on contemporary dramatists.

**SPA 573 Spanish American Essay.** (3) N  
Major works of the essay, within the framework of intellectual history and literary movements.

**SPA 574 Spanish American Vanguard Poetry.** (3) N  
Examination of poetic developments, 1920–1940, with emphasis on Huidobro, Vallejo, Neruda, and the international context of their works.

**SPA 575 Contemporary Spanish American Novel.** (3) N  
Principal novels of the *Nueva Narrativa Hispanoamericana*, within the context of contemporary theories of the narrative.

**SPA 576 Contemporary Spanish American Short Story.** (3) N  
Principal short stories of the *Nueva Narrativa Hispanoamericana*, within the context of contemporary theories of the narrative.

**SPA 577 Regional Spanish American Literature.** (3) N  
The figures and works of major national (Peru, Argentina, Chile, and Mexico) and regional (Caribbean) literatures. Topics offered on a rotating basis. May be repeated for different topics.

**SPA 578 Novel of the Mexican Revolution.** (3) N  
Representative works and authors of this genre (Guzmán, Azuela, Urquiza, Muñoz, and Romero), including related or peripheral offshoots in indigenous novels.

**SPA 581 Latin American Popular Culture.** (3) N  
Studies in selected topics of Latin American popular culture, with emphasis on appropriate academic models for the critical analysis of these materials.

**SPA 582 Studies in Latin American Film.** (3) N  
Examination of the role of film in contemporary Latin American culture; films viewed and analyzed as casebook examples. Seminar.

**SPA 591 Seminar.** (3) N  
Spanish and Spanish American literary, cultural, and linguistic topics.

**SPA 691 Figures and Works Seminar.** (3) N  
Topics may be selected from Spanish and Spanish American literatures.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.



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## Law

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### REGENTS' PROFESSORS

KAYE, MURPHY

### PROFESSORS

ARTERIAN, BARTELS, BENDER, BERCH, CALLEROS, ELLMAN, FELLER, FURNISH, GREY, GUERIN, JONES, KADER, KARJALA, LESHY, LOWENTHAL, MATHESON, O'GRADY, ROSE, SCHROEDER, STANTON, STROUSE, TESÓN, TSOSIE, TUCKER, WEINSTEIN, WINER

### ASSOCIATE PROFESSOR

BRENNAN

### CLINICAL PROFESSIONALS

DALLYN, DAUBER

### DIRECTORS

#### Center for the Study of Law, Science, and Technology

Strouse

#### Clinical Programs

O'Grady

#### Indian Legal Program

Tsosie

#### Legal Research and Writing and Academic Support

Stinson

For more information about the College of Law programs, see "College of Law," page 78.

### LAW (LAW)

#### LAW 515 Contracts I. (3) F

Exploration of common law legal method and the structure of Article 2 of the U.C.C. in the context of issues of contract formation.

#### LAW 516 Criminal Law. (3) F

The substantive law of crimes.

#### LAW 517 Torts I. (3) F

Legal protections of personality, property, and relational interests against physical, economic, and emotional harms.

#### LAW 518 Civil Procedure I. (3) F

Exploration of the structure of a lawsuit and techniques of alternative dispute resolution. Specific topics include commencement of suit, joinder of parties, discovery, pretrial motions, and subject matter jurisdiction.

#### LAW 519 Legal Method and Writing. (2) F

Examination of methods used to analyze legal problems. Review of precedent statutory construction and basic res judicata problems. Use of basic legal writing formats.

#### LAW 520 Contracts II. (2) S

Continuation of Contracts I focusing on contract interpretation.

#### LAW 522 Constitutional Law I. (3) S

Role of courts in the federal system, distribution of powers between state and federal governments, and the role of procedure in litigation of constitutional questions.

#### LAW 523 Property I. (2) F

Indicia of ownership, found property, estates in land, landlord tenant.

#### LAW 524 Legal Research and Writing. (2) S

Continuation of LAW 519.

#### LAW 525 Torts II. (2) S

Continuation of Torts I with emphasis on strict and products liability.

#### LAW 526 Property II. (3) S

Nonpossessory interests in property (easements, covenants, servitudes), nuisance, land use planning, and transfers of interests in property.

#### LAW 527 Civil Procedure II. (3) S

Continuation of LAW 518; subjects in LAW 518 are addressed in greater depth as well as personal jurisdiction, res judicata, collateral estoppel, and choice of law under the *Erie* doctrine.

#### LAW 600 Administrative Law. (3) A

Administrative process, emphasizing nature of powers exercised by administrative agencies of government, problems of procedure, and scope of judicial review.

#### LAW 601 Antitrust Law. (3) A

Legislation and its implementation to prevent monopoly and business practices in restraint of trade, including restrictive agreements involving price-fixing, trade association activities, and resale price maintenance.

#### LAW 602 Partnership Taxation. (2-3) N

Federal tax consequences of forming, operating, terminating, or transferring partnerships.

#### LAW 603 Conflict of Laws. (3) N

Problems arising when the operative facts of a case are connected with more than one state or nation. Choice of law, bases of jurisdiction, effect of foreign judgments, and underlying federal and constitutional issues.

#### LAW 604 Criminal Procedure. (3) F, S

The nature of the criminal procedural system with special focus on constitutional protections for the accused.

#### LAW 605 Evidence. (3) A

Principles and practice governing the competency of witnesses and presentation of evidence, including the rules of exclusion and roles of lawyer, judge, and jury under the adversary system.

#### LAW 606 Federal Income Taxation. (3) F, S

Federal income tax in relation to concepts of income, property arrangement, business activity, and current tax problems, with focus on the process of tax legislation and administration.

#### LAW 607 Advanced Civil Procedure. (3) F, S

An overview of the structure and life cycle of a lawsuit from pleadings to appeal, emphasizing the Federal Rules of Civil Procedure.

#### LAW 608 Business Associations I. (3) A

Partnerships, limited partnerships, and small business corporations. Includes a brief introduction to accounting. Detailed analysis of the problems of forming a close corporation, state law duties of care and loyalty, management, dividends and redemptions, issuance of stock, internal dispute resolution, dissolution, and the general law of derivative actions.

#### LAW 609 Business Associations II. (3) A

Interrelationship of federal and state law and a brief introduction to corporate finance (1933 Act). A broad overview of large company regulations including reporting rules, proxy regulation, insider trading, sale of control, tender offers and takeovers, and going private. Prerequisite: LAW 608.

#### LAW 610 Advanced Criminal Procedure. (2-3) A

Topics in criminal procedure, with emphasis on legal constraints on grand jury investigations, police practices, pretrial release, preliminary hearings, prosecutorial discretion, and plea bargaining.

#### LAW 611 Estate Planning I. (3) N

Tax laws relating to transfer of wealth both at death and during lifetime, including federal estate tax, gift tax, and income taxation of estates and trusts.

#### LAW 612 Family Law. (3) A

Legal and nonlegal problems that an individual may encounter because of a situation as a family member.

#### LAW 613 Federal Courts. (3) N

Federal judicial system; relationship of federal and state law; jurisdiction of federal courts and their relation to state courts.

#### LAW 614 Labor Relations. (3) N

Collective bargaining, including the right of employees to organize and to engage in concerted activities; resolution of questions concerning the representation of employees; duty of employers and unions to bargain; administration and enforcement of collective bargaining agreements.

**LAW 615 Public International Law.** (3) A

Role of law in international disputes. Drafting and interpretation of treaties and multilateral conventions are considered.

**LAW 616 Jurisprudence.** (3) A

Introduction to legal philosophy, with readings on the nature of law and legal reasoning, the relationship between law and morality and equality and social justice.

**LAW 618 Trusts and Estates I.** (3) A

Substantive concepts involved in transmitting wealth, including inter-state succession, wills and will substitutes, the modern trust as a family protective device, creation of future interests in a planned estate, social restrictions of a nontax nature, and methods of devoting property to charitable purposes.

**LAW 619 Commercial Law: Payment and Credit Systems.** (3) F

The law of credit obligations and payment devices. Focuses on Articles 3, 4, and 4A of the Uniform Commercial Code.

**LAW 620 Civil Rights Legislation.** (2–3) N

Coverage of the rights and remedies provided by federal civil rights legislation, principally, the key provisions of the Reconstruction Era Civil Rights Acts, portions of the employment discrimination legislation, and voting rights legislation.

**LAW 621 Commercial Law: Sales and Leases of Goods.** (3) S

Advanced issues involving the formation and interpretation of sales and lease contracts. Focuses primarily on Articles 2 and 2A of the Uniform Commercial Code.

**LAW 622 Commercial Law: Secured Transactions.** (3) A

Secured transactions under Article 9 of the Uniform Commercial Code and other relevant sections. An overview of the creation, perfection, and priority effects of security interests. Financing of business enterprise and consumer credit.

**LAW 623 Commercial Torts.** (3) A

Involves an analysis of actionable wrongs against a business entity or against proprietary rights held by that entity, covering the entire spectrum of private remedies for competitive wrongs.

**LAW 624 Community Property.** (1–2) F, S

Property rights of husband and wife; the Arizona community property system; homestead.

**LAW 625 Constitutional Law II.** (3) F, S

Fundamental protection for person, property, political, and social rights.

**LAW 627 Corporate Taxation.** (3) A

Problems in taxability of the corporation, corporate distributions, and corporate reorganizations.

**LAW 628 Creditor-Debtor Relations.** (3) A

Creditors' remedies in satisfaction of claims and debtors' protection and relief under bankruptcy, other laws.

**LAW 630 Employment Discrimination.** (2–3) N

Focuses primarily on Title VII of the Civil Rights Act of 1964, the Age Discrimination in Employment Act, and the Americans with Disabilities Act.

**LAW 631 Environmental Law.** (3) A

Litigation, administrative law, and legislation relating to problems of environmental quality. Topics covered may include air and water pollution, toxic substances, pesticides, and radiation.

**LAW 632 Indian Law.** (3) A

Inquiry into legal problems special to American Indians and tribes.

**LAW 634 Judicial Remedies.** (3) A

The nature and limits of injunctive, restitutionary, and compensatory remedies for the protection of personal, property, political, and civil rights.

**LAW 635 Juvenile Justice System.** (3) N

Special problems in the juvenile system.

**LAW 636 Land Use Regulation.** (3) A

Legal problems in the regulation and control of land development by state and local governments. Administration of zoning, subdivision, and other planning controls; issues of fairness and procedure in the utilization of such controls.

**LAW 637 Lawyering Theory and Practice.** (4) F, S

Issues of competency and professionalism in the practice of law.

**LAW 638 Law and Ethics of Lawyering.** (3) F, S

Emphasis on the Model Rules and Model Code that govern the professional responsibility of lawyers and their interpretation and application.

**LAW 639 Natural Resource Law.** (3) A

Examines the constitutional basis for federal land management and the different kinds of public lands management schemes (e.g., parks, forests, wildlife refuges), emphasizing acquisition of right to, and regulation of, the different uses of public lands and resources (e.g., mining, grazing, timber, wildlife habitat, recreation).

**LAW 640 Securities Regulation.** (2) A

Selected problems arising under the major statutes concerned with regulating the securities market.

**LAW 641 State and Local Government.** (2–3) N

Legal problems involved in the organization and administration of governmental units including the city, county, town, village, school district, and special district.

**LAW 643 Water Law.** (3) A

Acquisition of water rights; water use controls; interstate conflicts.

**LAW 644 Intellectual Property.** (3) A

The protection of intellectual property and encouragement of creativity—trade values, trade secrets, patents, copyrights, performing arts, and visual arts.

**LAW 702 Alternative Dispute Resolution.** (2–3) A

A broad exposure to methods of settling disputes in our society such as mediation, arbitration/conciliation, and negotiation, including examination of the current litigation model.

**LAW 703 Law, Science, and Technology.** (2–3) A

The legal mechanisms used in dealing with various issues raised by contemporary science and technology. Current legal responses to science and technology are explored.

**LAW 705 Mass Communications.** (2–3) A

An examination of First Amendment principles and statutory and regulatory requirements with respect to the conventional print and broadcast media, as well as recent technologies such as cable.

**LAW 706 Immigration Law.** (2–3) N

Exploration of political, economic, social, and legal issues concerning immigration. Specific topics covered include citizenship and naturalization, denaturalization, deportation, and refugee rights and asylum.

**LAW 709 International Human Rights.** (2–3) N

International rules and procedures governing the protection of human rights.

**LAW 710 Real Estate Tax Planning.** (2–3) A

Discussion of topics, including but not limited to real estate investments as tax shelters, alternative acquisition finance devices, refinancing techniques, and nontaxable exchanges.

**LAW 711 Real Estate Transfer.** (2–3) A

An examination of the legal aspects of the sale and purchase of real property encompassing three areas: the role of the lawyer and broker in the transaction, the sales contract, and issues relating to title protection.

**LAW 712 Religion and the Constitution.** (2–3) A

An in-depth study of the "establishment" and "free exercise" clauses of the First Amendment to the U.S. Constitution.

**LAW 714 Law and Social Science.** (2–3) N

Investigation of the use of social science research and methods in the legal system. Topics include psychology of eyewitness identification, social-psychological studies of decision making, statistical evidence of discrimination, econometric studies of the deterrent effects of capital punishment, and clinical predictions of violent behavior.

**LAW 715 Professional Sports.** (2–3) N

Unique legal problems relating to professional sports, including their relationship to antitrust laws, the nature of player contracts, and associated tax problems.

**LAW 717 Legislative Process.** (2–3) N

Explore both the legal and the practical context within which the legislative process operates with a major component of the course being a legislative drafting project.

**LAW 721 Education and the Law.** (2–3) N

Current legal problems affecting institutions of higher education, faculty, students, and governing boards.

**LAW 733 Negotiation, Mediation, and Counseling.** (3) A

Explores alternative models of negotiated dispute resolution, as well as the roles of lawyer and client in the negotiation process. Extensive use of simulation exercises.

**LAW 735 Estate Planning II.** (2–3) N

Preparation of actual estate plans and implementing legal documents for a variety of typical private clients. Both tax and nontax elements in preparation of the plans are considered. Prerequisite: LAW 611.

**LAW 736 Planning for the Business Client.** (2–3) N

Planning transactions involving business organizations with special emphasis on income tax and corporate considerations.

**LAW 738 Trial Advocacy.** (2–3) F, S

Students confront issues of trial advocacy through simulation of a variety of aspects of trial practice in a mock court setting. Prerequisite: LAW 605.

**LAW 745 The Supreme Court.** (2–3) A

Intensive examination of selected current decisions of the U.S. Supreme Court.

**LAW 768 International Business Transactions.** (2–3) N

Problems and policy considerations involved in international trade; tariffs, international monetary controls, and development loans.

**LAW 770 Law Journal.** (1–3) F, S

Academic credit for successful completion of work by a member of the staff of *Arizona State Law Journal*; maximum of 5 semester hours.

**LAW 772 Public Defender Clinic.** (1–6) F, S, SS

Placement in the Public Defender Clinic and related classroom component. Prerequisite: LAW 605.

**LAW 773 Law School Clinic.** (1–6) F, S, SS

Placement in the Law School Clinic and related classroom component. Prerequisite: LAW 605.

**LAW 774 Prosecutor Clinic.** (1–6) F, S, SS

Placement in Prosecutor Clinic and related classroom component. Prerequisite: LAW 605.

**LAW 780 Moot Court.** (1–3) F, S

Academic credit for successful completion of work as a member of the Moot Court Board of Directors; maximum of 3 semester hours.

**LAW 781 Individual Study.** (1) F, S, SS

With the approval of a faculty member, a student may research a legal subject of special interest and prepare a paper suitable for publication.

**LAW 782 Individual Study.** (2) F, S, SS

See LAW 781.

**LAW 783 Individual Study.** (3) F, S, SS

See LAW 781.

**LAW 784 Moot Court Competition.** (1–4) F, S

Successful participation and completion of a national moot court competition.

**LAW 785 Externship.** (1–12) F, S, SS

Supervised, practical lawyering in an external placement proposed by the student or established by a sponsoring agency and approved by the College of Law. In addition, an associated academic component is established by the student with a member of the faculty.

**LAW 791 Seminar in Law.** (1–12) F, S

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.



Waterfall and palms at ASU Research Park

Tim Trumble photo

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## Learning and Instructional Technology

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### REGENTS' PROFESSORS

BERLINER, KULHAVY

### PROFESSORS

BLANCHARD, FREEMAN, KLEIN, SULLIVAN

### ASSOCIATE PROFESSOR

SAVENYE

### CLINICAL ASSISTANT PROFESSOR

STAMM

The faculty in the Division of Psychology in Education offer graduate programs leading to the M.A., Master of Education, and Ph.D. degrees in Learning and Instructional Technology.

The graduate programs leading to a degree in Learning and Instructional Technology prepare students for a variety of positions consistent with their professional goals. Most doctoral graduates of the program accept appointments as university faculty members, training managers in business, industry, and government, or instructional designers in universities and community colleges. Potential employment opportunities for master's degree graduates include positions as training specialists in business, industry, and government, as educational designers in educational agencies, or as classroom teachers.

Applicants for admission to M.A. and Ph.D. degree programs in Learning and Instructional Technology must submit scores for the Graduate Record Examination (GRE). Master of Education program applicants must submit scores for either the GRE or the Miller Analogies Test.

### MASTER OF ARTS

At the master's level, students may specialize in instructional design and development or training and development. A minimum of 30 semester hours is required for the master's degree programs.

See "Master's Degrees," page 98, for general requirements.

### MASTER OF EDUCATION

For information on the Master of Education degree, see "Master of Education," page 174.

### DOCTOR OF PHILOSOPHY

At the doctoral level, students may specialize in one of two concentrations: learning or instructional technology. All application materials should be received at least three

months prior to the semester in which the applicant wishes to begin study.

See "Doctor of Philosophy," page 101, for information on the Ph.D. degree.

### RESEARCH ACTIVITY

Faculty maintain an active program of research and development that has been supported with funds from federal agencies and the university. General research areas include investigations dealing with instructional effectiveness and educational motivation. Doctoral students participate actively in research and development activities as an integral part of their degree programs. Learning research includes studies of spatial cognition, organization and memory for prose materials, knowledge structures, the effects of extra linguistics factors on learning and memory, and training research and evaluation.

### LEARNING AND INSTRUCTIONAL TECHNOLOGY (LNT)

**LNT 501 Foundations of Educational Technology.** (3) F, S  
 Introduction to instructional development. An examination of accomplishments and problems in the field.

**LNT 502 Design and Development of Instruction.** (3) F, S  
 Design, development, and formative evaluation of objectives-based instructional materials.

**LNT 503 Research Techniques for Instructional Development.** (3) F  
 Procedures for analyzing the effects of alternative instructional practices.

**LNT 504 Educational Evaluation.** (3) S  
 Evaluation procedures in instruction and training.

**LNT 510 Essentials of Classroom Learning.** (3) F, S, SS  
 Theoretical and empirical foundations of learning in the classroom milieu. Critical exposure to research and method in instructional psychology. Cross-listed as EDP 510. Credit is allowed for only EDP 510 or LNT 510.

**LNT 520 Development of Technology-Based Interactive Instruction.** (3) S  
 Procedures for developing effective instructional and training programs for delivery by computer. Lecture, lab. Prerequisite: LNT 502.

**LNT 530 Educational Technology and Training.** (3) S  
 Applications of educational technology to training and performance systems in business and industry. Lecture, lab. Prerequisites: LNT 501, 502, 540.

**LNT 540 Theoretical Views of Learning.** (3) F, S  
 Classical and cognitive theories of learning, plus recent orientations. Illustrative experimental and rational foundations; implications for educational practice. Cross-listed as EDP 540. Credit is allowed for only EDP 540 or LNT 540.

**LNT 542 The Psychology of Learning and Instruction.** (3) S  
 Critical review and evaluation of research on learning variables relevant to acquisition and retention of instructional materials. Lab. Cross-listed as EDP 542. Credit is allowed for only EDP 542 or LNT 542.

**LNT 545 Foundational Studies in Language and Learning.** (3) S  
 Historical developments in research relating cognitive models to the instructional process in language learning. Prerequisites: EDP 552; LNT 540 or instructor approval.

**LNT 584 Educational Technology Internship.** (1-6) F, S, SS  
 Prerequisites: LNT 501, 502; instructor approval. Pre- or corequisite: EMC 521.

**LNT 780 Advanced Instructional Development.** (1-3) S  
 Conducting and documenting selected instructional development activities. Prerequisites: LNT 502; instructor approval.

**LNT 792 Advanced Instructional Research.** (3) F  
 Design and execution of instructional research on selected topics. Prerequisites: LNT 503; instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Mass Communication

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 www.asu.edu/cronkite/masscom.html

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### PROFESSORS

ANDERSON, CRAFT, CRONKITE, DOIG, GODFREY,  
 HALVERSON, MERRILL, SYLVESTER, WATSON, YOUIM

### ASSOCIATE PROFESSORS

ALLEN, BRAMLETT-SOLOMON, GALICIAN, HOY, LENTZ,  
 MATERA, RUSSELL

### ASSISTANT PROFESSORS

BARRETT, GORMLY, RUSSOMANNO

### CLINICAL ASSOCIATE PROFESSORS

ITULE, LEIGH

### LECTURERS

CASAVANTES, NICHOLS

## MASTER OF MASS COMMUNICATION

The faculty in the Walter Cronkite School of Journalism and Telecommunication offer a graduate program leading to the professional degree Master of Mass Communication (M.M.C.). The program is designed to help students achieve academic and professional growth, to prepare students for positions in the mass media, and to provide a background to enable persons currently in the media to advance their careers.

**Admission.** In addition to the general requirements for admission to the Graduate College, the M.M.C. program requires applicants to provide three letters of recommendation (including two from professors in the last unit of study from degree-granting institutions), scores on either the GRE (verbal and quantitative) or the MAT, a biographical sketch that includes all professional media experience, and a 250–500 word statement outlining career aspirations that could be enhanced by admission to the program (the statement is also used as a writing sample). The applicant's undergraduate GPA, letters of recommendation, test scores, and professional media experience are all considered in the admission process. A TOEFL score of 600 or higher is required of all applicants whose native language is not English. Applicants wishing to enroll for fall semester must have all their application materials submitted by March 1.

**Admission Classification.** Applicants who have an undergraduate degree in an area of mass communication, who meet all other requirements, and who receive regular admission may begin in the program in either the fall or spring semester. A two-year program is designed for applicants who have an undergraduate degree in a discipline other than mass communication. The program consists of 45 semester hours. The first-year courses are designed to provide a foundation in journalism knowledge and skills and must be taken

in prescribed sequence. Some first-semester courses are prerequisites for courses to be taken in subsequent semesters.

**Registration.** Registration in courses numbered 500 is limited to students who have been admitted to the M.M.C. program or have approval from the instructor of the class. Non-degree graduate students may not register for 500-level courses in the School of Journalism and Telecommunication during early registration. Undergraduate students wishing to reserve graduate course credit must follow Graduate College guidelines and obtain approval from the director of graduate studies.

**Program of Study.** The program consists of 36 semester hours of graduate credit for students with undergraduate degrees in the areas of mass communication. Requirements are as follows:

1. 12 hours of core course work,
2. six to 12 hours of specialization courses,
3. nine to 15 hours of a related area outside the school, and
4. three hours of supervised applied project (MCO 593).

The program consists of 45 semester hours of credit for students with undergraduate degrees in areas other than mass communication. Requirements are as follows:

1. 15 hours of core course work,
2. 12 hours of specialization courses,
3. six hours of mass communication writing skills courses,
4. nine hours of a related area outside the school, and
5. three hours of supervised applied project (MCO 593).

**Foreign Language Requirements.** None.

**Thesis Requirements.** None.

**Final Examinations.** An oral examination in defense of the supervised research or creative project is required.

## RESEARCH AND CREATIVE ACTIVITY

Research activities in the School of Journalism and Telecommunication complement its teaching and service missions. Research interests of faculty are varied. The school encourages inquiry into mass communication problems and issues by drawing upon diverse approaches, including legal, historical, and quantitative methods. Faculty are involved in creative activity and research for both academic and professional publication. Recent and current projects include technological effects on the mass media, effects of U.S. Supreme Court decisions on the mass media, media portrayal of the elderly, perceptions of good news and bad news on television, and media and minorities.

In addition to publications in journals on varied research projects, the following titles of faculty-written books represent a diversity of interest areas: *Business Management of Consumer Magazines*; *Contemporary Sports Reporting*; *Photojournalism: The Visual Approach*; *Target: Cancer*; *The Practice of Newspaper Management*; *Electronic Age News Editing*; *The Gene Age*; *A "Washington Merry-Go-Round" of Libel Actions*; *News Writing and Reporting for Today's Media*; *Contemporary News Reporting*; *Visual Editing: A Graphic Guide for Journalists*; *Symbols, the*

*News Magazines, and Martin Luther King; Eisenhower and the Mass Media; Reruns on File: A Guide to Electronic Media Archives; Press Law in South Korea; and The Healing Blade: A Tale of Neurosurgery.*

### JOURNALISM (JRN)

#### JRN 401 Public Relations Techniques. (3) F, S

Theory and practice of publicity, public relations, and related techniques and procedures. Prerequisites: JRN 301 (or TCM 315); major.

#### JRN 412 Editorial Interpretation. (3) N

The press as an influence on public opinion. The role of the editorial in analyzing and interpreting current events. Prerequisite: JRN 301.

#### JRN 413 Advanced Editing. (3) F, S

Theory and practice of newspaper editing, layout and design, picture, and story selection. Prerequisite: JRN 313.

#### JRN 414 Electronic Publication Design. (3) F, S

Theory, organization, and practice of layout, typography, and design in traditional and multimedia publishing. Prerequisite: JRN 401.

#### JRN 415 Writing for Public Relations. (3) F, S

Development of specific writing techniques for the practitioner in public relations agencies and divisions of major organizations. Prerequisite: JRN 401.

#### JRN 417 Public Relations Campaigns. (3) F

Theory, principles, and literature of public relations and how they relate to audiences, campaigns, and ethics. Prerequisites: JRN 401, 415; instructor approval.

#### JRN 420 Reporting Public Affairs. (3) F, S

Instruction and assignments in reporting the courts, schools, government, city hall, social problems, and other areas involving public issues. Prerequisite: JRN 301.

#### JRN 440 Magazine Writing. (3) F, S

Writing and marketing magazine articles for publication. Prerequisite: JRN 301 or instructor approval.

#### JRN 451 Photojournalism II. (3) F, S

Theory and practice of photojournalism with emphasis on shooting, lighting, and layout for the media. Prerequisite: JRN 351.

#### JRN 452 Photojournalism III. (3) F, S

Advanced theory and practice of photojournalism with emphasis on the photo essay and illustrations in black and white and color. 2 hours lecture, 2 hours lab. Prerequisite: JRN 451.

#### JRN 465 Precision Journalism. (3) S

An advanced writing course with focus on reporting polls and surveys and other numerically-based stories as well as on understanding the concepts that underlie polls and surveys. Lecture, lab. Prerequisite: JRN 301 or instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### MASS COMMUNICATION (MCO)

#### MCO 402 Mass Communication Law. (3) F, S, SS

Legal aspects of the rights, privileges, and obligations of the press, radio, and television. Prerequisite: 70 earned semester hours. *General Studies: L2.*

#### MCO 418 History of Mass Communication. (3) F, S

American journalism from its English and colonial origins to the present day. Development and influence of newspapers, magazines, radio, television, and news gathering agencies. *General Studies: SB, H.*

#### MCO 421 News Problems. (3) S

Trends and problems of the news media, emphasizing editorial decisions in the processing of news. Prerequisite: 9 hours of mass communication/journalism/telecommunication courses or instructor approval.

#### MCO 430 International Mass Communication. (3) F, S

Comparative study of communication and media systems. Information gathering and dissemination under different political and cultural systems. *General Studies: G.*

#### MCO 450 Visual Communication. (3) F, S, SS

Theory and tradition of communication through the visual media with emphasis on the continuity of traditions common to modern visual media. *General Studies: HU.*

#### MCO 456 Political Communication. (3) F, S

Theory and research related to political campaign communication. The persuasive process of political campaigning, the role of the media, the candidate, and image creation. *General Studies: SB.*

#### MCO 460 Race, Gender, and Media. (3) S

Readings seminar designed to give students a probing examination of the interface between AHANA Americans and the mass media in the United States. *General Studies: C.*

#### MCO 463 Introduction to Media Statistics. (3) F, S

An introduction to statistical analysis as applied to the mass media. Prerequisite: professional status in Broadcasting or Journalism.

#### MCO 501 Newswriting and Reporting. (3) F

Designed for graduate students in the MMC program who have undergraduate degrees in nonjournalism areas. Objective is to teach fundamentals of writing and reporting. Lecture, lab. Prerequisite: acceptance into M.M.C. graduate program.

#### MCO 503 Press Freedom Theory. (3) S

Examination of philosophical and legal aspects of press freedom. Emphasis on First Amendment theory evolution from 1791 to present.

#### MCO 510 Research Methodology in Mass Communication. (3) F, S

Identification of research problems in mass communication. Overview of questionnaire construction. Attention to survey, historical, content analysis, experimental, and legal research methods.

#### MCO 520 Mass Communication Theories and Process. (3) F

Analysis of various theoretic models of mass communication with emphasis on the applications of these theories to various professional communication needs.

#### MCO 522 Mass Media and Society. (3) S

Mass media as social institutions, particularly interaction with government and public. Emphasis on criticism and normative statements.

#### MCO 530 Media Ethics. (3) F

Ethical conventions and practices of print and electronic media as they relate to the government and private sectors of the society.

#### MCO 531 Broadcast Journalism. (3) S

News and information practices of networks, stations, and industry. Practice in writing, reporting, and editing with emphasis on video. Lecture, lab. Prerequisite: MCO 501.

#### MCO 540 Historical/Legal Methods. (3) S

Introduction to legal and historical methods necessary to conduct qualitative mass communication research. Prerequisite: MMC graduate student.

#### MCO 560 Arizona Media Law. (3) F 2000

Case study approach of first amendment issues, media access, libel, confidentiality, and invasion of privacy as applied to media organizations in Arizona. Lecture, seminar.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### TELECOMMUNICATION (TCM)

#### TCM 433 Broadcast Sales and Promotion. (3) F, S

Basics of electronic media marketing practices, including commercial time sales techniques and radio/TV promotion fundamentals. Prerequisite: TCM 200.

#### TCM 435 Cable TV and Emerging Telecommunication Systems. (3) F, S

Structures and utilization of cable, industrial, and instructional television, satellite, and videocassettes. Prerequisite: TCM 200.

#### TCM 437 Advanced TV Production. (3) F, S

Emphasis on individual production projects of the student's own conception and design utilizing studio, field, and postproduction techniques. Prerequisite: TCM 235.

#### TCM 472 Broadcast Station Management. (3) F, S, SS

Management principles and practices, including organization, procedures, policies, personnel problems, and financial aspects of station management. Prerequisite: TCM 332.

#### TCM 475 Television Newscast Production. (3) F, S

Writing, reporting, and production of the television newscast. The course serves as the capstone of the broadcast journalism emphasis. Prerequisite: instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Mathematics

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### REGENTS' PROFESSOR TROTTER

#### PROFESSORS

ARMBRUSTER, BREMNER, BUSTOZ, FELDSTEIN,  
 GARDNER, HELTON, HOPPENSTEADT, IHRIG,  
 JACKIEWICZ, JACOBOWITZ, KADELL, KAWSKI,  
 KIERSTEAD, KOSTELICH, KUANG, KUIPER, LEONARD,  
 McDONALD, MITTELMANN, NICOLAENKO, QUIGG,  
 RENAUT, RINGHOFER, H.A. SMITH, H.L. SMITH, THIEME,  
 WEISS, YOUNG

#### ASSOCIATE PROFESSORS

BAER, BARCELO, BLOUNT, CHILDRESS, DRISCOLL, FAN,  
 FARMER, HASSETT, HURLBERT, J. JONES, KOSTELICH,  
 KURTZ, LOHR, LOPEZ, MAHALOV, McCARTER, MOORE,  
 SPIELBERG, SWIMMER, TAYLOR, TURNER, WELFERT

#### ASSISTANT PROFESSORS

CARLSON, GELB, D. JONES, KALISZEWSKI, NIKITIN,  
 PREWITT, ZANDIEH, ZUO

The faculty in the Department of Mathematics offer graduate programs leading to the M.A. and Ph.D. degrees in Mathematics.

The faculty also participate in the program leading to the Master of Natural Science degree when one of the concentrations is mathematics.

In addition, the faculty participate in the interdisciplinary program leading to the M.S. degree in Statistics (see "Statistics," page 294).

It is recommended but not required that students applying to one of these programs submit scores on the Graduate Record Examination.

Students in the College of Education admitted to the Master of Education (see "Master of Education," page 174) or Doctor of Education (see "Doctor of Education," page 175) degree program in Secondary Education may elect mathematics as the subject matter field. These programs are offered and administered through the College of Education.

### MASTER OF ARTS

This degree is designed for students who wish to extend their knowledge of mathematics or prepare for certain careers related to mathematics. In order to be admitted without deficiencies, the student's background should include an undergraduate mathematics major or an equivalent preparation such as may be obtained in certain undergraduate programs in engineering or the sciences. In particular, it is required that the student's preparation include courses in linear algebra and foundations of analysis. A certain degree

of familiarity with computer languages may also be required for some areas of study.

Students pursuing the M.A. degree in Mathematics may choose one of the following areas: general mathematics, applied mathematics, statistics and probability, and computational mathematics. Information concerning the requirements for each area may be obtained from the Department of Mathematics.

See "Master's Degrees," page 98, for general requirements.

**Program of Study.** The program of study, including courses in mathematics and related subjects, is selected with the recommendation of the student's supervisory committee. Ordinarily, a program of study consists of a minimum of 30 semester hours.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** A written comprehensive examination is required. For details inquire in the Department of Mathematics.

**Thesis Requirements.** A thesis is required.

**Final Examinations.** A final oral examination in defense of the thesis is required.

### MASTER OF NATURAL SCIENCE

The faculty of the Department of Mathematics participate in programs leading to the Master of Natural Science degree (see "Master of Natural Science," page 257). This degree is intended for the student who is interested in an interdisciplinary program with a major emphasis in mathematics and a minor emphasis in a related subject outside mathematics. The student's supervisory committee consists of two faculty members of the Department of Mathematics and one faculty member of the department in the related area. The supervisory committee designs a program of study of at least 36 semester hours that is appropriate for the type of interdisciplinary work the student wishes to pursue. For more information contact the Department of Mathematics.

### DOCTOR OF PHILOSOPHY

This degree is intended for the student with superior mathematical ability, emphasizing the development of creative scholarship and breadth and depth in background knowledge. Admission to the Ph.D. degree program is normally granted after completion of the master's degree.

See "Doctoral Degrees," page 100, for general requirements.

**Program of Study.** The program of study is selected with the recommendation of the student's supervisory committee.

**Qualifying Examinations.** Qualifying examinations are required. They test a student's mastery of basic material in two of the following five areas: algebra, differential equations, mathematical statistics, numerical methods, and real analysis. Normally, students entering the graduate program with a bachelor's degree take these qualifying examinations at the beginning of the third semester, and those entering with a master's degree at the beginning of the second semester. These examinations are given once each semester.

**Foreign Language Requirements.** A student is required to have a reading knowledge of a language other than English in which mathematics research is published.

**Comprehensive Examinations.** Written and oral comprehensive examinations are required.

**Dissertation Requirements.** A dissertation reporting significant, original research suitable for publication in a professional research journal is required. (See "Doctoral Dissertations," page 100.)

**Final Examinations.** A final oral examination in defense of the dissertation is required.

## RESEARCH ACTIVITY

Department members are actively engaged in research in the following areas: applied mathematics; mathematical physics; mathematical modeling; mathematical biology; mathematical neurobiology; bifurcation analysis; dynamical systems; control theory; nonlinear analysis; ordinary and partial differential equations; integral equations; computational mathematics; real, complex, and functional analysis; operator algebras; operator theory; algebra; number theory; topology; discrete mathematics; probability; theoretical and applied statistics; and mathematical education.

The department has several clusters of high-end UNIX workstations both for number-crunching and for graphics. Most students will do both class projects and their research computing on these computers. A number of PC and Macintosh computers are also available to students. In addition, all students have access to central computing facilities, which include IBM mainframes, UNIX clusters, and multiprocessor computers.

## MATHEMATICS (MAT)

### **MAT 410 Introduction to General Topology.** (3) A

Topological spaces, metric spaces, compactness, connectedness, and product spaces. Prerequisite: MAT 300 or 371 or instructor approval.

### **MAT 415 Introduction to Combinatorics.** (3) S

Topics include proof techniques, permutations, combinations; counting techniques including recurrence relations, generating functions, inclusion-exclusion; Ramsey theory and combinatorial designs. Prerequisites: MAT 300 (or 243) and 342 (or 242) or instructor approval.

### **MAT 416 Introduction to Graph Theory.** (3) S

Topics include trees, cycles, matchings, planarity, connectivity, hamiltonicity, colorings, graph algorithms, and other advanced topics. Prerequisites: MAT 300 (or 243) and 342 (or 242) or instructor approval.

### **MAT 419 Introduction to Linear Programming.** (3) S

Simplex method, duality, and network flows. Applications to game theory, geometry, combinatorics, graph theory, and posets. Prerequisites: CSE 100 (or 200 or 210); MAT 300 (or 243), 342 (or 242) or instructor approval. *General Studies: N2.*

### **MAT 420 Scientific Computing.** (3) F

Survey and application of programming languages, libraries, and scientific visualization tools. Programming assignments emphasize software development skills. Lecture, lab. Prerequisites: CSE 200 and MAT 274 and 342 or equivalents or instructor approval.

### **MAT 421 Applied Computational Methods.** (3) F, S

Numerical methods for quadrature, differential equations, roots of nonlinear equations, interpolation, approximation, linear equations, floating-point arithmetic, and roundoff error. Prerequisites: MAT 271 (or equivalent) and fluency in computer programming (preferably FORTRAN) or instructor approval. *General Studies: N3.*

### **MAT 423 Numerical Analysis I.** (3) F, S

Analysis and algorithms for numerical solutions linear/nonlinear equations, direct solvers, iterative procedures, optimization. Determination of eigenvalues. Elementary computer arithmetic. Prerequisites: MAT 342 and 371 and fluency in computer programming or instructor approval. *General Studies: N3.*

### **MAT 425 Numerical Analysis II.** (3) F, S

Analysis of and algorithms for numerical interpolation, integration, and differentiation. Numerical solution of ordinary differential equations, and method of lines. Those seeking a methods survey course should take MAT 421. Prerequisites: MAT 342 and 371 and fluency in computer programming or instructor approval. *General Studies: N3.*

### **MAT 427 Computer Arithmetic.** (3) S

Number systems, hardware/software arithmetic, overflow, significance, rounding, multiple precision, and automatic error control; impact on languages, architectures, robust programming, and software development. Prerequisite: CSE 100 (or 200) or MAT 421 and 423 (or MAT 425) or instructor approval. *General Studies: N3.*

### **MAT 442 Advanced Linear Algebra.** (3) F

Fundamentals of linear algebra, dual spaces, invariant subspaces, canonical forms, bilinear and quadratic forms, and multilinear algebra. Prerequisites: MAT 300 and 342 or instructor approval.

### **MAT 443 Introduction to Abstract Algebra.** (3) F

Introduction to concepts of abstract algebra. Not open to students with credit in MAT 444. Prerequisites: MAT 300 and 342 or instructor approval.

### **MAT 444 Intermediate Abstract Algebra.** (3) S

Basic theory of groups, rings, and fields, including an introduction to Galois theory. Appropriate as preparation for MAT 543. Prerequisites: MAT 300, 342.

### **MAT 445 Theory of Numbers.** (3) S

Prime numbers, unique factorization theorem, congruences, Diophantine equations, primitive roots, and quadratic reciprocity theorem. Prerequisites: MAT 300 and 342 or instructor approval.

### **MAT 451 Mathematical Modeling.** (3) S

A detailed study of 1 or more mathematical models that occur in the physical or biological sciences. May be repeated for credit with instructor approval. Prerequisites: MAT 242 (or 342) and 274 or instructor approval. *General Studies: N2.*

### **MAT 452 Introduction to Chaos and Nonlinear Dynamics.** (3) F

Properties of nonlinear dynamical systems; dependence on initial conditions; strange attractors; period doubling; bifurcations; symbolic dynamics; Smale-Birkhoff theorem; and applications. MAT 371 is recommended. Prerequisites: MAT 274, 342 (or 242).

### **MAT 455 Introduction to Fractals and Applications.** (3) S

Fractals; self-similar structures, fractals with iterated function systems of maps, computing fractals, fractal dimensions, chaotic dynamics on fractals, applications. MAT 371 is recommended. Prerequisites: MAT 274, 342 (or 242).

### **MAT 460 Applied Real Analysis.** (3) S

Vectors, curvilinear coordinates, Jacobians, implicit function theorem, line and surface integrals, Green's, Stokes', and divergence theorems. Not open to students with credit in MAT 372. Prerequisites: MAT 242 (or 342), 272, 274.

### **MAT 461 Applied Complex Analysis.** (3) F, SS

Analytic functions, complex integration, Taylor and Laurent series, residue theorem, conformal mapping, and harmonic functions. Prerequisite: MAT 272 or equivalent.

### **MAT 462 Applied Partial Differential Equations.** (3) S

Second order partial differential equations, emphasizing Laplace, wave, and diffusion equations. Solutions by the methods of characteristics, separation of variables, and integral transforms. Prerequisites: MAT 242 (or 342), 274.

### **MAT 472 Intermediate Real Analysis.** (3) F

Introduction to analysis in metric spaces with emphasis on the real line. Appropriate as preparation for MAT 570. Prerequisites: MAT 300, 342.

### **MAT 475 Differential Equations.** (3) F

Asymptotic behavior of solutions of linear and nonlinear ordinary differential equations, stability, Sturm-Liouville problems, boundary value problems, and singular point behavior of autonomous systems. Prerequisites: MAT 242 (or 342), 274.



**MAT 476 Partial Differential Equations.** (3) S

First order quasilinear, second order linear (wave, Laplace, heat). Characteristics, harmonic functions, maximum principles, Fourier series, separation of variables. Prerequisites: MAT 274 (or 475), 372 (or 472).

**MAT 485 History of Mathematics.** (3) N

Topics from the history of the origin and development of mathematical ideas. Prerequisite: MAT 272 or equivalent.

**MAT 505 Perturbation Methods.** (3) N

Nonlinear oscillations, strained coordinates, renormalization, multiple scales, boundary layers, matched asymptotic expansions, turning point problems, and WKBJ method. Cross-listed as MAE 505. Credit is allowed only for MAE 505 or MAT 505.

**MAT 510 Point Set Topology.** (3) F

Topological spaces, metric spaces, compactness, connectedness, local properties, product and decomposition spaces, mappings, covering properties, and separation properties. Prerequisite: MAT 371 or 410 or instructor approval.

**MAT 511 Point Set Topology.** (3) S

Continuation of MAT 510. Prerequisite: MAT 510 or instructor approval.

**MAT 514 Enumerative Combinatorics I.** (3) F

First semester of a systematic development of enumerative combinatorics including: elementary counting techniques, sieve methods, and partially ordered sets. Prerequisite: graduate standing or instructor approval.

**MAT 515 Enumerative Combinatorics II.** (3) S

Second semester of a systematic development of enumerative combinatorics including: lattices, exponential structures, symmetric functions, and selected special topics. Prerequisite: MAT 514 or instructor approval.

**MAT 516 Graph Theory I.** (3) F

First semester of a systematic development of graph theory including: matchings, connectivity, arboricity, planarity, coloring, network flows. Prerequisite: graduate standing or instructor approval.

**MAT 517 Graph Theory II.** (3) S

Second semester of a systematic development of graph theory including: dense and sparse graphs, Ramsey theory, hamiltonicity, random graphs, minors. Prerequisite: MAT 516 or instructor approval.

**MAT 518 Combinatorial Optimization I.** (3) F

First semester of a systematic development of combinatorial optimization including: linear programming, duality, primal-dual algorithms, network flow algorithms, weighted matchings. Prerequisite: graduate standing or instructor approval.

**MAT 519 Combinatorial Optimization II.** (3) S

Second semester of a systematic development of combinatorial optimization including: matroid algorithms, theory of NP-completeness, polynomial time approximation, dynamic programming. Prerequisite: MAT 518 or instructor approval.

**MAT 520 Numerical Linear Algebra.** (3) F

Direct solution of linear systems, iterative methods, eigenvalues and eigenvectors, singular value decomposition, the QR algorithm, error propagation, arithmetic, and stability. Prerequisites: MAT 342 and 423 (or 421) or instructor approval.

**MAT 521 Iterative Methods.** (3) S

Numerical methods for solving linear/nonlinear systems of equations (symmetric, nonsymmetric). Iterative methods for linear systems, conjugate gradients, multigrid methods, preconditioning, Krylov methods. Prerequisites: MAT 371 and 423 (or 421) or instructor approval.

**MAT 523 Numerical Optimization.** (3) N

Linear programming, unconstrained nonlinear minimization, line search algorithms, conjugate gradients, quasi-Newton methods, constrained nonlinear optimization, gradient projection, and penalty methods. Prerequisite: MAT 342 or 371 or 460 or 520 (or equivalent) or instructor approval.

**MAT 524 Parallel Numerical Algorithms.** (3) N

Algorithms for massively parallel, hypercube architectures; "parallel" FORTRAN; solution of linear, nonlinear systems; partial differential equations; iterative methods; multigrid; domain decomposition. Prerequisites: MAT 371 and 423 (or 421) or instructor approval.

**MAT 526 Numerical Solution of Bifurcation Problems.** (3) N

Nonlinear parameter-dependent differential, algebraic equations, numerical solutions; bifurcation, turning points; continuation methods, branch switching; steady-state, time-dependent cases; Hopf Bifurcation. Prerequisites: MAT 371 and 423 (or 421) or instructor approval.

**MAT 530 Numerical Solution of Ordinary Differential Equations.** (3) F

One step, linear multistep methods; consistency, order, stability, convergence; discretization, roundoff errors, error estimation, adaptive strategy; implementation, software for nonstiff equations. Prerequisites: MAT 371 and 423 (or 421) or instructor approval.

**MAT 531 Numerical Solution of Stiff Differential Systems.** (3) S

Runge-Kutta methods, order conditions, construction of highly stable methods, order stars, error estimation, stepsize selection, contractivity properties, linear multistep methods. Prerequisites: MAT 371 and 423 (or 421) or instructor approval.

**MAT 533 Computational Elliptic and Parabolic Partial Differential Equations.** (3) F

Parabolic and elliptic equations, finite difference, finite element methods, stability, consistency, convergence, practical aspects, applications, software. Prerequisites: MAT 371 and 423 (or 421) or instructor approval.

**MAT 534 Computational Hyperbolic Partial Differential Equations.** (3) S

Numerical solutions of hyperbolic PDEs, finite difference methods, well-posedness, stability, consistency, convergence, adaptive grids; Maxwell's equations, elastic wave propagation; Navier-Stokes. Prerequisites: MAT 371 and 423 (or 421) or instructor approval.

**MAT 535 Spectral Methods for Partial Differential Equations.** (3) N

Spectral, pseudo-spectral theory; Galerkin, collocation methods; Tau-methods, global approximation properties, stability; convergence; solutions for linear, nonlinear systems. Prerequisites: MAT 371 and 423 (or 421) or instructor approval.

**MAT 543 Abstract Algebra.** (3) F

Groups, modules, rings and fields, Galois theory, homological algebra, and the representation theory. Prerequisite: MAT 444 or instructor approval.

**MAT 544 Abstract Algebra.** (3) S

Continuation of MAT 543. Prerequisite: MAT 543 or instructor approval.

**MAT 550 Variational Methods.** (3) F

Calculus of variations and its applications to extremal problems, classical mechanics, and partial differential equations. Prerequisites: MAT 274 and 462 or equivalents.

**MAT 551 Linear Operators and Integral Equations.** (3) S

Bounded linear and compact operators on Hilbert spaces. Linear integral equations, Fredholm and Hilbert-Schmidt theory, and approximate methods. Distributions. Prerequisites: MAT 242 and 462 or equivalents.

**MAT 555 Fractal Geometry.** (3) N

Geometry and analysis of fractal sets; definitions of dimensions; calculating dimensions; projections, products of fractals; random fractals; multifractal measures; and applications. Prerequisites: MAT 371, 455. MAT 472 is recommended.

**MAT 570 Real Analysis.** (3) S

Lebesgue integration, selected function spaces, differentiation, abstract measure theory, and elements of functional analysis. Prerequisite: MAT 372 or instructor approval.

**MAT 571 Real Analysis.** (3) F

Continuation of MAT 570. Prerequisite: MAT 570 or instructor approval.

**MAT 572 Complex Analysis.** (3) F

Analytic functions, series and product representations, entire and meromorphic functions, normal families, Riemann mapping theorem, harmonic functions, and Riemann surfaces. Prerequisite: MAT 371 or instructor approval.

**MAT 573 Complex Analysis.** (3) S

Continuation of MAT 572. Prerequisite: MAT 572 or instructor approval.

**MAT 574 Theory of Ordinary Differential Equations.** (3) N

Systems, existence proofs, singularities, asymptotic behavior of solutions, boundedness of solutions, eigenvalues and eigenfunctions, and perturbation theory. Prerequisite: MAT 372 or instructor approval.

**MAT 575 Theory of Ordinary Differential Equations and Dynamical Systems.** (3) N

Geometric approach to ODEs and dynamical systems; (un)stable, center manifolds; structural stability; normal forms; averaging; chaos; persistence. May be repeated for credit with instructor approval. Prerequisites: MAT 452 and 475 or MAT 574 or instructor approval.

**MAT 576 Theory of Partial Differential Equations.** (3) N

Existence and uniqueness theorems, boundary value and initial value problems, characteristics, Green's functions, maximum principle, distributions, and weak solutions. Prerequisite: knowledge of Lebesgue integration or instructor approval.

**MAT 577 Theory of Partial Differential Equations.** (3) N

Continuation of MAT 576. Prerequisite: MAT 576 or instructor approval.

**MAT 578 Functional Analysis.** (3) N

Locally convex, normed, and Hilbert spaces. Linear operators, spectral theory, and application to classical analysis. Prerequisite: MAT 472 or 571 or instructor approval.

**MAT 579 Functional Analysis.** (3) N

Continuation of MAT 578. Prerequisite: MAT 578 or instructor approval.

**MAT 591 Seminar.** (1–3) N

Topics may be selected from the following:

- (a) Algebra
- (b) Analysis
- (c) Applied Mathematics
- (d) Combinatorial Mathematics
- (e) Mathematical Logic
- (f) Numerical Analysis
- (g) Topology

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**MATHEMATICS EDUCATION (MTE)****MTE 480 Mathematics in the Upper-Elementary Grades I.** (3) N

An introduction to probability and statistics, including open-ended data gathering and processing, counting techniques, sampling strategies, estimation, and decision making. Prerequisite: MTE 381 or instructor approval.

**MTE 481 Mathematics in the Upper-Elementary Grades II.** (3) N

Elementary functions and their applications. A thorough investigation of some of the algorithms of basic arithmetic. Prerequisite: MTE 480 or instructor approval.

**MTE 482 Methods of Teaching Mathematics in Secondary School.** (3) F, SS

Examination of secondary school curricular material and analysis of instructional devices. Teaching strategies, evaluative techniques, diagnosis, and remediation and problem solving. Prerequisite: instructor approval.

**MTE 483 Mathematics in the Secondary School.** (3) S, SS

Topics in geometry, number theory, algebra, and analysis. Emphasis on unifying principles. Prerequisite: MAT 310 or instructor approval.

**MTE 582 Modern Mathematics for Teachers.** (3) N

Theory of sets, real number system, transfinite numbers, and other selected topics. Prerequisite: instructor approval.

**MTE 583 Abstract Algebra for Teachers.** (3) N

Postulational approach to algebra and elementary mathematical systems, including groups and fields. Prerequisite: instructor approval.

**MTE 585 Modern Geometry for Teachers.** (3) A

Euclidean, projective, and non-Euclidean geometries. Prerequisite: instructor approval.

**MTE 587 Analysis for Teachers.** (3) N

Subject matter in mathematics appropriate for accelerated programs in secondary schools, including analytic geometry and calculus. Prerequisite: instructor approval.

**MTE 588 Analysis for Teachers.** (3) N

Continuation of MTE 587. Prerequisite: MTE 587 or instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**STATISTICS AND PROBABILITY (STP)****STP 420 Introductory Applied Statistics.** (3) F, S, SS

Introductory probability, descriptive statistics, sampling distributions, parameter estimation, tests of hypotheses, chi-square tests, regression analysis, analysis of variance, and nonparametric tests. Prerequisite: MAT 117 or equivalent. *General Studies:* N2.

**STP 421 Probability.** (3) F

Laws of probability, combinatorial analysis, random variables, probability distributions, expectations, moment generating functions, transformations of random variables, and central limit theorem. Prerequisites: MAT 300 and STP 420 or equivalents.

**STP 425 Stochastic Processes.** (3) S

Markov chains, stationary distributions, pure jump processes, 2D order processes, and other topics in stochastic processes. Prerequisites: MAT 342; STP 421.

**STP 427 Mathematical Statistics.** (3) S

Limiting distributions, interval estimation, point estimation, sufficient statistics, and tests of hypotheses. Prerequisite: STP 421.

**STP 429 Experimental Statistics.** (3) S

Statistical inference for controlled experimentation. Multiple regression, correlation, analysis of variance, multiple comparisons, and nonparametric procedures. Prerequisite: STP 420 or equivalent. *General Studies:* N3.

**STP 525 Advanced Probability.** (3) N

Measure-theoretic foundations of probability, distribution functions and characteristic functions, laws of large numbers and central limit theorems, conditional probabilities, martingales, and topics in stochastic processes. Prerequisites: MAT 571 and STP 421 or instructor approval.

**STP 526 Theory of Statistical Linear Models.** (3) F

Multinomial distribution, distribution of quadratic forms, full and nonfull rank models, generalized inverses, unbalanced data, variance components, and the large sample theory. Prerequisites: STP 427; knowledge of matrix algebra.

**STP 530 Applied Regression Analysis.** (3) F

Method of least squares, simple and multiple linear regression, polynomial regression, analysis of residuals, dummy variables, and model building. Prerequisite: STP 420 or equivalent.

**STP 531 Applied Analysis of Variance.** (3) S

Factorial designs, balanced and unbalanced data, fixed and random effects, randomized blocks, Latin squares, analysis of covariance, and multiple comparisons. Prerequisite: STP 420 or equivalent.

**STP 532 Applied Nonparametric Statistics.** (3) F

One sample test, tests of 2 or more related or independent samples, measures of correlation, and tests of trend and dependence. Prerequisite: STP 420 or equivalent.

**STP 533 Applied Multivariate Analysis.** (3) S

Discriminant analysis, principal components, factor analysis, cluster analysis, and canonical correlation. Prerequisite: STP 420 or equivalent.

**STP 534 Applied Discrete Data Analysis.** (3) N

Models for discrete and count data, measures of association, and log-linear and regression models for contingency tables. Prerequisite: STP 420 or equivalent.

**STP 535 Applied Sampling Methodology.** (3) S

Simple random, stratified, cluster sampling; variance estimation in complex surveys; nonparametric superpopulation approaches; nonresponse models; computational methods. Prerequisite: STP 420 or equivalent.

**STP 591 Seminar.** (1–3) N

Topics may be selected from the following:

- (a) Probability
- (b) Statistics

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Mechanical Engineering

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### PROFESSORS

BOYER, DAVIDSON, EVANS, FERNANDO, JANKOWSKI,  
 KRAJCINOVIC, PECK, ROY, SHAH, SIERADZKI,  
 TSENG, YAO

### ASSOCIATE PROFESSORS

CHEN, KUO, SQUIRES

### ASSISTANT PROFESSORS

CHAPSKY, McNEILL, PERALTA, PHELAN

The faculty in the Department of Mechanical and Aerospace Engineering offer graduate programs leading to the degrees of M.S., Master of Science in Engineering, and Ph.D. in Mechanical Engineering. A number of areas of study may be pursued, including design and manufacturing, dynamics and control, energy systems, engineering mechanics, and thermosciences.

The faculty also offer graduate degree programs in Aerospace Engineering.

All of the department's graduate programs stress a sound foundation in fundamentals leading to a specialized area of study.

**Graduate Record Examination.** All applicants are required to take the Graduate Record Examination; the subject test in engineering is highly recommended but not required.

### MASTER OF SCIENCE

See "Master's Degrees," page 98, for general requirements.

### MASTER OF SCIENCE IN ENGINEERING

See "Master of Science in Engineering," page 182, for information on the Master of Science in Engineering degree.

### DOCTOR OF PHILOSOPHY

The Ph.D. degree is conferred upon evidence of excellence in research leading to a scholarly dissertation that is an original contribution to knowledge in the field of mechanical engineering.

See "Doctoral Dissertations," page 100, for general requirements.

**Program of Study.** The program of study must be established no later than the first semester after successfully completing the qualifying examination.

**Qualifying Examinations.** The purposes of the qualifying criteria are to assess if the student is qualified to continue in the doctoral program and to detect deficiencies in the stu-

dent's background that can be corrected by appropriate course work and individual study. Within the first year of graduate studies at ASU, a graduate student pursuing a Ph.D. program of study in Mechanical Engineering must complete three 500-level core courses, preferably in the major area of interest, and one 500-level mathematics course, both with an average GPA of 3.25 or higher. Specific qualifying course requirements for each major area are available from the department.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Written and oral comprehensive examinations are required. The examinations are administered by the program committee.

**Dissertation Requirements.** A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required.

**Final Examinations.** A final oral examination in defense of the dissertation is required.

### RESEARCH ACTIVITY

The department has established a wide variety of theoretical and experimental research programs in mechanical engineering to prepare graduate students for careers with industry, universities, and government agencies. The faculty are informally organized into groups pursuing research topics directly related to the general improvement of knowledge in engineering fields or to the application of engineering principles to problems with high national priorities.

Some recent and current examples of faculty and student research projects include studies in aerospace vehicle dynamics, guidance, and control; laser diagnostics in combustion; solar energy systems; modeling and optimal design of rotor-bearing systems; feature-based modeling; design automation; expert systems for manufacturing; concurrent engineering; kinematic geometry of mechanisms and robots; modeling and control of robots for manufacturing; infrared detection of surface defects; development of finite element models; acoustic fatigue; noise control; failure analysis and life predictions; crystal growth; fluid mechanics; metal cutting; transonic airfoil design; hydrodynamic stability; turbulence modeling; numerical modeling of reacting flows; robotics; magnetic bearing development; thermionics; experimental and analytical studies in two-phase flow; convective heat transfer in complex flows and turbine cooling; unsteady aerodynamics; nonlinear waves; perturbation methods; turbulent mixing in stratified flows; double diffusive instabilities; internal waves and internal gravity currents; topography effects in rotating and stratified flows; experimental and analytical studies on pulverized-coal combustion; pollutant formation and spray burning; combustion diagnostics and modeling of continuous flow combustion.

Experimental investigations are carried out in a number of specialized facilities: computer-aided engineering and expert systems laboratory, computer-aided design/computer-aided manufacturing laboratory, combustion laboratory, composite materials laboratory, direct energy conversion laboratory, dynamics and controls laboratory, heat transfer laboratory, laser diagnostics laboratory, hydrodynamic stability laboratory, robotics laboratory, solar energy laboratory, stratified flow laboratory, rotating flow laboratory, supersonic wind tunnel laboratory, thermoscience

laboratory, unsteady wind tunnel facility, fatigue crack growth at metal/metal and metal/ceramic interfaces, fatigue damage of thin films and nanolayered composites, texture effects on cyclic behavior of polycrystalline metals, mechanical properties of structural silicides, and vibrations laboratory. Equipment fabrication is supported by the college's well-equipped Development Shop, which has a staff of machinists and electronic technicians.

### Computer Resources and Facilities

Mechanical Engineering graduate education and research is supported by an extensive array of college- and university-supported computer hardware and software, in addition to laboratory minicomputers and microcomputers. ASU operates an IBM ES9000-732, an IBM 3090-300E, a VAX 6000-634, a MASPAR-MP-2, and a cluster of four IBM RISC-6000 substations, which are available to support graduate research. The College of Engineering and Applied Sciences supports a Convex C220, one Motorola 8640, one DEC VAX, a SPARC 2000, and many minicomputers and microcomputers. All of these machines are available for use by the engineering faculty and students for classroom and research work. The ASU Computing Commons is equipped with three IBM RS/6000-590, one MASPAR, several DEC VAX 5000, numerous Sun Sparc servers, and many other platforms. Access to these computers is via the ASU Advanced Communications Support System (ACSS) broadband network as well as dial-in lines. The university also operates microcomputer sites with more than 400 IBM and Apple Macintosh systems.



Students bask on the steps of the light well, above Hayden Library's entrance.

Tim Trumble photo

## MECHANICAL AND AEROSPACE ENGINEERING (MAE)

### MAE 402 Introduction to Continuum Mechanics. (3) A

Application of the principles of continuum mechanics to such fields as flow-in porous media, biomechanics, electromagnetic continua, and magneto-fluid mechanics. Prerequisites: ECE 313; MAE 361 (or 371); MAT 242 (or 342).

### MAE 404 Finite Elements in Engineering. (3) A

Introduction to ideas and methodology of finite element analysis. Applications to solid mechanics, heat transfer, fluid mechanics, and vibrations. Prerequisites: ECE 313; MAT 242 (or 342).

### MAE 406 CAD/CAM Applications in MAE. (4) A

Solution of engineering problems with the aid of state-of-the-art software tools in solid modeling, engineering analysis, and manufacturing; selection of modeling parameters; reliability tests on software. 3 hours lecture, 3 hours lab. Prerequisites: MAE 441; instructor approval.

### MAE 417 Control System Design. (3) A

Tools and methods of control system design and compensation, including simulation, response optimization, frequency domain techniques, state variable feedback, and sensitivity analysis. Introduction to nonlinear and discrete time systems. Prerequisite: MAE 317.

### MAE 433 Air Conditioning and Refrigeration. (3) A

Air conditioning processes; environmental control; heating and cooling loads; psychrometry; refrigeration cycles. Prerequisite: MAE 388 or MET 432 or instructor approval.

### MAE 434 Internal Combustion Engines. (3) A

Performance characteristics, combustion, carburetion and fuel-injection, and the cooling and control of internal combustion engines. Computer modeling. Lab. Prerequisite: MAE 388.

### MAE 435 Turbomachinery. (3) A

Design and performance of turbomachines, including steam, gas and hydraulic turbines, centrifugal pumps, compressors, fans, and blowers. Pre- or corequisite: MAE 361 or 371.

### MAE 436 Combustion. (3) A

Thermochemical and reaction rate processes; combustion of gaseous and condensed-phase fuels. Applications to propulsion and heating systems. Pollutant formation. Prerequisite: MAE 388.

### MAE 447 Robotics and Its Influence on Design. (3) A

Robot applications, configurations, singular positions, and work space; modes of control; vision; programming exercises; design of parts for assembly. Prerequisite: MAE 317.

### MAE 455 Polymers and Composites. (3) F

Relationship between chemistry, structure, and properties of engineering polymers. Design, properties, and behavior of fiber composite systems. Cross-listed as MSE 470. Credit is allowed for only MAE 455 or MSE 470. Prerequisite: ECE 350.

### MAE 462 Space Vehicle Dynamics and Control. (3) F

Attitude dynamics and control, launch vehicles, orbital mechanics, orbital transfer/rendezvous, space mission design, space structures, spacecraft control systems design. Prerequisite: MAE 317.

### MAE 463 Propulsion. (3) A

Fundamentals of gas-turbine engines and design of components. Principles and design of rocket propulsion and alternative devices. Lecture, design projects. Prerequisite: ECE 386. Pre- or corequisite: MAE 361 (or 371).

### MAE 465 Rocket Propulsion. (3) A

Rocket flight performance; nozzle design; combustion of liquid and solid propellants; component design; advanced propulsion systems; interplanetary missions; testing. Prerequisite: MAE 361 or 371.

### MAE 466 Rotary Wing Aerodynamics and Performance. (3) A

Introduction to helicopter and propeller analysis techniques. Momentum, blade-element, and vortex methods. Hover and forward flight. Ground effect, autorotation, and compressibility effects. Prerequisites: ECE 386 and MAE 361 or instructor approval.

### MAE 467 Aircraft Performance. (3) A

Integration of aerodynamic and propulsive forces into aircraft performance design. Estimation of drag parameters for design. Engine, airfoil selection. Conceptual design methodology. Lecture, design projects. Prerequisite: MAE 361 or 371. Pre- or corequisite: MAE 441.

### MAE 469 Projects in Astronautics or Aeronautics. (3) F, S

Various multidisciplinary team projects available each semester. Projects include design of high-speed rotocraft autonomous vehicles, liquid-fueled rockets, micro-aerial vehicles, satellites. Prerequisite: instructor approval.

**MAE 471 Computational Fluid Dynamics.** (3) A

Numerical solutions for selected problems in fluid mechanics. Prerequisites: ECE 384; MAE 361 (or 371).

**MAE 504 Laser Diagnostics.** (3) S

Fundamentals of optics and the interaction of light with matter. Laser sources, laser spectroscopy, velocimetry, particle sizing, and surface characterization.

**MAE 505 Perturbation Methods.** (3) N

Nonlinear oscillations, strained coordinates, renormalization, multiple scales, boundary layers, matched asymptotic expansions, turning point problems, and WKBJ method. Cross-listed as MAT 505. Credit is allowed for only MAE 505 or MAT 505.

**MAE 506 Advanced System Modeling, Dynamics, and Control.** (3) S

Lumped-parameter modeling of physical systems with examples. State variable representations and dynamic response. Introduction to modern control. Prerequisite: ASE 582 or MAT 442.

**MAE 507 Optimal Control.** (3) F

Optimal control of systems. Calculus of variations, dynamic programming, linear quadratic regulator, numerical methods, and Pontryagin's principle. Cross-listed as EEE 587. Credit is allowed for only EEE 587 or MAE 507. Prerequisite: EEE 482 or MAE 506.

**MAE 509 Robust Multivariable Control.** (3) S

Characterization of uncertainty in feedback systems, robustness analysis, synthesis techniques, multivariable Nyquist criteria, computer-aided analysis and design. Prerequisites: MAE 417, 506.

**MAE 510 Dynamics and Vibrations.** (3) F

Lagrange's and Hamilton's equations, rigid body dynamics, gyroscopic motion, and small oscillation theory.

**MAE 511 Acoustics.** (3) F

Principles underlying the generation, transmission, and reception of acoustic waves. Applications to noise control, architectural acoustics, random vibrations, and acoustic fatigue.

**MAE 512 Random Vibrations.** (3) S

Review of probability theory, random processes, stationarity, power spectrum, white noise process, random response of single and multiple DOF systems, and Markov processes simulation. Prerequisite: MAE 510 or instructor approval.

**MAE 515 Structural Dynamics.** (3) S

Free vibration and forced response of discrete and continuous systems, exact and approximate methods of solution, finite element modeling, and computational techniques. Prerequisite: MAE 510 or instructor approval.

**MAE 517 Nonlinear Oscillations.** (3) F

Existence, stability, and bifurcation of solutions of nonlinear dynamical systems. Methods of analysis of regular and chaotic responses. Prerequisite: MAE 510 or instructor approval.

**MAE 518 Dynamics of Rotor-Bearing Systems.** (3) S

Natural whirl frequency, critical speed, and response analysis of rigid and flexible rotor systems. Bearing influence and representation. Stability analysis. Methods of balancing.

**MAE 520 Solid Mechanics.** (3) F

Introduction to tensors: kinematics, kinetics, and constitutive assumptions leading to elastic, plastic, and viscoelastic behavior. Applications.

**MAE 521 Structural Optimization.** (3) N

Linear and nonlinear programming. Problem formulation. Constrained and unconstrained optimization. Sensitivity analysis. Approximate techniques. FEM-based optimal design of mechanical and aerospace structures. Cross-listed as CEE 533. Credit is allowed for only CEE 533 or MAE 521. Prerequisite: instructor approval.

**MAE 522 Variational Principles of Mechanics.** (3) S

Virtual work, stationary, and complementary potential energies. Hamilton's principle. Application of these and direct methods to vibrations, elasticity, and stability. Prerequisite: MAE 520 or equivalent.

**MAE 523 Theory of Plates and Shells.** (3) F

Linear and nonlinear theories of plates. Membrane and bending theories of shells. Shells of revolution. Prerequisite: MAE 520.

**MAE 524 Theory of Elasticity.** (3) S

Formulation and solution of 2- and 3-dimensional boundary value problems. Prerequisite: MAE 520.

**MAE 527 Finite Element Methods in Engineering Science.** (3) F

Discretization, interpolation, elemental matrices, assembly, and computer implementation. Application to solid and fluid mechanics, heat transfer, and time dependent problems. Prerequisite: ASE 582.

**MAE 536 Combustion.** (3) N

Thermodynamics; chemical kinetics of combustion. Explosion and ignition theories. Reactive gas dynamics. Structure, propagation, and stability of flames. Experimental methods. Prerequisite: MAE 436 or instructor approval.

**MAE 540 Advances in Engineering Design Theory.** (3) F

Survey of research in engineering design process, artifact and design, knowledge, formal and informal logic, heuristic and numerical searches, theory of structure and complexity. Prerequisite: graduate standing.

**MAE 541 CAD Tools for Engineers.** (3) F

Elements of computer techniques required to develop CAD software. Data structures, including lists, trees, and graphs. Computer graphics, including 2- and 3-dimensional algorithms and user interface techniques.

**MAE 542 Geometric Modeling in CAD/CAM.** (3) S

Geometric and solid modeling, curve and surface design, CAD database architectures, and integration of solid modeling into engineering processes. Prerequisite: MAE 541 or instructor approval.

**MAE 544 Mechanical Design and Failure Prevention.** (3) F

Modes of mechanical failure; application of principles of elasticity and plasticity in multiaxial state of stress to design synthesis; failure theories; fatigue; creep; impact. Prerequisite: MAE 443.

**MAE 546 CAD/CAM Applications in MAE.** (4) F

Solution of engineering problems with the aid of state-of-the-art software tools in solid modeling, engineering analysis; and manufacturing; selection of modeling parameters; reliability tests on software. Open only to students without previous credit for MAE 406. 3 hours lecture, 3 hours lab. Prerequisite: instructor approval.

**MAE 547 Mechanical Design and Control of Robots.** (3) N

Homogeneous transformations, 3-dimensional kinematics, geometry of motion, forward and inverse kinematics, workspace and motion trajectories, dynamics, control, and static forces.

**MAE 548 Mechanism Synthesis and Analysis.** (3) S

Algebraic and graphical methods for exact and approximate synthesis of cam, gear, and linkage mechanisms; design optimization; methods of planar motion analysis; characteristics of plane motion; spatial kinematics.

**MAE 557 Mechanics of Composite Materials.** (3) S

Analysis of composite materials and applications. Micromechanical and macromechanical behavior. Classical lamination theory developed with investigation of bending-extension coupling.

**MAE 560 Propulsion Systems.** (3) N

Design of air-breathing gas turbine engines for aircraft propulsion; mission analysis; cycle analysis; engine sizing; component design.

**MAE 561 Computational Fluid Dynamics.** (3) S

Finite-difference and finite-volume techniques for solving the subsonic, transonic, and supersonic flow equations. The method of characteristics. Numerical grid-generation techniques. Prerequisite: MAE 571 or instructor approval.

**MAE 563 Unsteady Aerodynamics.** (3) S

Unsteady incompressible and compressible flow. Wings and bodies in oscillatory and transient motions. Kernel function approach and panel methods. Aeroelastic applications. Prerequisite: MAE 460 or 461.

**MAE 564 Advanced Aerodynamics.** (3) F

Perturbation method. Linearized subsonic and supersonic flows. Thin wing/slender body theories. Lifting surface theory. Panel method computation. Prerequisite: MAE 460 or 461.

**MAE 566 Rotary-Wing Aerodynamics.** (3) F

Introduction to helicopter and propeller analysis techniques. Momentum, blade-element, and vortex methods. Hover and forward flight. Ground effect, autorotation, and compressibility effects. Prerequisite: MAE 361.

**MAE 571 Fluid Mechanics.** (3) F

Basic kinematic, dynamic, and thermodynamic equations of the fluid continuum and their application to basic fluid models.

**MAE 572 Inviscid Fluid Flow.** (3) S

Mechanics of fluids for flows in which the effects of viscosity may be ignored. Potential flow theory, waves, and inviscid compressible flows. Prerequisite: MAE 571.

**MAE 573 Viscous Fluid Flow.** (3) F

Mechanics of fluids for flows in which the effects of viscosity are significant. Exact and approximate solutions of the Navier-Stokes system, laminar flow at low and high Reynolds number. Prerequisite: MAE 571.

**MAE 575 Turbulent Shear Flows.** (3) F

Homogeneous, isotropic, and wall turbulence. Experimental results. Introduction to turbulent-flow calculations. Prerequisite: MAE 571.

**MAE 577 Turbulent Flow Modeling.** (3) S

Reynolds equations and their closure. Modeling of simple and complex turbulent flows, calculations of internal and external flows, and application to engineering problems. Prerequisite: MAE 571.

**MAE 581 Thermodynamics.** (3) F

Basic concepts and laws of classical equilibrium thermodynamics; applications to engineering systems. Introduction to statistical thermodynamics.

**MAE 582 Statistical Thermodynamics.** (3) A

Kinetic and quantum theory. Statistical mechanics; ensemble theory. Structure and thermodynamics of noninteracting and interacting particles. Boltzmann integro-differential equation. Prerequisite: graduate standing.

**MAE 585 Conduction Heat Transfer.** (3) F

Basic equations and concepts of conduction heat transfer. Mathematical formulation and solution (analytical and numerical) of steady and unsteady, one- and multidimensional heat conduction and phase change problems. Prerequisites: ECE 386; MAE 388.

**MAE 586 Convection Heat Transfer.** (3) S

Basic concepts and governing equations. Analysis of laminar and turbulent heat transfer for internal and external flows. Natural and mixed convection. Prerequisite: MAE 388.

**MAE 587 Radiation Heat Transfer.** (3) F

Advanced concepts and solution methodologies for radiation heat transfer, including exchange of thermal radiation between surfaces, radiation in absorbing, emitting, and scattering media and radiation combined with conduction and convection. Prerequisite: MAE 388.

**MAE 588 Two-Phase Flows and Boiling Heat Transfer.** (3) S

Pool and flow boiling heat transfer, condensation heat transfer, various models of vapor-liquid mixture flows, gas-solid mixture flows, and experimental measurement techniques.

**MAE 589 Heat Transfer.** (3) F

Basic concepts; physical and mathematical models for heat transfer. Applications to conductive, convective, radiative, and combined mode heat transfer. Prerequisite: MAE 388.

**MAE 594 Graduate Research Conference.** (1) F, S

Topics in contemporary research. Required every semester of all departmental graduate students registered for 9 or more semester hours. Not for degree credit.

**MAE 598 ST: Special Topics.** (1–3) F, S

Special topics courses, including the following, which are regularly offered, are open to qualified students:

- (a) Advanced Spacecraft Control
- (b) Aeroelasticity
- (c) Aerospace Vehicle Guidance and Control
- (d) Boundary Layer Stability
- (e) Hydrodynamic Stability
- (f) Plasticity
- (g) Polymers and Composites

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Medieval and Renaissance Studies

### Interdisciplinary Certificate Programs

**Robert E. Bjork**

*Director*

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#### American Studies

(ASU West)

Assistant Professor: Moulton

#### Architecture

Professor: Meunier

#### Art

Associate Professor: Schleif;

Assistant Professor: Wolfthal

#### English

Professors: Bjork, Brink;

Associate Professors: Corse, Gutierrez, Mahoney;

Assistant Professors: Perry, Stevens, Vaden;

Lecturer: Obermeier

#### History

Professors: Batalden, Burg, Tillman, Warnicke;

Associate Professors: Barnes, Soergel;

Assistant Professors: McKee, Thornton

#### Languages and Literatures

Professors: Alexander, Losse, Wixted;

Associate Professors: Hendrickson, Sanchez, Senner;

Assistant Professors: Candela, Vitullo

#### Law

Professor: Rose;

Associate Professor: Brennan

#### Music

Professor: Metz;

Associate Professors: Haefer, Rave

#### Philosophy

Professor: White

#### Religious Studies

Professor: Samuelson;

Associate Professor: Coudert;

Assistant Professor: Clay

#### Theatre

Professor: Knapp

#### University Honors College

Lecturers: Facinelli, Ramseyer

Graduate students admitted to a degree program in any field may earn one of two M.A.- or Ph.D.-level certificates: the Certificate in Medieval Studies or the Certificate in Renaissance Studies. Since medieval and Renaissance studies are by nature interdisciplinary, students in the certificate program receive interdisciplinary training. Besides the course work and examinations required in their major field, students take six to nine semester hours outside their discipline and receive training in a medieval vernacular language or a modern European language.

The core of the program has two components: (1) Latin, the international language for both the Middle Ages and Renaissance, and (2) paleography, the study of the physical medium through which Latin and other languages were transmitted.

The certificate program prepares students for advanced study or for academic positions by augmenting their skills and knowledge, thereby making them more equipped to handle the demands of their fields. For more information, contact the Arizona Center for Medieval and Renaissance Studies.

## Microbiology

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Chair

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### PROFESSORS

BURKE, JACOBS, MOSSMAN, SCHMIDT

### ASSOCIATE PROFESSORS

BIRGE, HOFFMAN, MISRA, STOUT

### ASSISTANT PROFESSORS

BLOOM, CHANG

The faculty in the Department of Microbiology offer programs leading to the M.S. and the Ph.D. degrees in Microbiology.

The faculty also participate in the program leading to the Master of Natural Science degree when one of the concentrations is microbiology (see "Master of Natural Science," page 257).

The Graduate Record Examination (GRE) is required for all applicants. Three letters of recommendation and a statement of personal goals must be submitted for admission to the graduate programs. Applicants are expected to have completed the requirements for an undergraduate major in biology, chemistry, microbiology, or have an adequate background in related courses in biology, chemistry, mathematics, physics, and plant biology. Applicants without this background may be asked to take the GRE subject test. Applications are accepted throughout the year. To be considered for assistantships and fellowships, completed applications must be received by February 15 for the fall semester and by October 15 for the spring semester.

The graduate programs are designed to prepare students for careers in teaching and in research on various aspects of microbiology in educational institutions, industry, or government agencies. To ensure proper course selection, new students must have the department's approval for all course registrations.

### MASTER OF SCIENCE

See "Master's Degrees," page 98, for general requirements.

**Program of Study.** A minimum of 30 semester hours of graduate credit are required, of which at least six hours must be thesis and research credit. The program is planned by the student in consultation with the supervisory committee.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Students are expected to achieve, through course work, a fundamental understanding of the following subdisciplines: bacterial genetics, immunology, molecular biology, physiology and metabolism, and virology. Alternatively, the student may demonstrate this fundamental understanding by a comprehensive examination prepared by the student's supervisory committee.

**Thesis Requirements.** A thesis is required.

**Final Examinations.** A final oral examination covering the thesis and related subject matter is required.

### DOCTOR OF PHILOSOPHY

See "Doctor of Philosophy," page 101, for general requirements.

**Program of Study.** At least 60 semester hours of graduate credit, in addition to 24 hours of dissertation and research, are required; a minimum of 24 hours of this total is in formal course work. The program is planned in consultation with the supervisory committee.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Written and oral comprehensive examinations are required.

**Dissertation Requirements.** A dissertation based on original work of high quality, demonstrating proficiency in the student's area of interest, is required. (See "Doctoral Dissertations," page 100.)

**Final Examinations.** A final oral examination in defense of the dissertation is required.

### RESEARCH ACTIVITY

The following represent major areas of research emphasis by faculty and graduate students in microbiology: bacterial enzymology, bacterial genetics, immunology, host-parasite relationships, medical molecular biology, neuroimmunology, physiology, systematics, and virology.

Recent studies include the following: structure and function of the outer membrane of *Escherichia coli*; genetics of outer membrane proteins; control and regulation of metabolic pathways; regulation of environmentally responsive genes in bacteria; genetics of *E. coli* isocitrate dehydrogenase; site-specific conjugal recombination in *E. coli*; development of *Bacillus* cloning systems; genetic studies of entomocidal Bacilli; biology of budding and appendaged bacteria; biology of the genus *Seliberia*; molecular mechanism of interferon action; translational control of gene expression in reovirus; immune system-nervous system interactions; CNS involvement in autoimmune disease; mechanisms of stress effects on chronic immunologic diseases; molecular pathogenesis of herpes virus; regulation of VDJ recombination in B lymphocyte development.

**MICROBIOLOGY (MIC)**

**MIC 420 Immunology: Molecular and Cellular Foundations.** (3) F  
Molecular and cellular foundations of immunology. Antibody/antigen interactions, cellular response, cytokines, immunogenetics, immunoregulation, autoimmunity, psychoneuroimmunology research/medical perspectives. Prerequisites: CHM 231 (or 331) and MIC 205 (or 220) or instructor approval.

**MIC 421 Experimental Immunology.** (2) F, S

An introduction to the basic techniques, methods, and assays used in immunology. 6 hours lab. Prerequisites: CHM 231 and 331 and MIC 302 or instructor approval.

**MIC 425 Advanced Immunology.** (3) S 2001

A survey of recent advances in immunology, including lymphocyte membranes, lymphokines/biochemistry, molecular genetics, theoretical immunology, immunoregulation, neuroimmunology, and immunologic diseases. Prerequisite: MIC 420 or instructor approval.

**MIC 441 Bacterial Genetics.** (3) S

Survey of genetic exchange and regulatory processes in bacteria and their viruses. Bacteria and viruses as tools in genetic engineering. Prerequisites: BIO 340 and MIC 205 (or 220) or instructor approval.

**MIC 442 Bacterial Genetics Laboratory.** (1) N

Techniques of mutagenesis, mapping, and strain construction. 4 hours lab. Prerequisites: MIC 206, 302. Pre- or corequisite: MIC 441.

**MIC 445 Techniques in Molecular Biology/Genetics.** (2) F, S

Molecular genetic principles plasmid construction, purification and characterization; PCR; mutagenesis; hybridization and sequence analysis; protein quantitation; immunologic detection and electrophoresis. Prerequisites: BIO 340 and MIC 302 or instructor approval.

**MIC 446 Techniques in Molecular Biology/Genetics Lab.** (2) F, S

Molecular genetic techniques; plasmid construction, purification and characterization; PCR; mutagenesis; hybridization and sequence analysis; protein quantitation; immunologic detection and electrophoresis. Pre- or corequisite: MIC 445.

**MIC 470 Bacterial Diversity and Systematics.** (4) F

Biology, classification, and enrichment culture of the nonpathogenic bacteria. 2 hours lecture, 6 hours lab. Prerequisite: MIC 302.

**MIC 485 General Virology.** (3) F

Fundamental nature of viruses, their replication, pathogenesis, and ecology. Prerequisites: BIO 340 and CHM 331 or instructor approval.

**MIC 486 General Virology Laboratory.** (2) S

Fundamentals of virus detection, isolation and assay; propagation of virus in mammalian cell culture; recombinant virus and vector construction. 6 hours lab. Prerequisite: MIC 302. Pre- or corequisite: MIC 485.

**MIC 527 Neuroimmunology.** (3) S

Studying mind's influence on immunity and the immune system's influence on the mind, neuroimmunologic diseases, and the neuroimmunological circuitry involved. Seminar. Prerequisite: MIC 420 or instructor approval.

**MIC 581 Molecular Mechanism of Pathogenesis.** (3) S

Pathogenic mechanisms and host responses in viral and/or bacterial diseases. Prerequisites: MIC 381 and 420 or instructor approval.

**MIC 585 Molecular Virology.** (3) N

Selected topics concerning molecular aspects of eukaryotic virus replication and pathogenesis. Prerequisite: instructor approval.

**MIC 591 Seminar.** (1–3) F, S

Topics may be selected from the following:

- (a) Bacterial Ecology
- (b) Current Research in Microbiology
- (c) Enzymology
- (d) Genetic Engineering
- (e) Genetics
- (f) Immunology
- (g) Molecular Virology
- (h) Neuroimmunology
- (i) Pathogenic Bacteriology

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**Molecular and Cellular Biology****Interdisciplinary Master's and Doctoral Programs**

**Bertram L. Jacobs**

*Director*

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**Biology**

Regents' Professor: Markow;

Professors: Capco, Chandler, Hazel, McGaughey, Satterlie;

Associate Professors: Goldstein, Smith;

Assistant Professors: Newfeld, Rawls

**Chemistry and Biochemistry**

Professors: Bieber, Blankenship, Lohr, Rose, Woodbury;

Associate Professor: Allen;

Assistant Professor: L. Bloom

**Microbiology**

Professors: Jacobs, Schmidt;

Associate Professors: Hoffman, Misra, Stout;

Assistant Professors: D. Bloom, Chang

**Plant Biology**

Professors: Backhaus, Hooper, Trelease, Vermaas;

Associate Professors: Frasch, Roberson, Stutz, Webber;

Assistant Professor: Pogson

The interdisciplinary M.S. and Ph.D. degrees in Molecular and Cellular Biology are administered by the Interdisciplinary Committee on Molecular and Cellular Biology. The participating faculty are drawn primarily from four core departments (the Departments of Biology, Chemistry and Biochemistry, Microbiology, and Plant Biology), with additional faculty from the Departments of Anthropology, and Physics and Astronomy. One striking aspect of studies in this broad area of biological science is the interdisciplinary nature of the field. Similar approaches and techniques are used for studies of biological systems whether they are viral, bacterial, plant, or animal.

The graduate degrees offered by the faculty through this program prepare students for careers that span traditional disciplinary boundaries. The broad-based training provides the necessary skills for professional careers in academic institutions, governmental institutions, and industry, particularly those related to health and chemical sciences.

**Graduate Record Examination.** All applicants are required to take the Graduate Record Examination (GRE). Submission of scores on the verbal, quantitative, analytical, and advanced sections of the GRE is required for admission to the M.S. and Ph.D. degree programs. The subject test in the sciences is highly recommended.

**TOEFL and SPEAK Test.** Students whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL). A TOEFL score of 630 is required for admission to the MCB program. Students whose native language is not English must pass the Speaking Proficiency English Assessment Kit (SPEAK) test with



a score of at least 55 if they wish to be considered for teaching assistantship support.

### MASTER OF SCIENCE

See "Master's Degrees," page 98, for general requirements.

**Program of Study.** Thirty semester hours are required. A minimum of 10 designated semester hours of MCB courses and six hours of Research and Thesis are required. The remaining courses are selected by the student in consultation with the supervisory committee.

**Thesis Requirements.** A written thesis based on original research is required.

**Final Examinations.** A final oral examination in defense of the thesis is required.

### DOCTOR OF PHILOSOPHY

See "Doctor of Philosophy," page 101, for general requirements.

**Program of Study.** Eighty-four semester hours are required. A minimum of 12 designated semester hours of MCB courses, six semester hours of elective course work, and 24 semester hours of Research or Dissertation are required. The remaining courses are selected by the student in consultation with the supervisory committee.

**Comprehensive Examinations.** Written and oral comprehensive examinations are required.

**Dissertation Requirements.** A written dissertation based on original research of high quality that demonstrates proficiency in the area of specialization is required.

**Final Examinations.** The final oral examination in defense of the dissertation is required. Evidence must be presented that the research contribution is publishable in the primary literature.

### RESEARCH ACTIVITY

Refer to individual programs (Biology, Chemistry and Biochemistry, Microbiology, and Plant Biology) for descriptions of research activities.

#### MOLECULAR AND CELLULAR BIOLOGY (MCB)

**MCB 500 Research Methods in Molecular and Cellular Biology.** (2) F, S  
Rotation laboratory experiences in which students participate in research under the direction of an MCB faculty member. May be repeated for credit.

**MCB 501 Seminar: Molecular and Cellular Biology Colloquium.** (1) F, S  
Presentation of current research by noted researchers in the field. May be repeated for credit.

**MCB 555 Advanced Molecular and Cellular Biology I.** (3) F  
Study of structural and functional organization of biomolecules and cells, based on current literature. 3 hours lecture, discussion. May be repeated once for credit. Pre- or corequisites: BIO 543 (or equivalent); CHM 461.

**MCB 556 Advanced Molecular and Cellular Biology II.** (3) S  
Continuation of MCB 555. 3 hours lecture, discussion. May be repeated once for credit. Pre- or corequisites: BIO 543 (or equivalent); CHM 462.

**MCB 591 Seminar: Current Literature in Molecular and Cellular Biology.** (1) F, S  
Presentation and discussion of current research in the areas of molecular and cellular biology. May be repeated for credit.

**MCB 700 Research Methods in Molecular and Cellular Biology.** (2) F, S  
Rotation laboratory experiences in which students participate in research under the direction of an MCB faculty member. May be repeated for credit.

**MCB 701 Seminar: Molecular and Cellular Biology Colloquium.** (1) F, S  
Presentation of current research by noted researchers in the field. May be repeated for credit.

**MCB 791 Seminar: Current Literature in Molecular and Cellular Biology.** (1) F, S  
Presentation and discussion of current research in the areas of molecular and cellular biology. May be repeated for credit.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Music

### Master's

Amy Holbrook

*Master's Program Coordinator*  
(MUSIC E177) 480/965-3372

### Doctoral

Jerry Doan

*Doctoral Program Coordinator*  
(MUSIC E211) 480/965-4223

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[www.asu.edu/cfa/music/sub/academ.html](http://www.asu.edu/cfa/music/sub/academ.html)

### REGENTS' PROFESSORS

HICKMAN, PAGANO

### PROFESSORS

ATSUMI, BACON, BRITTON, COSAND, CROWE, DOAN, FLEMING, HACKBARTH, HAMILTON, HARRIS, HOFFER, HUMPHREYS, KLIEWER-BRITTON, KOONCE, LOCKWOOD, MAGERS, MAROHNIC, METZ, OLDANI, PILAFIAN, REBER, ROGERS, RUSSELL, SELLHEIM, SHINN, SKOLDBERG, SPINOSA, SPRING, STOCKER, STRANGE, SUNKETT, SWAIM, THOMPSON, UMBERSON, WELLS, WILLIAMSON, WYTKO

### ASSOCIATE PROFESSORS

BARROLL-ASCHAFFENBURG, CARPENTER, DeMARS, DREYFOOS, HAEFER, HOLBROOK, MARSHALL, MAY, MONTGOMERY, PETERSON, RAVE, REYNOLDS, ROCKMAKER, SMITH, SOLIS, STAUFFER, WILSON

### ASSISTANT PROFESSORS

BRYAN, BUSH, LYMAN, McLIN, RIO

### LECTURER

SHELLANS

The faculty in the School of Music offer graduate programs leading to the M.A. degree in Music with concentrations in ethnomusicology, music history and literature, and music theory.

The faculty also offer a graduate program leading to the professional Master of Music degree in Composition, Music

Education, and Performance and the professional Doctor of Musical Arts degree in Music with concentrations in choral conducting, composition, music education, and solo performance.

**Graduate Diagnostic Examinations.** All students admitted to graduate degree programs must satisfactorily complete examinations before any comprehensive examinations may be scheduled. In music theory, the areas are as follows:

1. aural skills;
2. form;
3. analytical skills: 19th-century music; and
4. analytical skills: contemporary music.

In music history, the areas are (1) medieval, renaissance, and baroque and (2) classical, romantic, and contemporary.

**Undergraduate Deficiencies.** Deficiencies are determined by the school. Removal of all deficiencies is the responsibility of the student and is considered additional to the minimum hours for graduation.

**Graduate Assistantships.** The deadline is February 15 for teaching assistantship applications.

## MASTER OF ARTS

See "Master's Degrees," page 98, for general requirements.

**Prerequisites.** Applicants are expected to have a B.A. degree in Music or its equivalent from an accredited institution.

**Admission.** Application must be accompanied by evidence of scholarly achievement or potential (e.g., a term paper) and by letters of recommendation from two persons qualified in the field.

### Program of Study

**Ethnomusicology.** A minimum of 30 semester hours of graduate credit is required, of which at least 16 semester hours must be in the field of ethnomusicology, including six semester hours of thesis, and at least six semester hours in music theory.

**Music History and Literature.** A minimum of 30 semester hours of graduate credit is required, of which at least two-thirds must be in the field of music history and literature.

**Music Theory.** A minimum of 32 semester hours of graduate credit is required, of which at least 18 must be in the field of music theory and at least 10 must be selected from the fields of music theory, music composition, and music history.

### Course Requirements

**Ethnomusicology.** MUP 587 (two semesters), MHL 568, 591, 592, 599 (Thesis), and six semester hours of music theory.

**Music History and Literature.** MUP 582 (two semesters), MHL 532, 591 (two semesters), 599 (Thesis), and six hours of music theory.

**Music Theory.** MTC 520, 525, 527, 528, 599 (Thesis); six semester hours of music history.

**Foreign Language Requirements.** A passing grade on the foreign language reading examination in French or German is required.

**Final Examinations.** A final examination (written, oral, or both) is required. An oral examination in defense of the thesis is also required.

## MASTER OF MUSIC

The faculty in the School of Music offer a graduate program leading to the professional degree Master of Music (M.M.). Three majors are available: Composition, Music Education, and Performance. For the Music Education major, concentrations are available in

1. choral music,
2. general music,
3. instrumental music, and
4. jazz studies.

For the Performance major, concentrations are available in

1. music theatre musical direction,
2. music theatre performance,
3. performance pedagogy,
4. piano accompanying, and
5. solo performance (voice, keyboard, instrumental).

**Prerequisites.** A Bachelor of Music degree or its equivalent from an accredited institution is required for admission to the M.M. program.

**Admission.** Admission to all concentrations under the major in Performance, with the exception of music theatre musical direction, is dependent on a successful audition, either in person or by taped performance. For admission to the major in Composition, the applicant must submit three original works showing technical facility in composition and letters of recommendation from two qualified persons in the field. For admission to the M.M. in Music Education degrees, the applicant must have completed all requirements for music teacher certification. Postbaccalaureate certification is available and may be completed concurrently with master's degree work.

Letters of recommendation from three qualified persons in the field are also required. For the jazz studies concentration, a video or audio tape of a recent jazz performance (solo or ensemble) by the applicant must be submitted, and a video or audio tape of a jazz ensemble directed by the applicant should also be submitted if available.

Students majoring in Performance with a concentration in solo performance (voice) and performance pedagogy (voice) are required to take a diction examination in French, German, and Italian during registration week of their first semester. Students who do not pass this examination are required to take the appropriate semester(s) of MUP 250.

For admission to the concentration in performance pedagogy (piano), a minimum of one semester of prior piano pedagogy study including significant intern teaching experience is required. In addition, the student must demonstrate evidence of teaching ability, either in person or by videotape.

**Program of Study.** The student must complete a minimum of 32 semester hours of graduate courses, of which at least one-third must be in the area of concentration.

**Foreign Language Requirements.** Solo performance (voice only) and performance pedagogy (voice only) require a total of 16 semester hours of college-level credit in more than one language chosen from French, German, or Italian. The concentration in piano accompanying requires two semesters of college-level study in French, German, or Italian and two semesters of diction (or the equivalent) in the remaining languages in that group. These requirements may be fulfilled in whole or in part through language instruction in secondary and/or undergraduate school or by other means (for more information, see the *General Catalog*). These language requirements are not part of the 32-hour program of study. However, hours toward the requirements may be taken concurrently with the program of study if a deficiency exists.

**Final Examination.** A final written or oral examination, or both, is required. An oral examination in defense of the thesis is required if the thesis is an option.

### Composition

*Composition.* MTC 523 (four semester hours), 525, 599; six hours of music history.

### Music Education

*Choral Music.* MUE 548, 549, 550 (or 579), 568, 570; two semester hours of ensemble; six semester hours of music history (including MHL 575); five hours of music theory. One MHL or MTC course must be in contemporary music.

*General Music.* MUE 548, 549, 550 (or 579), 551, 552; six semester hours of music history; five hours of music theory. One MHL or MTC course must be in contemporary music, and one MHL course or one ensemble must be in ethnomusicology.

*Instrumental Music.* MUE 548, 549, 550 (or 579), 564, 566; six semester hours of music history; five hours of music theory. One MHL or MTC course must be in contemporary music.

*Jazz Studies.* MUE 548, 549, 550 (or 579), 560, 562 (two semesters); MUP 509, 510, 517, 518, three semester hours of jazz ensemble; six semester hours of music history; five hours of music theory. One MHL or MTC course must be in contemporary music.

### Performance

*Solo Performance (Voice).* MUP 527 (eight semester hours), 541, 551, 595, 596; performing ensembles (two hours); six hours of music history; five hours of music theory.

*Solo Performance (Keyboard).* MUP 527 (eight semester hours), 551 (or 581), 595, 596; performing ensembles (two hours); six hours of music history and literature; five hours of music theory.

*Solo Performance (Instrumental).* MUP 527 (eight semester hours), 551, 581, 595, 596; performing ensembles (two hours); six hours of music history; five hours of music theory.

*Piano Accompanying.* MUP 527 Studio Instruction (eight semester hours), 511 (or 521 Studio Instruction [four

hours]), 588 (four hours), 595, 596; six hours of music history; five hours in music theory.

*Performance Pedagogy.* MUP 527 (eight semester hours), 541 (voice only), 551 and/or 581, 595, 596; performing ensembles (two hours), (piano only: MUP 440 [or proficiency], 507, 508, 581 [four hours]); six hours in music history; five hours of music theory.

*Music Theatre Musical Direction.* MUP 511 Studio Instruction (four semester hours), 540, 551, 571 (two hours), 591, 595, 596; a three-hour graduate THP course designed for directors (as approved by supervisory committee); musical direction of two musical theatre productions; five hours of music history; five hours of music theory.

*Music Theatre Performance.* MUP 511 Studio Instruction (six semester hours), 551, 570 (three hours), 571 (three hours), 595, 596; a three-hour graduate THP course designed for actors (as approved by supervisory committee); leading roles in two musical theatre productions; five hours of music history; five hours of music theory.

## DOCTOR OF MUSICAL ARTS

The Doctor of Musical Arts (D.M.A.) is a professional degree program designed for students desiring high levels of performance, academic proficiency, and preparation for teaching positions at the university level. The major is Music with four concentrations: choral conducting, composition, music education, and solo performance.

**Admission.** Students seeking admission normally hold the Master of Music degree. Applicants with other degrees are considered if they have received graduate training similar to that normally expected in a Master of Music degree program. The application for admission must be accompanied by an applicant's statement relating to goals, preparation, and educational background. The applicant must submit scores for the GRE (quantitative, verbal, and analytical) or the MAT. Three letters of recommendation are required. Applicants must perform a satisfactory audition or submit a tape recording of performances or compositions as appropriate to the concentration. The deadline is February 15 for teaching assistantship applications.

**Supervisory Committee.** When the program of study is filed, the supervisory committee is appointed by the dean of the Graduate College upon recommendation of the director and the graduate committee of the School of Music. The committee consists of five members; at least three should be from the major field.

**Program of Study.** A total of 90 semester hours beyond the bachelor's degree is required. Only 36 hours from a master's degree or other postgraduate work will be counted toward the 90 hour requirement.

**Continuous Enrollment.** Once admitted to a D.M.A. degree program, the student is expected to be enrolled continuously, excluding summer sessions, until all requirements for the degree have been fulfilled. This requirement applies to students admitted fall 1994 and thereafter. Continuous enrollment promotes steady progress toward the completion of the degree and an ongoing relationship between the student and faculty offering the program. If additional credit is not required toward the D.M.A. degree, the student may enroll for Continuing Registration 795. Continuing

Registration does not carry credit; no grade is given. If a program of study must be interrupted for one or more semesters, the student may apply for leave status, not to exceed one calendar year. A student on leave is not required to pay fees, but is not permitted to place any demands on university faculty or use any university facilities. A student who interrupts a program without obtaining leave status may be removed automatically from the Graduate College, under the assumption that the student has decided to discontinue the program. A student removed from the Graduate College for this reason may reapply for admission; the application is considered along with all other new applications to the degree program.

An application for leave status, endorsed by the members of the student's supervisory committee and the head of the academic unit, must be approved by the dean of the Graduate College. This request must be filed and approved no later than the last day of registration in the semester of anticipated absence.

**Residency.** In general, the D.M.A. degree student should expect to spend at least the equivalent of three academic years beyond the bachelor's degree in the program. At least two semesters following the first year (30–32 semester hours) of graduate study must be spent in continuous full-time residence at ASU. After the first year (30–32 semester hours), at least 54 hours must be completed in residence at ASU.

**Foreign Language Requirements.** Competency in at least one foreign language is required for solo performance and music composition concentrations. Some concentrations require two foreign languages.

**Comprehensive Examinations.** Near the completion of course work, the student must apply to the Graduate College, through the supervisory committee and the school director, for permission to take the comprehensive examinations. These written and oral examinations are designed to assess the student's competency in the major and supportive fields. Failure in the comprehensive examinations is considered final unless the supervisory committee recommends, and the dean of the Graduate College approves, a re-examination. A re-examination may be administered no sooner than three months and no later than one year from the date of the original examination. Only one re-examination is permitted.

**Candidacy.** Doctoral students should apply for admission to candidacy immediately after they have met all requirements for the degree, *except the dissertation*. These requirements include passing the comprehensive examinations and foreign language examination, if applicable, and meeting other requirements specified by the academic unit.

**Dissertation, Research Papers, and Recitals.** The music composition and music education concentrations require a dissertation of an original and creative nature. The choral conducting concentration requires a conducting recital plus either a dissertation or a series of projects and a research paper. The solo performance concentration requires at least three recitals following admission to the program and a research paper. All candidates must enroll for a total of 24 semester hours of credit in recital (MUP 796), research

(MUP 792), and dissertation (MUP 799) as appropriate to the concentration.

**Final Examinations.** The final oral examination in defense of the dissertation or research paper is scheduled by the Graduate College. The exam is conducted by the supervisory committee and others appointed by the dean of the Graduate College. All final oral examinations must be conducted at least one week before the degree conferral date.

**Graduation.** The student is eligible for graduation when the final oral examination has been passed, Graduate College scholarship requirements have been met, and the dissertation/research paper has been approved by the supervisory committee, the director of the school, and the dean of the Graduate College.

Applications for graduation should be made no later than the date specified in the Graduate College calendar.

**Maximum Time Limit.** D.M.A. candidates must complete all requirements within five years after the comprehensive exams have been passed.

### MUSIC HISTORY/LITERATURE (MHL)

**MHL 532 Music Bibliography.** (3) F

Major historical and analytical writings; systematic and historical collections of music. Reading knowledge of a foreign language recommended.

**MHL 535 Medieval Music.** (3) S 2001

Music of Europe in the Middle Ages, Gregorian chant, religious, and secular monophony and polyphony to 1400.

**MHL 536 Music of the Renaissance.** (3) S 2000

Music in Europe, with emphasis on stylistic concepts and changes, c. 1400–1580.

**MHL 544 World Music I.** (3) F 1999

Music of traditional and folk cultures of Africa, Europe, and the Americas.

**MHL 545 World Music II.** (3) F 2000

Traditional, folk, and art music of the Pacific, Near East, and Asia.

**MHL 547 Topics in American Music.** (3) N

Selected topics in the history of music. Composers working in the Americas with emphasis upon music since 1900.

**MHL 557 Topics in Symphonic Literature.** (3) S 2000

An examination of the evolution of the symphony and symphonic poem from the early classic era through the 19th century, with emphasis on the analysis of selected works.

**MHL 564 History of Music Instruments.** (3) F 2000

Survey of the history and development of music instruments in traditional, folk, and art cultures.

**MHL 566 Area Studies in Ethnomusicology.** (3) S 2000

Study of the music of a particular culture, country, or area (e.g., music of Mexico, Latin America, China, Africa). May be repeated for credit.

**MHL 568 Introduction to Ethnomusicology.** (3) F 1999

Introduction to the theory and methodology of the discipline, including bibliography, fieldwork, transcription, analysis, and organology.

**MHL 575 History of Choral Music.** (3) F

Major choral works.

**MHL 591 Seminar.** (1–12) N

**MHL 644 Notation of Polyphonic Music.** (3) S 2000

Music notation from the 15th through 17th centuries, including problems of transcription into modern notation.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### MUSIC THEORY AND COMPOSITION (MTC)

**MTC 516 Baroque Music.** (3) S 2000

Detailed analysis of selected examples of music from the Baroque period.

**MTC 517 Classic Music.** (3) S 2001

Detailed analysis of selected examples of music from the Classic period.

**MTC 518 Romantic Music.** (3) F 2000

Detailed analysis of selected examples of music from the Romantic period.

**MTC 519 Late 19th-/Early 20th-Century Music.** (3) F 1999

Detailed analysis of selected examples of music from the late 19th and early 20th centuries.

**MTC 520 Analytical Techniques.** (3) S, SS

Analytical techniques systematically applied to music. Concentration on structural and compositional procedures.

**MTC 523 Advanced Composition.** (2–3) F, S

Advanced music composition, including complex techniques and larger structure. May be repeated for credit. Prerequisite: instructor approval.

**MTC 525 Pedagogy of Theory.** (3) F 2000

Practices and principles of teaching music theory. Emphasizes most desirable and practical offerings possible. Comparative studies of existing practices.

**MTC 527 History of Music Theory.** (3) F 1999

Theory from Pythagoras to the 16th century. Need not be taken in sequence with MTC 528.

**MTC 528 History of Music Theory.** (3) S 2000

Theory from the 17th century to the present. Need not be taken in sequence with MTC 527.

**MTC 555 Computer Music Notation.** (2) N

Instruction in preparing score and parts of music compositions using various music-notation software packages. Credit cannot be applied toward the graduate theory requirement. Lecture, lab. Prerequisite: instructor approval.

**MTC 647 Directions in New Music.** (3) N

Studies in contemporary idioms and aesthetics drawn from recent works of visiting composers; involves analytical discourse, critical writing, and applied concepts in composition. Lecture, discussion, exercise. Prerequisite: instructor approval.

**MTC 723 Advanced Composition.** (3) F, S

Special problems in writing in complex forms and textures. May be repeated for credit. Studio.

**MTC 755 Music Composition Technology.** (3) N

Advanced study in digital sampling, synthesis, sequencing, computer-generated sound, and computer/performer interfaces. May be repeated for credit. Lecture, lab. Prerequisites: MTC 436 and 437 or equivalents.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### MUSIC EDUCATION (MUE)

**MUE 548 Introduction to Research in Music Education.** (3) F, SS  
Survey of research methods and literature in music education. Focus on interpretation and evaluation.

**MUE 549 Foundations of Music Education.** (3) A

A treatment of historical perspectives, philosophy-aesthetics identified with music education, and learning theories applied to music teaching/learning. Basic research and writing skills appropriate to graduate studies in music education.

**MUE 550 Studies in Music Curricula.** (3) A

Scope and sequence of musical experiences. Development of criteria for the evaluation of music curricula.

**MUE 551 Advanced Studies in Elementary School Music.** (3) A

For experienced teachers; organization and content of the general music classes in kindergarten and the first 6 grades of elementary school. Emphasis on teaching music reading and ear training to young children.

**MUE 552 General Music, Music Theory, and Music History**

**Classes in the Junior and Senior High School.** (3) A  
Organization and content of school music classes which are not performance oriented.

**MUE 553 Contemporary Elementary Music.** (3) N

Identification and development of materials and techniques for teaching special units of music study to elementary (K–8) children.

**MUE 560 Jazz Pedagogy.** (3) S 2001

Study of pedagogy, repertoire, and technique of instruction in jazz styles, ensemble techniques, and performance practice for school ensembles. Lecture, lab, discussion, observation. Prerequisite: M.M., Music Education major.

**MUE 562 Jazz Ensemble Rehearsal Techniques.** (1) F, S

Conducting and rehearsal techniques for school jazz ensembles. Lab. Prerequisite: M.M., Music Education major.

**MUE 564 Instrumental Music, Advanced Rehearsal Techniques.**

(3) A

An in-depth analysis of instrumental techniques in preparation for a thorough discussion of band tuning problems and solutions. Discussion of productive conducting and rehearsal techniques for school music teachers.

**MUE 566 Instrumental Literature for Schools.** (3) A

Comprehensive study and analysis of all types of instrumental music.

**MUE 568 Choral Music, Advanced Rehearsal Techniques.** (3) A

Musical and vocal techniques necessary for presentation of choral literature. Analysis and experimentation with psychological, acoustical, and other problems of rehearsal and performance.

**MUE 570 Choral Literature for Schools.** (3) A

Comprehensive study and analysis of choral music for the high school with special emphasis on octavo literature.

**MUE 579 Psychology of Music.** (3) A

The nature of musicality and its evaluation. A review of recent research.

**MUE 585 Vocal Acoustics and Production.** (3) A

An in-depth approach to the psychological/physiological workings of the vocal mechanism.

**MUE 733 Contemporary Issues and Research in Music Education.** (3) A

Emphasis upon recent research relating to music instruction at all levels; current and historical issues in choral, general, and instrumental music.

**MUE 744 Higher Education Instruction.** (3) A

Philosophical and psychological principles of college/university teaching. Patterns of music teacher education and a projection of course outlines.

**MUE 755 Philosophy and Aesthetics in Music Education.** (3) SS

Philosophy and aesthetics as they influence curriculum content and teaching procedures.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### MUSIC PERFORMANCE (MUP)

**MUP 507 Group Piano Practicum.** (2) F

Curricula, materials, and teaching techniques for group teaching at the university and community college levels. Observation/supervised teaching in group piano.

**MUP 508 Studio Observation.** (1) F, S

Weekly observation of studio teaching by various piano faculty. Paper as final requirement. Prerequisite: M.M. performance/pedagogy piano student.

**MUP 509 Jazz Keyboard Harmony.** (1) F

Emphasis on jazz chords and chord progressions, harmonization, voicing, and analysis of transcriptions. Lab. Prerequisite: M.M., Music Education student.

**MUP 510 Jazz Keyboard Harmony.** (1) S

Continuation of MUP 509. Lab. Prerequisite: MUP 509.

**MUP 511 Studio Instruction.** (2) F, S

For majors in Music degree program. Bassoon, cello, clarinet, contrabass, cornet, euphonium, flute, guitar, harp, harpsichord, horn, oboe, organ, percussion, piano, saxophone, trombone, trumpet, tuba, viola, violin, voice. Minimum contact of 1 hour plus studio class weekly. May be repeated for credit. May not be taken for audit. Prerequisites: placement examination and audition.

**MUP 517 Advanced Improvisation.** (1) F

Improvisation techniques within the context of advanced jazz literature. Must be taken in sequence with MUP 518. Lab. Prerequisites: placement examination and audition.

**MUP 518 Advanced Improvisation.** (1) S

Continuation of MUP 517. Lab. Prerequisite: MUP 517.

**MUP 521 Studio Instruction.** (1) F, S, SS

For secondary or minor instrument instruction and nonmajors in the university. Bassoon, cello, clarinet, contrabass, cornet, euphonium, flute, guitar, harp, harpsichord, horn, oboe, organ, percussion, piano, saxophone, trombone, trumpet, tuba, viola, violin, voice. Minimum contact of 1/2 hour per week. May be repeated for credit. May not be taken for audit. Prerequisites: placement examination and audition.

**MUP 527 Studio Instruction.** (2 or 4) F, S

For Performance majors in Master of Music degree program only. Bassoon, cello, clarinet, contrabass, cornet, euphonium, flute, guitar, harp, harpsichord, horn, oboe, organ, percussion, piano, saxophone, trombone, trumpet, tuba, viola, violin, voice. Minimum contact of 1/2 hour per week. May be repeated for credit. May not be taken for audit. Prerequisites: placement examination and audition.

**MUP 540 Advanced Conducting.** (3) F

Score preparation and conducting techniques for instrumental music. Concentration on study of historical styles. Required of D.M.A. students in Instrumental Music.

**MUP 541 The Art Song.** (3) N

Seminar on solo song from its beginning to the present day.

**MUP 544 Chamber Orchestra.** (1) F, S

Important masterpieces from all periods of music will be performed throughout the year. May be repeated for credit. Prerequisite: instructor approval.

**MUP 545 Symphony Orchestra.** (1) F, S

Open on the basis of audition with the director. Masterpieces of symphony orchestra literature. Three times per week. May be repeated for credit.

**MUP 546 Sinfonietta.** (1) F, S

Symphonic orchestra that presents approximately six concerts annually, performing masterpieces of the classical repertoire. 3 times per week. May be repeated for credit. Prerequisite: audition with director.

**MUP 550 Choral Union.** (1) F, S

Open to all students in the university and to interested singers in the community by audition. Preparation and performance of the larger choral works. 2 hours per week. May be repeated for credit.

**MUP 551 Repertoire.** (2) N

Literature available for performance in all performing media. May be repeated for credit.

**MUP 552 Concert Choir.** (1) F, S

4 hours per week. May be repeated for credit. Prerequisite: instructor approval.

**MUP 553 University Choir.** (1) F, S

4 hours per week. May be repeated for credit. Prerequisite: instructor approval.

**MUP 555 Men's Chorus.** (1) F, S

Open to all male students in the university who can qualify on the basis of auditions. Rehearsal and performance of music for male voices. 3 hours per week. May be repeated for credit. Prerequisite: instructor approval.

**MUP 557 Women's Chorus.** (1) F, S

2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

**MUP 561 Marching and Concert Bands.** (1) F, S

Open by audition only. Staging of formations and drills for football games and other events (fall); masterpieces of symphonic band literature (spring). Meets daily. May be repeated for credit.

**MUP 570 Music Theatre: Techniques.** (1) F, S

Exercises and improvisations for the singing actor emphasizing body awareness, isolations, and freedom of the vocal and breath mechanisms. Section 1 (Interpretation); Section 2 (Expression); Section 3 (Movement for Singers). Each Section: 3 hours per week. May be repeated for credit.

**MUP 571 Music Theatre: Workshops.** (1) F, S

Development of specific skills for the musical-dramatic interpretation. Section 1 (Role Preparation); Section 2 (Styles); Section 3 (Opera Scenes); Section 4 (Musical Comedy); Section 5 (Revue Ensembles). Each section: 1 hour lecture, demonstration, 1 lab per week. May be repeated for credit.

**MUP 572 Music Theatre: Orchestras.** (1) F, S

Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyric Opera Theatre productions. Section 1 (Orchestra); Section 2 (Chamber Orchestra); Section 3 (Chamber Ensemble). May be repeated for credit. Prerequisite: instructor approval.

**MUP 573 Music Theatre: Performance.** (1) F, S

Open to all students who can qualify on the basis of auditions with the instructor. Participation in Lyric Opera Theatre productions. Section 1 (Principal Roles); Section 2 (Chorus). May be repeated for credit. Prerequisite: instructor approval.

**MUP 574 Music Theatre: Production.** (1) F, S

Participation in Lyric Opera Theatre productions. Section 1 (Vocal Performance); Section 2 (Technical Music Theatre); Section 3 (Problems in Production) to be taken concurrently with MUP 373, Section 2. May be repeated for credit.

**MUP 576 New Music Ensemble.** (1) F, S

Rehearsal and performance of music written in the last 20 years. May be repeated for credit. Prerequisite: instructor approval.

**MUP 577 Brass Choir.** (1) F, S

Public performance of music written for brass instruments. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

**MUP 579 Chamber Music Ensembles.** (1) F, S

String, brass, woodwind, percussion, keyboard, vocal, and mixed ensembles. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

**MUP 581 Performance Pedagogy and Materials.** (2) N

Principles and methods of performance techniques for each performance field. May be repeated for credit.

**MUP 582 Collegium Musicum.** (1) F, S

Singers and instrumentalists specializing in the performance of early and unusual music. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

**MUP 585 Percussion Ensemble.** (1) F, S

Rehearsal and performance of standard and original repertoire for the percussion ensemble and related instruments. 2 hours per week. May be repeated for credit. Prerequisite: instructor approval.

**MUP 586 Stage Band.** (1) F, S

Rehearsal and performance of literature for the stage band. 4 hours per week. May be repeated for credit. Prerequisite: instructor approval.

**MUP 587 Ethnomusicology Ensembles.** (1) F, S

Performance learning experience for the music of various cultures of the world. May be repeated for credit. Prerequisite: knowledge of instrument or instructor approval.

**MUP 588 Piano Accompanying.** (1) F, S

Performance majors with a concentration in piano accompanying (others at the discretion of the instructor). Piano accompaniments found in vocal and instrumental literature; discussion of styles and performance practices; experience in public performance. 2 hours per week. May be repeated for credit.

**MUP 591 Seminar.** (1–12) N**MUP 596 Solo Performance.** (1) F, S

For Master of Music candidates in applied music only. May be full recital, major operatic role, solo performance with orchestra, ensemble, or lecture recital.

**MUP 597 Solo Performance.** (1) F, S

See MUP 596.

**MUP 671 Choral Repertoire.** (3) N

Examination of large choral/orchestral works to determine their musical and textual characteristics from a conductor's point of view.

**MUP 727 Studio Instruction.** (2 or 4) F, S

For D.M.A. candidates only. Minimum contact of 1 hour per week. May be repeated for credit.

**MUP 796 Solo Performance.** (1–15) F, S

For D.M.A. candidates only. May be repeated for credit.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Natural Science

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### MASTER OF NATURAL SCIENCE

The Master of Natural Science (M.N.S.) degree offers the opportunity for interdisciplinary graduate training in the natural sciences (biological sciences, mathematics, and physical sciences) and cognate areas. The degree program is especially suited for individuals who desire professional training rather than research training. Because of designed flexibility, the degree also offers the opportunity for individualized professional graduate programs depending upon the backgrounds and goals of the students. The major is Natural Science and the student is expected to emphasize course work in two or more areas of concentration. The program must be interdisciplinary. Additional information about this program can be found under the various majors in the natural sciences and by contacting faculty offering the following concentrations:

1. biology,
2. chemistry,
3. geology,
4. mathematics,
5. microbiology,
6. physics, and
7. plant biology.

**Admission.** See “Admission to the Graduate College,” page 89. A prerequisite for admission is the availability of resources for the proposed program and a faculty member in one of the departments to serve as graduate advisor. The submission of scores on the GRE (verbal, quantitative, and analytical) is required of all applicants.

**Supervisory Committee.** The supervisory committee, consisting of three faculty members, is appointed by the dean of the Graduate College upon the recommendation of the chair of the academic unit in which the graduate advisor serves as a faculty member. The supervisory committee is formed soon after the student has been admitted to the degree program. The graduate advisor and student suggest names of persons to serve on the supervisory committee. The composition of the supervisory committee must reflect the interdisciplinary nature of the program.

**Program of Study.** A program of study is recommended by the supervisory committee after conferring with the student. The minimum number of semester hours required for the degree is 30. An additional number of semester hours may be required by the supervisory committee depending upon the background of the student and the nature of the proposed program. In some cases undergraduate courses may be required in order to remove deficiencies.

**Foreign Language Requirements.** None.

**Thesis Requirements.** A thesis is optional.

**Final Examinations.** A final written or oral examination, or both, is required. Each examination is administered by the supervisory committee.

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## Nursing

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### PROFESSORS

DURAND, KENNEY, PERRY, THURBER

### ASSOCIATE PROFESSORS

ADAMS, BAGWELL, BRILLHART, DIRKSEN, GALE, ISMEURT, KILLEEN, KOMNENICH, MATTSON, MOORE, PRIMAS, ROOT, SHEEHY

### ASSISTANT PROFESSORS

ALPERS, BOYCHUK, CESAROTTI, CLARKE-STEFFEN, GARRITY, LONG, McCARTHY, PICKENS, RODRIGUEZ, SEHESTED, SOUSA, ZUNKEL

### CLINICAL ASSOCIATE PROFESSORS

BECK, BELL, FARGOTSTEIN, HAGLER, JASPER, KASTENBAUM, SCOGGIN, STILLWELL, WHITE

### CLINICAL ASSISTANT PROFESSORS

P. JOHNSON, W. JOHNSON, MORRIS, SHEARMAN, WOTRING

### INSTRUCTOR

ROSDAHL

The faculty in the College of Nursing offer a graduate program leading to the M.S. degree in Nursing. Concentrations are available in one of the following areas:

1. adult health nursing,
2. community health nursing,
3. community mental health/psychiatric nursing,
4. family health nursing,
5. nursing administration, and
6. parent-child nursing with the tracks of the childbearing family and nursing of children.

A post-master's Family Nurse Practitioner certificate program is available. The College of Nursing and the School of Health Administration and Policy also offer a concurrent M.H.S.A./M.S. in Nursing (with a concentration in nursing administration) degree program enabling students to pursue concurrent work in health services administration and nursing administration. For more information, see “Master of Health Services Administration,” page 212.

The purpose of the graduate program is to provide an academic environment that fosters scholarship, critical thinking, creativity, and prepares nurses for leadership as nurse specialists and beginning researchers. The graduate program offers advanced level courses that can be used as a base for doctoral study and for functional role development in teaching, management, or practice as a nurse practitioner.

The master's program is designed to prepare graduates to

1. synthesize advanced knowledge using concepts, theories, principles, and research from nursing, humanities, and sciences to develop advanced nursing practice knowledge which emphasizes the holistic approach;
2. demonstrate leadership, management, and teaching abilities in advanced nursing practice;
3. assume leadership, responsibility, and accountability for holistic therapeutic interventions within or across levels of care for diverse clients including individuals, families, groups, or communities;
4. participate in professional nursing organizations and political arenas;
5. participate in research and utilize research findings;
6. communicate scholarly ideas and professional knowledge to colleagues, other disciplines, and the public;
7. provide leadership in collaboration with clients and other health care professionals in the planning and delivery of holistic health care that is responsive to changing needs and societal trends;
8. examine critically the health of populations and related health care issues; and
9. demonstrate lifelong personal and professional learning.

**Functional Areas.** The curriculum also provides creative study in teaching, management, and clinical nurse practitioner role, including adult, pediatrics, women's health, psychiatric, and family. In addition, students may pursue special interests, such as health problems of selected groups, or unique aspects of the student's area of concentration.

## MASTER OF SCIENCE

See "Master's Degrees," page 98, for general requirements.

**Admission.** See "Admission to the Graduate College," page 89.

Admission to graduate status in the College of Nursing is based upon meeting the following requirements:

1. junior or senior status or a cumulative GPA equal to 3.00 (4.00 = A);
2. a baccalaureate degree in nursing accredited by a nationally recognized accrediting agency;
3. current Arizona license to practice as a registered nurse and/or to enroll in some nursing practicum courses;
4. satisfactory completion of the Graduate Record Examination in the past five years with scores of 500 or higher in each of the three areas preferred;
5. one year of work experience in a relevant area of professional nursing (additional years may be required for nurse practitioner roles);
6. a descriptive statistics course in a college or university with a grade of "C" or higher, and an inferential statistics course with a grade of "B" or higher;
7. recommendations from three professional persons knowledgeable about the applicant's academic and nursing leadership potential;
8. an interview with a representative of the specialty area;
9. eligibility for admission to the Graduate College;
10. completion of the TOEFL with a score of 550 or higher and of all requirements for the Commission on Foreign Graduate Nursing Schools (CFGNS) if considered an international student; and
11. completion of a baccalaureate level health assessment course within the preceding five years for all nurse practitioner programs.

Applicants who reside and work, or plan to reside and work in rural or medically underserved areas are encouraged to apply for admission. Applications to the program are due February 1.

**Supervisory Committee.** The dean of the Graduate College, upon recommendation of the College of Nursing associate dean for Graduate Programs and Research, appoints the supervisory committee. The supervisory committee recommends the program of study, administers any special qualifying examinations, administers the final oral examination, and approves the thesis or the nonthesis option project.

**Program of Study.** The program of study for the M.S. degree consists of a minimum of 40 semester hours for the nursing administration and community health areas and 47–53 hours for nurse practitioner role specialty areas.

The program of study for the M.S. degree in Nursing requires the completion of a strong research component. This requirement can be accomplished by either of two pathways: (1) completion of the required research course and six hours of thesis or (2) completion of the nonthesis option that includes the required research course (three hours), the research utilization course (three hours), the applied project course (one hour), and a presentation of the completed requirements. The completed project and presentation are evaluated by the student's supervisory committee.

**Foreign Language Requirements.** None.

**Degree Requirements.** The student must successfully complete the following as defined by the supervisory committee and as approved by the dean of the Graduate College:

1. the program of study,
2. a comprehensive written examination as required,
3. a thesis and final oral examination in defense of the thesis *or* nonthesis option project.

## RESEARCH ACTIVITY

The faculty and student research projects of the College of Nursing reflect a wide array of research interests. Studies have focused on the nursing profession, the nursing process, and the broad spectrum of health promotion, health maintenance, and developmental processes pertinent to nursing and health care.

Examples of faculty research include research in the area of minorities, such as studies on the utilization of health care by Latino mothers and their children; Latino and non-Latino caregivers of the elderly; African American women and cardiovascular disease; health care of Native Americans; and battering in pregnant Latino women. Additional research focuses on the special health needs of homeless children; care of the elderly, including home health care;



sociocultural influences on functional health in women; chronic illness in children and adults; family violence; various women's health issues; pediatric infectious diseases and family communication; children's temperament; biomedical ethics, clinical decision making, and community health nursing.

### NURSING (NUR)

#### **NUR 500 Research Methods.** (3) F, S

Research methods including research conceptualization and design in nursing. Prerequisite: graduate-level inferential statistics course.

#### **NUR 501 Advanced Adult Health Assessment/Promotion.** (3) F

Designed to expand adult health assessment/promotion skills through knowledge/strategies essential for developing and interpreting data. Lecture, demonstration. Prerequisites: college core courses except thesis/project; undergraduate health assessment course. Corequisite: NUR 580.

#### **NUR 502 Management and Maintenance of Adults with Chronic Health Alterations: Theory.** (3) S

Includes theory/research that guides the management/maintenance of adults with chronic health alterations. Psychophysiological interrelationships of illnesses emphasized. Lecture, seminar. Prerequisites: NUR 501, 580; admission to the graduate Nursing program; all flexible core courses except thesis/project.

#### **NUR 503 Management and Maintenance of Adults with Acute Health Alterations: Theory.** (3) S

Emphasizes theoretical research foundations essential for advanced practice involving care of adults with acute episodic alterations in health. Lecture, seminar. Prerequisite: NUR 501. Pre- or corequisite: NUR 580.

#### **NUR 512 Community Health Nursing: Advanced Theory I.** (3) F

Students identify and analyze theoretical perspectives and models guiding advanced community health nursing practice. Lecture, seminar. Prerequisite: all graduate program core courses. Corequisite: NUR 580.

#### **NUR 513 Community Health Nursing: Advanced Theory II.** (3) S

Drawing from their internship, students critically examine the application of theory to advanced community health nursing/public health practice. Lecture, seminar. Prerequisite: NUR 512. Corequisite: NUR 580.

#### **NUR 521 Community Mental Health/Psychiatric Nursing: Advanced Mental Health Assessment.** (3) F

Students gain knowledge of theories related to holistic health assessment for the promotion of physical/psychological health and develop skill in mental health assessments. Lecture, seminar, lab. Prerequisite: all graduate program core courses.

#### **NUR 522 Community Mental Health/Psychiatric Nursing: Advanced Theory I.** (3) F

Analysis of issues, theories, and research in restoration and promotion of mental health. Emphasizes developing conceptual framework for psychiatric nursing. Prerequisite: NUR 521. Corequisite: NUR 580.

#### **NUR 523 Community Mental Health/Psychiatric Nursing: Advanced Theory II.** (3) S

Focus of this course is development of theoretical basis for intervention and a knowledge base for collaboration and consultation in the mental health area. Prerequisite: NUR 522. Corequisite: NUR 580.

#### **NUR 524 Psychoneuroimmunology Approaches to Practice.** (3) SS

Overview of theories, concepts, and research in psychoneuroimmunology including physiological aspects and application to a holistic nursing model. Seminar. Prerequisite: graduate standing.

#### **NUR 531 Nursing of Children: Theory I.** (3) F

Focus on current practices, research, and issues related to health promotion and disease prevention for children and adolescents. Lecture, seminar. Prerequisite: all core and flexible courses except thesis and/or applied project. Corequisite: NUR 580.

#### **NUR 532 Nursing of Children: Theory II.** (3) S

Focus on concepts, theories, and research as basis for strategies related to management of illness and health maintenance for children. Lecture, seminar. Prerequisite: NUR 531. Corequisite: NUR 580.

#### **NUR 533 Nursing of Children with Special Needs: Theory II.** (3) S

Focus on concepts, theories, and research related to acute and chronic health deviations of children. Lecture, seminar. Prerequisite: NUR 531 or instructor approval. Corequisite: NUR 580.

#### **NUR 534 Women's Health: Theory I.** (4) F

Focuses on theories, principles, and research related to managing the health of normal perinatal women and families. Cooperative learning strategies. Prerequisite: all graduate program core courses. Corequisite: NUR 580.

#### **NUR 535 Women's Health: Theory II.** (4) S

Focuses on management of nursing care for high-risk perinatal women and women with common health problems. Cooperative learning strategies. Prerequisite: NUR 534. Corequisite: NUR 580.

#### **NUR 542 Nursing Administration Theory I.** (1–3) F

Critical analysis of leadership theories, organizational dynamics, and nursing administration processes. Seminar, case study. Prerequisite: all graduate program core courses.

#### **NUR 544 Nursing Administration Theory II.** (1–3) S

Synthesis of knowledge from previous courses to develop advanced nursing role. Analysis of resource and quality management and informatics. Lecture, seminar. Prerequisite: NUR 542.

#### **NUR 551 Theoretical Foundations of Advanced Practice Nursing.** (3) F, S

Designed to facilitate student exploration and examination of the foundations of advanced nursing practice. Lecture, seminar. Prerequisite: enrollment in graduate Nursing program.

#### **NUR 552 Health Care Issues and Systems.** (3) F, S

Analysis of organization, financing, service delivery and outcomes of the health system. Emphasizes policy issues, roles, and challenges for nurses. Lecture, seminar.

#### **NUR 553 Life Span Development.** (3) F

Critical examination of concepts, theories, issues, and research related to developmental periods throughout the life span. Biological and health, cognitive, psychological, and sociocultural influences are analyzed. Lecture, discussion. Prerequisite: admission to the graduate Nursing program or instructor approval.

#### **NUR 554 Population-Based Health Care.** (3) F, S

Identification and assessment of specific community health needs and health care patterns of target populations. Promotion, protection, and improvement of health is addressed when planning health care services. Lecture, seminar. Prerequisite: admission to the graduate Nursing program or instructor approval.

#### **NUR 558 Advanced Pediatric Health Assessment.** (2) S

Expansion of basic health assessment skills and development of clinical problem-solving skills for advanced practice nurses. Assessments of infants, children, and adolescents included. Lecture, lab. Prerequisites: admission to the graduate Nursing program; undergraduate health assessment within the last five years.

#### **NUR 559 Advanced Health Assessment.** (3) S

Expansion of basic health assessment skills and development of clinical problem-solving skills for advanced practice nurses. Assessments of infants, children, adolescents, and adults included. Lecture, lab. Prerequisites: admission to the graduate Nursing program; undergraduate health assessment within the last five years.

#### **NUR 561 Advanced Practice Nursing Role.** (2) SS

Focuses on the examination and implementation of the role of the advanced practice nurse, emphasizing major components and sub-components of the role. Lecture, seminar. Prerequisite: admission to the graduate Nursing program or instructor approval.

#### **NUR 562 Family Nurse Practitioner Theory I: Health Promotion, Management, and Maintenance.** (4) F

First didactic role specialty course. Focus on concepts and strategies to promote, manage, and maintain health of child, adult, and family. Corequisite: NUR 580.

#### **NUR 563 Family Nurse Practitioner Theory II: Health Promotion, Management, and Maintenance.** (4) S

Second didactic role specialty course utilizing knowledge from previous courses to formulate therapeutic promotion, management, and maintenance for individuals across the life span. Corequisite: NUR 580.

#### **NUR 564 Applied Pharmacotherapeutics for Advanced Practice.** (3) S

Lifespan course for advanced nurse practitioners to expand knowledge of pharmacotherapeutic concepts and principles. Lecture, discussion, case studies. Prerequisite: admission to the graduate Nursing program.

**NUR 565 Applied Physiology/Pathophysiology in Advanced Practice.** (3) S

Advanced nurse practitioner course designed to expand previously acquired anatomy and physiology knowledge and discern pathological alterations across the lifespan. Lecture, seminar, case studies. Prerequisites: admission to the graduate Nursing program or instructor approval; undergraduate anatomy and physiology.

**NUR 566 Pediatric Physiology/Pathophysiology.** (3) S

Analysis of the patterns of heredity, cellular differentiation, and the development of systems in the infant to adolescent. Prerequisite: admission to the graduate Nursing program or instructor approval.

**NUR 571 Teaching in Nursing Programs.** (3) N

Analysis of theories, issues, and research related to teaching in nursing. Focus on the process of teaching/learning. Seminar, cooperative learning. Prerequisite: graduate standing. Corequisite: teaching practicum.

**NUR 578 Gestalt Therapy I.** (3) F

An introduction to theory and methodology of Gestalt therapy and its uses for mental health promotion and restoration.

**NUR 579 Gestalt Therapy II.** (3) S

Focus is on further development of Gestalt therapy and its application in working with various client populations. Prerequisite: NUR 578.

**NUR 580 Practicum (Electives).** (1–4) N

Clinical application of theories, concepts, and principles such as health promotion, health management, health maintenance, teaching, management, and special clinical studies.

**NUR 580 Advanced Nursing Practicum I, II.** (2–6) F, S

Clinical application of theories, concepts, and principles. The areas of concentration include the following:

- (a) Adult Health Nursing
- (b) Community Health Nursing
- (c) Community Mental Health/Psychiatric Nursing
- (d) Family Health Nursing
- (e) Nursing Administration
- (f) Parent-Child Nursing with the Tracks of the Childbearing Family and Nursing of Children

Conferences. Prerequisites: admission to the graduate Nursing program; instructor approval. Corequisite: NUR 501 or 502 or 503 or 512 or 513 or 522 or 523 or 531 or 532 or 533 or 534 or 535 or 562 or 563 or 584.

**NUR 582 Advanced Human Physiology.** (3) F

Analyzes major theories and concepts of human physiology. Interrelationship of physiology and health is explored.

**NUR 584 Community Health Nursing Internship.** (3) S

Students operationalize community health nursing/public health content in leadership roles in a variety of community agencies. Clinical internship. Prerequisites: NUR 512, 580. Corequisite: NUR 513.

**NUR 585 Stress Reduction.** (3) N

Theory, application, and evaluation of mind/body relaxation methods, including physiological effects. Research findings emphasized. Daily student practice. Prerequisite: graduate standing or instructor approval.

**NUR 586 Advanced Pathophysiology.** (3) S

Manifestation of altered human physiology and disease. Systems theory is used to analyze the relationships of disease and physiology.

**NUR 589 Research Utilization.** (3) F, S

Emphasis on the synthesis and application of research to an identified clinical nursing problem. Prerequisite: NUR 500. Corequisite: NUR 593.

**NUR 591 Seminar.** (2–4) N

Advanced topics, including curriculum development and health promotion. Prerequisite: instructor approval in selected courses.

**NUR 593 Applied Project.** (1) F, S

Preparation of a supervised applied project that is a graduation requirement in some professional majors. Corequisite: NUR 589. Completion of NUR 551 is recommended.

**NUR 598 ST: Special Topics.** (2–4) N

Special study, including issues in health care and organizations, management in nursing, ethical issues, and clinical nurse specialist role. Prerequisite: instructor approval in selected courses.

**NUR 599 Thesis.** (1–6) F, S, SS

Research proposal development, data collection and analysis, thesis writing, and thesis oral defense. Six hours required.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Performance

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See “Music,” page 251.

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## Philosophy

**Brad Arment**

*Chair*

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### REGENTS' PROFESSOR

MURPHY

### PROFESSORS

CREATH, FITCH, HUMPHREY, MAIENSCHIN, WHITE

### ASSOCIATE PROFESSORS

ARMENDT, BLACKSON, COHEN, de MARNEFFE,  
GULESERIAN, KOBES, MCGREGOR, REYNOLDS

### ASSISTANT PROFESSOR

DEVLIN

The faculty in the Department of Philosophy offer a graduate program leading to the M.A. or Ph.D. degree in Philosophy. For the specific requirements of the Ph.D., contact the department.

### MASTER OF ARTS

See “Master’s Degrees,” page 98, for general requirements.

**Prerequisites.** At least 15 semester hours of upper-division course work in philosophy, including history of philosophy, epistemology, metaphysics and the equivalent of PHI 333 Introduction to Symbolic Logic are required. No course credits in which a grade of less than “B” has been earned may count toward meeting this 15-semester-hour requirement. Persons otherwise qualified for admission but lacking the above prerequisites may make up this deficiency by enrolling as a nondegree graduate student and taking those philosophy courses necessary to complete the prerequisite. If some or most of the prerequisites have already been met, the student may be admitted into the program under “provisional status” or under “regular status with deficiencies.” All applicants for admission to the program must submit scores for the general section of the Graduate Record Examination.

**Program of Study.** The M.A. degree program in Philosophy is designed to prepare students either to teach philosophy at the community college level, to enter doctoral programs in philosophy at other institutions, or to be employed in any areas that require critical, analytical thinking (such as medicine, law, government, or publishing). The program seeks to maintain a balance between a breadth of course offerings in the traditional areas of philosophy—metaphysics

ics, ethics, epistemology, logic, and history of philosophy—and opportunities for study in current philosophical developments, such as the philosophy of science, philosophy of language, and philosophical psychology. The program of study includes at least 30 semester hours of approved graduate-level courses, not including PHI 599 Thesis. An additional six hours of PHI 599 Thesis is required. The details of each student's program are worked out with the director of graduate studies.

**Course Requirements.** Each student is required to take an approved graduate-level course of three semester hours or more in each of the following areas and to obtain at least a “B” in each course: metaphysics/epistemology, value theory and logic; and any two of the following: history of early philosophy, history of modern philosophy, and history of contemporary philosophy.

**Foreign Language Requirements.** None.

**Thesis Requirements.** A thesis is required. This written work must demonstrate the ability to carry out independent research in philosophy.

**Final Examinations.** A final oral examination in defense of the thesis is required.

## RESEARCH ACTIVITY

The department offers a solid program in traditional and contemporary philosophy. Areas of recent and current faculty research include the following: belief ascription, the nature of singular propositions, time and time travel, modality and belief, philosophical problems of cognitive psychology, reference and attribution, God and modality, God and evil, divine freedom, theories of punishment and criminal law, freedom and coercion, mercy and legal justice, evolution and morality, Kantian autonomy, liberalism, social justice and basic rights, growth and character of experimentation, the rise of American biology, the roles of research traditions and working hypotheses in science, the character of theoretical entities, observation and justification, coherence theories of knowledge, foundational theories of knowledge, theories of rational choice, knowledge of oneself, the riddles of induction, skepticism, analyticity, the notion of following rules, Plato, Aristotle, ancient theories of freedom and determination, critical theory, 19th-century idealism, actualism, causality, space, time and continuity, Kant, Carnap, Quine, and Rawls.

A selection of books and forthcoming books of the faculty include the following: *Perception, Reason, and Knowledge* (editor); *Fundamentals of Logic* (co-author); *Introduction to Symbolic Logic*; *Dear Carnap, Dear Van: The Quine-Carnap Correspondence and Related Work* (editor); *Analyticity: The Carnap-Quine Debate*; *Naming and Believing*; *Welches sind die wirklichen Fortschritte, die die Metaphysik seit Leibniz und Wolf's Zeiten in Deutschland gemacht hat?* (translator, editor); *Perpetual Peace and Other Essays* (translator); *Transforming Traditions in American Biology, 1880–1915*; *Defining Biology: Lectures From the 1890's* (editor); *The Coming of Age of American Biology*; *The Emergence of Biology in America* (co-editor); *Kant: The Philosophy of Right*; *Retribution, Justice and Therapy: Essays in the Philosophy of Law*; *Evolution, Morality and the Meaning of Life*; *The Philosophy of Law: An Introduction to Jurisprudence* (co-author); *Agency and*

*Integrity: Philosophical Themes in the Ancient Discussions of Determinism and Responsibility*; *Retribution Reconsidered*; *The Continuous and the Discrete: Ancient Physical Theories from a Contemporary Perspective*; *Inquiry, Forms, and Substances: A Study in Plato's Metaphysics and Epistemology*; *Partisan or Neutral? The Futility of Public Political Theory*.

The department has also developed interdisciplinary programs linking philosophy with other disciplines, e.g., philosophy of law and history and philosophy of science and technology.

## PHILOSOPHY (PHI)

### PHI 401 Rationalism. (3) N

Examination of classical philosophical rationalism, as in Descartes, Spinoza, Malebranche, or Leibniz. Contemporary rationalist thought may also be examined. Prerequisites: PHI 302; 1 course from among PHI 305, 309, 312, 316, 317.

### PHI 402 Empiricism. (3) N

Examination of representatives of either classical or contemporary philosophical empiricism, e.g., Bacon, Hobbes, Locke, Butler, Berkeley, Reid, Hume, Mill, Carnap, and Ayer. Prerequisites: PHI 302 and 305 (or 309 or 312 or 316 or 317). *General Studies: HU*.

### PHI 403 Contemporary Analytic Philosophy. (3) A

Aims and methods of such 20th-century philosophers as Frege, Moore, Russell, Wittgenstein, Carnap, Ayer, Wisdom, Ryle, Austin, Strawson, Quine, and Sellars, with application to metaphysics and epistemology. Prerequisites: PHI 302; 1 course from among PHI 312, 314, 315, 316, 317, 401, 402. *General Studies: HU*.

### PHI 413 Advanced Symbolic Logic. (3) N

Properties of formal systems axiomatizing propositional and 1st-order predicate logic. May also include modal logic, number theory, and limits of logicism. Prerequisite: PHI 333.

### PHI 420 Topics in Philosophy. (3) A

Course descriptions on file in department. Topics may be selected from the following:

- History of Philosophy
- Metaphysics/Epistemology
- Philosophy of Language/Logic
- Philosophy of Science
- Value Theory

Courses may be repeated for credit. Prerequisite: one relevant upper-division PHI course or instructor approval.

### PHI 591 Seminar. (1–3) A

Topics may be selected from the following:

- Aesthetics
- Epistemology
- Ethics
- History of Philosophy
- Logic
- Metaphysics
- Philosophy of Language
- Philosophy of Law
- Philosophy of Science
- Social and Political Philosophy

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Physical Education

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### MASTER OF PHYSICAL EDUCATION

The faculty in the Department of Exercise Science and Physical Education offer a program leading to the Master of Physical Education (M.P.E.) degree. The M.P.E. degree is designed to prepare scholarly professionals (i.e., teachers of physical education). Emphasis is placed on improving

instructional effectiveness and developing a quality physical education curriculum in a school setting. Three areas of study are available: elementary, secondary, and adapted physical education.

**Admission.** Applicants who hold a bachelor's degree in education and who are certified to teach may apply to the M.P.E. degree directly. Applicants with a bachelor's degree in physical education but who are not certified to teach will apply to the postbaccalaureate/M.P.E. degree. Deficiencies will be assessed where applicable.

**Program of Study.** A minimum of 33 semester hours of course work is required for the M.P.E. program, with 18 hours of required core courses, six hours of cognate area, and nine hours of recommended electives. A total of 58 semester hours is required of students completing both the postbaccalaureate program and the M.P.E.

**Foreign Language Requirements.** None.

**Final Examinations.** A final written comprehensive examination is required.

## Physics

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### REGENTS' PROFESSOR SPENCE

#### PROFESSORS

BENNETT, BURSTEIN, COMFORT, COWLEY, DOAK, DOW,  
HANSON, HESTENES, JACOB, KAUFMANN, LINDSAY,  
MENÉNDEZ, NIGAM, PAGE, REZ, RITCHIE, SANKEY,  
SCHEINFELD, SCHMIDT, SMITH, STARRFIELD, TILLERY,  
TSEN, TSONG, VENABLES, VOSS,  
WINDHORST, WYCKOFF

#### ASSOCIATE PROFESSORS

AANNSTAD, ACHARYA, ALARCON, BENIN,  
CHAMBERLIN, CULBERTSON, HERBOTS,  
HESTER, MARZKE

The faculty in the Department of Physics and Astronomy offer graduate programs leading to the M.S. and Ph.D. degrees in Physics. In the M.S. program, options are available in physics, physics with an emphasis in astronomy, interdisciplinary physics, technical physics, or physics teaching. In the Ph.D. program, options are available in physics, physics with an emphasis in astronomy, or applied physics.

Students enrolled in the Ph.D. degree program may be awarded an M.S. degree in passing.

The faculty in the Department of Physics and Astronomy also participate in the program leading to the Master of Natural Science degree (see "Master of Natural Science,"

page 257) when one of the concentrations is physics, and in the interdisciplinary program leading to the Ph.D. degree in the Science and Engineering of Materials (see "Science and Engineering of Materials," page 281).

Students admitted to the Master of Education degree program with a major in Secondary Education may elect physics or science education as the subject matter field. A Doctor of Education degree program option is also available. The M.Ed. (see "Master of Education," page 174) and Ed.D. (see "Doctor of Education," page 175) are offered and administered through the College of Education.

The master's and doctoral programs are designed to prepare students for professional research careers in governmental, industrial, or academic institutions and for teaching at the university, college, or secondary school levels.

An evaluation of the progress of all graduate students is made during the spring semester by the Graduate Program Committee. Students whose progress is considered to be unsatisfactory are placed on probation. Failure to maintain a GPA of 3.00 in courses taken while enrolled as a graduate student, exclusive of research, thesis, and dissertation, is an indication of unsatisfactory progress and may result in dismissal from the program.

Courses can include up to six hours of 400-level courses (see "Graduate Credit Courses," page 94). Timely attempts at examination are also required.

Teaching experience in undergraduate physics and astronomy laboratories and recitations is valuable training for graduate students and is considered part of the graduate program.

Departmental colloquia are an integral part of the graduate program. Regular attendance at colloquia is expected of all graduate students intending to earn graduate degrees.

## MASTER OF SCIENCE

See "Master's Degrees," page 98, for general requirements.

**Admission.** To be admitted without deficiencies, entering graduate students should have adequate undergraduate preparation equivalent to an undergraduate major of 30 semester hours in physics and 20 semester hours in mathematics. Courses in analytic mechanics, electromagnetism, and modern physics, including quantum mechanics, are particularly important. Students applying for admission must submit scores for the verbal, quantitative, and analytical sections of the Graduate Record Examination (GRE).

Applicants for financial support must submit a score on the physics advanced examination of the GRE. Subsequent financial support in the form of teaching or research assistantships is contingent upon satisfactory performance in course work, timely completion of the final examination for the M.S. degree as described below, and need and availability of such support. Students on probation are offered financial support only under exceptional circumstances.

**Program of Study.** The faculty in the Department of Physics and Astronomy offer the M.S. degree under two options: Track I—emphasizing physics, and Track II—emphasizing one of the following related fields:

1. astronomy and astrophysics,
2. interdisciplinary physics (e.g., with chemistry),
3. technical physics, or

#### 4. physics teaching.

A supervisory committee is formed for each student, usually during the first year of study. In each case an appropriate program of study is selected with the approval of the supervisory committee. A research project resulting in a thesis is required of all students enrolled in the M.S. program.

#### Track I

*Physics.* An individual program of study, including courses in physics, astronomy, mathematics, or related subjects, is selected with the approval of the supervisory committee to make up a coherent program of graduate study. The courses and research project are to be conducted primarily within the Department of Physics and Astronomy.

#### Track II

*Astronomy and Astrophysics.* The AST graduate courses are taken plus the required graduate physics courses for the Track II M.S. program. The research project must be in the area of astronomy and astrophysics, conducted under the supervision of one or more faculty members of the Department of Physics and Astronomy who specialize in this subject.

*Interdisciplinary Physics.* The courses taken are approximately half in physics and half in some other subject area. The research project must be in an interdisciplinary area and conducted under the joint supervision of one faculty member from the Department of Physics and Astronomy and one faculty member from another department.

*Technical Physics.* The research project involves active collaboration with some industrial or government laboratory under the supervision of a faculty member from the Department of Physics and Astronomy and may be conducted either in the Department of Physics and Astronomy or in the outside laboratory. At least half the courses taken must be in physics.

*Physics Teaching.* The course of study and research are designed to prepare for a career in physics teaching, with appropriate modifications for teaching at the high school or community college level. At least half the courses taken must be in physics. Students participate in directed, evaluated teaching experiences.

**Foreign Language Requirements.** None.

**Thesis Requirements.** A thesis is required of all students obtaining the M.S. degree. Every student must obtain at least six semester hours in PHY 592 or PHY 599. However, no more than nine semester hours in these courses can be counted toward the 30 semester hours required for the M.S. degree.

**Final Examinations.** The final examination for the M.S. degree is an oral examination on the subject of the student's thesis and on graduate course work taken.

### DOCTOR OF PHILOSOPHY

See "Doctor of Philosophy," page 101, for general requirements.

**Admission.** This program is designed for students of high ability who show promise for independent research. An applicant holding a baccalaureate degree should have the same undergraduate preparation as for admission to the

master's program. An applicant presenting acceptable graduate credit, earned at this or another institution must demonstrate mastery of this material on the "Written Comprehensive Examination," and the "Oral Comprehensive Examination," page 264.

Students applying for admission must submit scores for the verbal, quantitative, and analytical sections of the GRE.

Applicants for financial support must submit a score on the physics advanced examination of the GRE. Subsequent financial support in the form of teaching or research assistantships is contingent upon satisfactory performance in course work, timely completion of examinations, including the written and oral Ph.D. comprehensive examinations as described below, and need and availability of such support. Students on probation are offered support only under exceptional circumstances. The period for which a Ph.D. candidate may receive financial support through the Department of Physics and Astronomy will not normally exceed six years.

**Program of Study.** In order to accommodate the needs for training in preparation for the wide variety of occupations of professional physicists and astrophysicists, in areas ranging from academic faculty to industrial research to administrative positions, doctoral degree programs are offered under two tracks: physics (Track I) and astrophysics, applied physics, or interdisciplinary physics (Track II). The goal is to provide, through course work and independent study, competence at advanced levels in fundamental, applied and interdisciplinary branches of physics and astronomy, and demonstrated ability in independent research.

Students enrolled in the Ph.D. program may obtain an "M.S. degree in passing" by satisfactorily filing and completing an M.S. Program of Study, obtaining a GPA of at least 3.00 in a set of core courses which total 24 semester hours, and passing a written comprehensive examination. The core courses shall be those designated for one of the tracks in the Ph.D. program. Graduate core courses satisfactorily completed at other institutions may be waived upon petition by the Graduate Program Committee. Up to nine semester hours of classroom-based courses may be substituted for core courses that are waived by the Graduate Program Committee.

Each student's progress is overseen by a supervisory committee appointed for the student usually during the first year of study. This committee also approves the student's program of study.

#### Track I

*Physics.* The student's individual program includes courses selected, with the approval of the supervisory committee, to make up a coherent program for the achievement of these goals. The program may be directed toward either theoretical or experimental aspects, and frequently includes courses in cognate fields, particularly mathematics, depending on the student's selected field.

#### Track II

*Applied Physics.* Under advisement by the supervisory committee, a program of study is selected with a major portion in physics and a minor portion (nine semester hours or more to be passed with at least a "B" average) in another area. The supervisory committee should include appropriate representation from the minor area.

*Astronomy and Astrophysics.* The following six AST 598 graduate courses are required for all students enrolled in the astronomy and astrophysics graduate program:

AST I	Interstellar Medium and Gaseous Astrophysics
AST II	Galactic Structure
AST III	Stellar Interiors and Stellar Evolution
AST IV	Extragalactic Astronomy
AST V	Astronomical Data Taking and Data Reduction
AST VI	Cosmology and High-Energy Astrophysics

**Course Requirements.** The following basic core of courses, or their equivalents, is required of both Track I and Track II students:

PHY 501	Methods of Theoretical Physics	3
PHY 521	Classical Mechanics	3
PHY 531	Advanced Electricity and Magnetism	3
PHY 541	Statistical Physics	3
Total		12

In addition, the following courses are required of all Track I students:

PHY 502	Methods of Theoretical Physics	3
PHY 532	Electrodynamics	3
PHY 576	Quantum Theory	3
PHY 577	Quantum Theory	3
Total		12

Additional course work in both tracks is selected with the advisement and approval of the supervisory committee.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** The following examinations are required of all students intending to earn the Ph.D. degree.

**Master of Science Degree in Passing.** Students enrolled in the Ph.D. degree may be awarded an M.S. degree in passing.

### Written Comprehensive Examination

**Track I.** The subject matter of this examination is classical and quantum mechanics, statistical mechanics, and electricity and magnetism, as represented by the courses PHY 521, 531, 532, 541, 576, and 577. The examination is given in two four-hour sessions on separate days, but there is no division of subject matter for the separate sessions.

**Track II.** This examination consists of parts A and B.

Part A emphasizes quantum mechanics, classical mechanics, and electricity and magnetism, as represented by the courses PHY 416, 521, and 531, and is written in a four-hour examination period.

For all Track II students except astronomy and astrophysics students, Part B is a written examination prepared by the student's supervisory committee and approved by the graduate examination committee. The Part B Track II examination for astronomy and astrophysics students is prepared by the astrophysics subcommittee of the graduate examination committee, and is based mostly on the course material presented in the AST courses. Part B of the Track II exam is given within three days after the Part A exam. The Part B exam for astronomy and astrophysics students is graded by the astrophysics faculty; Part B for all other Track II students is graded by their supervisory committee, under the supervision of the graduate examination committee.

The written comprehensive examination is normally given twice yearly, approximately during registration weeks of the fall and spring semesters. Ph.D. candidates must attempt the examination before the beginning of their fifth semester as full-time students in the physics graduate program and must pass the examination before the beginning of the sixth semester.

### Oral Comprehensive Examination

Ph.D. candidates are required to pass the oral comprehensive examination by the end of their sixth semester as full-time students in the physics graduate program. The examination is administered and graded by the student's supervisory committee. It tests the student's general knowledge of one of the following four broad areas of current activity in physics:

1. astronomy and astrophysics,
2. atomic and molecular physics,
3. nuclear and particle physics, and
4. solid-state and many-body physics.

The area tested is to be chosen by the student at the time of scheduling of the examination. The student may request to be examined on specific subjects in addition to one of the above areas. In all cases, a student's specific dissertation topic, should it exist at the time of the examination, is to be excluded from the material covered by the examination.

**Dissertation Requirements.** A dissertation representing an original contribution to the field, as a result of independent work suitable for publication in a refereed physics or astronomy journal, is required.

**Final Examinations.** A final oral examination that covers, but is not necessarily limited to, the subject of the dissertation is required.

### RESEARCH ACTIVITY

The Department of Physics and Astronomy is engaged in a large number and a broad spectrum of research activities. The following is a list of current and recent research interests of the faculty.

*Applied Physics.* Mechanisms of inelastic effects of particle-solid interactions; surface characterization and depth-profiling by secondary ion mass spectrometry and sputter-induced photon spectroscopy; surface structure determination by low-energy ion-scattering spectrometry; and scanning tunneling microscopy.

*Astronomy and Astrophysics.* Comets, hydrodynamic studies of compact stellar objects and of novae outbursts; ultraviolet observations of novae in eruption; stellar atmosphere studies of supernovae, novae, and cool stars; pulsating white dwarfs and hot, evolved stars; studies of the interstellar medium, ionized regions and dust in our galaxy; normal galaxies; 21 cm HI studies of galaxies; stellar populations; dynamics and kinematics of galaxies; classification of spiral galaxies; clusters of galaxies; galaxy formation and evolution; distribution of matter in space; quasars and active galaxies.

*Experimental Condensed Matter Physics.* Lattice dynamics of crystals near the covalent-ionic boundary; superionic conductors; optical studies at very high pressures; NMR and related magnetic measurements in small particles and metal

ammonia compounds; resonance Raman spectroscopic studies of electron-phonon interactions and Raman and Brillouin scattering studies of phonon-phonon interactions; picosecond and frequency domain Raman studies of semiconductors; dielectric measurements of various polymer systems; scattering by transverse waves in polymers; tandem interferometer studies of polymer dynamics; EXAFS studies of local environments in solids; magnetic and structural properties of compositionally layered materials; magnetic properties of metallic thin films; organic low-dimensional conductors; and spin glasses.

*Theoretical Condensed Matter Physics.* Resonance Raman scattering; development of techniques for photoacoustic measurement of the photophysical properties of biological molecules; electronic structure of solids; band gap levels in semiconductors due to defects and surfaces; dynamics and transport properties of perfect and imperfect crystals; electron-phonon interaction, phonons in superfluid He; and ab initio calculations of the structural and electronic properties of semiconductor surfaces.

*Diffraction Physics.* Development of techniques and the theoretical basis for electron microscopy and electron diffraction; the design and construction of electron optical instruments and attachments; determination of the structures of crystals and of their defects and disorder by the scattering of electrons and the generation of secondary radiation using ultra high-resolution microscopy; scanning transmission electron microscopy; microdiffraction, and micro-analysis; the structure and reactions of solid surfaces studied by high resolution imaging, diffraction, and spectroscopies; channeling phenomena and their application in the analysis of crystals; the electronic states of surfaces and defects in solids; scanning Auger spectroscopy; growth of overlayers on surfaces.

*Theoretical High Energy and Particle Physics.* Dispersion relation phenomenology; pion-nucleon scattering and associated reactions; current algebra; models of chiral symmetry breaking; electromagnetic interactions of hadrons; gauge field theories; and unified gauge field theories.

*Experimental Nuclear Physics.* Meson physics, including pion-induced reactions (such as pion-nucleon and pion-nucleus scattering, charge exchange, and absorption), pion decay and meson photoproduction; proton-nucleus scattering and reactions at medium energies; polarization measurements, including observables for polarized targets; electron scattering and electro-nuclear reactions in few-body systems; studies of nucleon resonances with real and virtual photons; studies of subnuclear degrees of freedom.

*Theoretical Nuclear Physics.* Charge exchange reactions of pions with light nuclei; three-body problems; kaonic and antiprotonic atoms; electron-nucleus interactions; and nuclear form factors.

*Science Education.* Theoretical and experimental work related to the development of advanced logical and analogical reasoning, and problem solving heuristics and concepts through science instruction; attitudes towards science; role of peer interaction; evaluation of preservice and in-service teacher education programs; role of cultural influences.

*Theoretical Physics.* Local observables in quantum theory; electron theory; and applications of the WKB method.

## PHYSICS (PHY)

### PHY 412 Classical Particles, Fields, and Matter III. (3) F

Electromagnetic fields of moving charges, Maxwell's equations, harmonic phenomena, oscillations, waves, electromagnetic radiation, covariant electromagnetism, introduction to general relativity. Prerequisites: PHY 311, 333. Corequisite: PHY 416 or instructor approval.

### PHY 416 Quantum Physics III. (3) F

Introduction to the quantum theory of atoms, molecules, solids and nuclei, Dirac's equation. Prerequisites: PHY 311, 315. Corequisite: PHY 412 or instructor approval.

### PHY 420 Research Paper. (1) F, S

Scientific report writing. Culminates in a paper based on library or laboratory research or both. Taken in conjunction with other courses as approved. Conference. Prerequisite: instructor approval. *General Studies: L2.*

### PHY 441 Statistical and Thermal Physics I. (3) F

Statistical and experimental basis of heat, temperature, and entropy. Mechanical and statistical basis of the laws of thermodynamics. Applications of macroscopic thermodynamics. Phase equilibrium. Prerequisites: PHY 311, 315.

### PHY 442 Statistical and Thermal Physics II. (3) S

Principles and applications of statistical mechanics. Quantum statistics of ideal gases and simple solids. Equilibrium of phases and chemical species. Transport theory. Irreversible processes and fluctuation. Prerequisite: PHY 441.

### PHY 452 Physical Optics. (3) F

Principles of reflection, refraction, diffraction. Additional topics from contemporary optics may include Fourier transform spectroscopy, linear systems theory, holography. 2 hours lecture, 2 hours lab. Prerequisites: PHY 302, 311, 315. Corequisite: PHY 412.

### PHY 462 Nuclear and Particle Physics. (3) S

Static properties of nuclei, natural and induced radioactivity, nuclear reactions, nuclear models and energy levels, mesons and hyperons, and interaction of photons and electrons with matter. Prerequisites: PHY 311, 315.

### PHY 465 Advanced Laboratory II. (2) F, S

Continuation of PHY 334. Students are encouraged to substitute laboratory research project in consultation with faculty sponsor. Prerequisite: PHY 334.

### PHY 466 Advanced Laboratory III. (1-3) F, S

Continuation of PHY 465. Prerequisite: PHY 465.

### PHY 480 Methods of Teaching Physics. (3) S

Evaluation of various approaches to the teaching of high school physics. Preparation of demonstrations and experiments. Organization of a laboratory. Designed for secondary school physics teachers. Prerequisite: instructor approval.

### PHY 481 Solid-State Physics. (3) S

Structure, elastic properties, and dynamics of crystals; electron motions in crystals under applied fields. Prerequisites: PHY 311, 315.

### PHY 501 Methods of Theoretical Physics. (3) F, S

Provides mathematical foundations for graduate students in basic and applied physics. Complex variables, vector spaces, operators, matrices, ordinary differential equations, integral equations and transforms, and special functions. May include additional topics.

### PHY 502 Methods of Theoretical Physics. (3) F, S

Continuation of PHY 501. Prerequisite: PHY 501.

### PHY 521 Classical Mechanics. (3) F

Variational principles, Lagrange's and Hamilton's equations, rigid body motion, canonical transformations, Hamilton-Jacobi theory.

### PHY 523 Relativity. (3) N

Special and general theories of relativity. Prerequisite: PHY 532 or instructor approval.

### PHY 531 Advanced Electricity and Magnetism. (3) F

Electrostatics and magnetostatics; potential theory and theory of constitutive relations; Maxwell's equations; the wave equation, plane electromagnetic waves, cavities, and wave guides.

### PHY 532 Electrodynamics. (3) S

Special theory of relativity, covariant formulation of electromagnetic interactions; inhomogeneous wave equations, Lienard-Wiechert potentials, and radiation fields; interactions of charged particles and electromagnetic waves, scattering, dispersion. Prerequisites: PHY 412 and 531 or instructor approval.

**PHY 541 Statistical Physics.** (3) F

Probability theory and principles of statistical inference; evaluating experimental data; foundations of statistical mechanics; general laws of thermodynamics from microscopic theories; calculation of specific properties of bulk matter.

**PHY 551 X-ray and Electron Diffraction.** (3) S

Fresnel and Fraunhofer diffraction in integral formulation; diffraction of X-rays and neutrons by crystal lattices; structures of solids, including crystal structure analysis; theory and techniques of electron microscopy/diffraction of crystalline/noncrystalline specimens. Prerequisite: PHY 481 or instructor approval.

**PHY 561 Nuclear Physics.** (3) F, S

Two nucleon interaction, Clebsch-Gordon coefficients, internucleon forces, meson theory and high energy scattering, nuclear binding energy, nuclear models, transition probability estimates, nuclear reactions, and beta decay. Prerequisite: PHY 576 or instructor approval.

**PHY 562 Nuclear Physics.** (3) F, S

Continuation of PHY 561. Prerequisite: PHY 561 or instructor approval.

**PHY 568 Elementary Particle Physics.** (3) N

Classification of particles; phenomenology of strong, electromagnetic and weak interactions, cross sections, and decay rates; isotopic spin and higher symmetries; structure of reaction amplitudes. Prerequisite: PHY 577.

**PHY 569 Elementary Particle Theory.** (3) N

Continuation of PHY 568. Prerequisite: PHY 568.

**PHY 576 Quantum Theory.** (3) F, S

Abstract approach to quantum mechanics in Hilbert space; observables and their corresponding operators, eigenstates, and eigenvalues; quantum dynamics; approximation methods; systems of identical particles; angular momentum and group representation theory; collision processes; relativistic quantum theory. Prerequisite: PHY 521.

**PHY 577 Quantum Theory.** (3) F, S

Continuation of PHY 576. Prerequisite: PHY 576.

**PHY 578 Relativistic Quantum Theory.** (3) F, S

Relativistic 1-particle equations, Klein-Gordon equation, Dirac equation, 2d quantization, theory of scattering, S-matrix, Feynman diagrams, quantum electrodynamics, and renormalization procedures. Prerequisite: PHY 577.

**PHY 579 Relativistic Quantum Theory.** (3) F, S

Continuation of PHY 578. Prerequisite: PHY 578.

**PHY 581 Solid-State Physics.** (3) F

Quantum theory of solids, including phonons, lattice specific heats, band structure models, Fermi surfaces, thermal expansion, plasmons, electron-phonon interactions, and scattering by lattice defects. Pre- or corequisite: PHY 576.

**PHY 582 Solid-State Physics.** (3) S

Elements of transport theory, thermal conduction, electronic conduction in metals, mobility in semiconductors, Hall effect, magnetoresistance, and selected topics of current research. Prerequisite: PHY 581.

**PHY 587 Quantum Optics.** (3) F, S

Quantization of the electromagnetic field. Quantum theory of coherence, photon counting, photon states, lasers, density operators, and atomic Raman scattering. Prerequisite: PHY 576.

**PHY 588 Quantum Optics.** (3) F, S

Continuation of PHY 587. Prerequisite: PHY 587.

**PHY 598 ST: Special Topics.** (1–4) F, S

Continuation of PHY 587. Prerequisite: PHY 587.

(a) Quantum Mechanics (3) S

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**ASTRONOMY (AST)****AST 421 Astrophysics I.** (3) F

Selected astrophysical topics, including: stellar evolution, star formation, interstellar medium, galactic structure, extragalactic astronomy, high-energy astrophysics, and cosmology. Prerequisites: AST 321, 322; PHY 311, 314.

**AST 422 Astrophysics II.** (3) S

Same range of astrophysical topics as for AST 421 but different specific topics will be emphasized in a given year. Prerequisites: AST 321, 322; PHY 311, 314.

**AST 598 ST: Special Topics.** (1–4) N

- (a) Astronomical Data Taking and Data Reduction
- (b) Cosmology and High-Energy Astrophysics
- (c) Extragalactic Astronomy
- (d) Galactic Structure
- (e) Interstellar Medium and Gaseous Astrophysics
- (f) Stellar Interiors and Stellar Evolution

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**Plant Biology**

**J. Kenneth Hooper**

*Chair*

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**PROFESSORS**

BACKHAUS, HOOBER, KLOPATEK, NASH, PINKAVA,  
SOMMERFELD, TRELEASE, VERMAAS

**ASSOCIATE PROFESSORS**

CLARK, DAY, FRASCH, MARTIN, PIGG, ROBERSON,  
STROMBERG, STUTZ, SZAREK, TOWILL, WEBBER

**ASSISTANT PROFESSOR**

POGSON

**ACADEMIC PROFESSIONALS**

BINGHAM, LANDRUM, LOBRUTTO, SHARP

The faculty in the Department of Plant Biology offer programs leading to the M.S. and Ph.D. degrees in Plant Biology. Among other areas of study, two concentrations are available: ecology and photosynthesis.

Select faculty collaborate with the faculty in the Departments of Biology, Chemistry and Biochemistry, and Microbiology in offering programs leading to the M.S. and Ph.D. degrees in Molecular and Cellular Biology (see “Molecular and Cellular Biology,” page 250).

The faculty participate in the programs leading to the Master of Natural Science degree (see “Master of Natural Science,” page 257) when the primary or secondary area of concentration is in plant biology. Students interested in pursuing the M.N.S. degree through an interdisciplinary program emphasizing any of these areas should contact the Department of Plant Biology for additional information.

Applicants for these degree programs must submit scores on the Graduate Record Examination (GRE) (aptitude). GRE scores in the advanced subject area are recommended.

The graduate programs are designed to prepare students for careers in teaching and in research on various aspects of plant biology, in educational institutions, industry, or government agencies.

**MASTER OF SCIENCE**

**Prerequisites.** Completion of the requirements for an undergraduate major in the plant sciences, biology, or related discipline, and an adequate background in related courses in chemistry, mathematical, and physical sciences.



**Program of Study.** A minimum of 30 semester hours of graduate credit is required. The program must include at least three semester hours of research, three semester hours of thesis, one semester of the core course PLB 502 Perspectives in Plant Biology and one hour of participatory seminar (PLB 591). The program is planned by the student in consultation with the supervisory committee.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Not required.

**Thesis Requirements.** A thesis is required.

**Final Examinations.** A final research seminar and an oral examination covering the thesis and related subject matter are required.

## DOCTOR OF PHILOSOPHY

See "Doctor of Philosophy," page 101, for general requirements.

**Program of Study.** A minimum of 84 semester hours of graduate credit is required. The program must include at least 24 hours of research and dissertation credit and at least 30 hours of formal graduate course work. One semester of the core course PLB 502 Perspectives in Plant Biology and two hours of participatory seminar (PLB 591) are also required. Courses numbered 590 or 790 (Reading and Conference) are not considered formal courses. The program is planned by the student in consultation with a program committee that also administers and evaluates the comprehensive examinations.

**Foreign Language Requirements.** Completion at the undergraduate level of a one-year course with a grade of "C" or higher is required. Additional study may be required by the student's supervisory committee.

**Comprehensive Examinations.** Written and oral comprehensive examinations administered and evaluated by the student's program committee are required.

**Dissertation Requirements.** A dissertation based on original work of high quality, demonstrating proficiency in the student's area of interest, is required. (See "Doctoral Degrees," page 100.)

**Final Examinations.** A final oral examination in defense of the dissertation is required. It is administered by a dissertation committee consisting of three to five members who previously served on the student's program committee.

## RESEARCH ACTIVITY

Major areas of research by the faculty, professional staff, and graduate students in Plant Biology include emphasis in the following subject areas:

*Biochemistry/Cell Biology/Physiology.* Cell fractionation and protein biochemistry, organelle biogenesis and metabolism in oil seeds, enzyme cytochemistry, structures and mechanisms of enzymes in photosynthetic light reactions using magnetic resonance spectroscopy and X-ray crystallography, photobiology of vascular and nonvascular plants, physiology of the fern haplophase.

*Ecology/Environmental Science.* Environmental studies spanning organismic to regional levels of organization,

including effects of enhanced UV-B radiation upon plants, leaf optics, leaf gas exchange and photosynthesis, adaptations to environmental stresses (life cycle, physiology, reproduction, and structure), evolutionary biology of cacti and leaf succulents, lichenology, quantitative ecology, effects of air pollution on plants and ecosystems, dendroecology, mineral cycling and restoration, landscape ecology, human impacts on ecosystems and ecosystem response to perturbation, interdisciplinary studies of riparian ecosystems.

*Molecular Genetics/Molecular Biology.* Targeted mutagenesis of photosynthesis genes in cyanobacteria and plants, functional and structural analysis of genetically engineered mutants, transformation of green algae, chloroplast gene expression, and biogenesis of thylakoid membrane-protein complexes.

*Nonvascular Plants/Fungi.* Fungal and algal cell wall chemistry, ultrastructure and storage products, developmental morphology and life cycles of algae and fungi, phytoplankton ecology and water quality, and apical growth in fungi.

*Organismic Research.* Paleobotany, paleopalynology, particularly of Cretaceous and Tertiary horizons, and anatomically preserved plants from Carboniferous coal swamps and from the Permian and Triassic of Gondwana, origin and diversification of seed plants.

*Systematics/Taxonomy.* Cytogenetics and hybridization studies in the Cactaceae, floristics of the southwestern U.S. and northern Mexico, chemosystematics of plants, particularly the Compositae, and chemical ecology.

*Urban Horticulture.* Tissue-culture of drought-tolerant plants, molecular basis for rubber formation, plant pathology, particularly of the physiology of plant-fungal pathogen interactions, landscape horticulture, environmental stress physiology, computer simulation modeling, and nursery production and marketing.

The research mission of the department is supported by well-equipped research laboratories, greenhouses, environmental and radioisotope rooms, computer laboratory and personal computers, photographic and darkroom facilities, herbarium, the electron microscopy laboratory, and the electron paramagnetic resonance spectroscopy facility.

## PLANT BIOLOGY (PLB)

### PLB 400 Lichenology. (3) S 2001

Chemistry, ecology, physiology, and taxonomy of lichens. 2 hours lecture, 3 hours lab. Prerequisite: BIO 182 or equivalent.

### PLB 402 Mycology. (3) S

Fungal morphology and systematics with an introduction to fungal cell biology, ecology, economic significance, and growth and development. 2 hours lecture, 3 hours lab. Prerequisite: BIO 182 or MIC 206 or equivalent.

### PLB 404 Phycology. (4) S

The algae (both fresh water and marine forms), emphasizing field collection and identification of local representatives. Morphological, ecological, and economic aspects of the algae. 3 hours lecture, 3 hours lab. Prerequisite: BIO 182 or instructor approval.

### PLB 406 Vascular Plant Structure. (4) S

Comparative form and evolutionary trends in the major groups of vascular plants. 3 hours lecture, 3 hours lab. Prerequisite: PLB 300 or equivalent.

### PLB 407 Plant Fossils and Evolution. (4) S 2001

A broad survey of plant life of the past, including the structure of plant fossils, their geologic ranges, geographic distribution, and paleo-environment. 3 hours lecture, 3 hours lab or field trip. Prerequisite: BIO 182 or equivalent.

**PLB 408 Pollen and Spores.** (3) N

Significance of fossil and extant pollen, spores, and other palynomorphs to ecology, evolution, stratigraphy, and systematics. 2 hours lecture, 1 hour lab. Prerequisite: instructor approval.

**PLB 410 Angiosperm Taxonomy.** (3) S

Principles underlying angiosperm phylogeny. 2 hours lecture, 3 hours lab. Prerequisite: PLB 310 or instructor approval.

**PLB 411 Trees and Shrubs of Arizona.** (3) F

Identification of woody plants from desert, chaparral, and forest habitats in Arizona. 1 hour lecture, 3 hours lab, field trips. Prerequisite: BIO 182 or equivalent or instructor approval.

**PLB 412 Cytogenetics.** (3) F

Chromosomal basis of inheritance. Cross-listed as BIO 441. Credit is allowed for only BIO 441 or PLB 412. Prerequisite: BIO 340.

**PLB 413 Cytogenetics Laboratory.** (2) F

Microscopic analysis of meiosis, mitosis, and aberrant cell division. 6 hours lab. Cross-listed as BIO 442. Credit is allowed for only BIO 442 or PLB 413. Pre- or corequisite: BIO 441 or PLB 412.

**PLB 414 Plant Pathology.** (3) S

Identification and control of biotic and abiotic factors that cause common disease problems to plants. Prerequisite: BIO 182. *General Studies: L2.*

**PLB 502 Perspectives in Plant Biology.** (3) F

Introduce major areas of research within the department with the goal of broadening knowledge to enable multidisciplinary research and communication. Prerequisite: instructor approval.

**PLB 591 Seminar.** (1–12) N**ENVIRONMENTAL SCIENCE AND ECOLOGY****PLB 420 Plant Ecology: Organisms and Populations.** (3) S 2001

Factors and controls on the physiological ecology and organization of plants and plant populations using empirical and theoretical approaches. 2 hours lecture, 3 hours lab. Prerequisite: BIO 320 or PLB 322 or equivalent.

**PLB 421 Plant Ecology: Communities and Ecosystems.** (3) S

Plant community organization, field sampling techniques and the structure and function of terrestrial ecosystems emphasizing the role of vegetation. 2 hours lecture, 3 hours lab. Prerequisite: BIO 320 or PLB 322 or equivalent.

**PLB 422 Plant Geography.** (3) N

Plant communities of the world and their interpretation, emphasizing North American plant associations. Cross-listed as GPH 422. Credit is allowed for only GPH 422 or PLB 422. Prerequisite: BIO 182 or GPH 111.

**PLB 430 Statistical Analyses in Environmental Science.** (3) S 2000

ANOVAS, 1-way classification of factorial and partially hierarchic designs; introductory multivariate statistics. Prerequisite: MAT 210 or equivalent.

**PLB 432 Computer Applications in Biology.** (3) F

Computer analysis techniques in biology emphasizing data entry, management and analysis, and graphic portrayal. Employs mainframe and microcomputers. 2 hours lecture, 3 hours lab. Cross-listed as BIO 406. Credit is allowed for only BIO 406 or PLB 432. Prerequisites: BIO 182 and MAT 117 (or 210) or instructor approval. *General Studies: N3.*

**PLB 434 Landscape Ecological Analysis and Modeling.** (3) S

Technical methods of landscape ecological analyses. Includes mathematical and statistical examination and modeling of landscape ecological patterns and processes. Prerequisites: BIO 320 and 406 or PLB 432 (or equivalent).

**PLB 520 Plant Structural Adaptation.** (2–3) F 2000

Adaptive traits of leaf size/unique growth form on energy transfer efficiency; stomatal architecture and water-use efficiency; applications of stable isotopes. Prerequisite: BIO 320 or PLB 306 (or 308) or equivalent.

**PLB 522 Plant Photosynthetic Adaptation.** (3) F

Evolution and ecology of C4 and CAM; adaptive traits improving competitive ability in natural environments; comparative physiology of desert plants. Prerequisite: PLB 308 or instructor approval.

**PLB 524 Methods in Environmental Plant Physiology.** (3) S 2001

Techniques to measure and quantify microclimate and mass transfer. Supporting principles. 2 hours lecture, 3 hours lab. Prerequisite: BIO 320 or PLB 308.

**MOLECULAR BIOSCIENCES/BIOTECHNOLOGY****PLB 440 Photobiology.** (3) F 2000

Principles underlying the effects of light on growth, development, and behavior of plants, animals, and microorganisms. Cross-listed as BIO 464. Credit is allowed for only BIO 464 or PLB 440. Prerequisites: CHM 231 (or 331); 12 hours of courses in life sciences.

**PLB 442 Algal and Fungal Physiology.** (3) N

Cellular physiology and biochemistry of algae and fungi; responses of these organisms to chemical and physical stimuli and their processes of morphogenesis. Prerequisites: BIO 182 (or equivalent); CHM 231.

**PLB 444 Plant Growth and Development.** (3) S 2001

Molecular basis of development, role of signal transduction pathways/gene regulation in control of organ formation, pollination, germination and growth. Prerequisite: BIO 353 (PLB 340 recommended).

**PLB 540 Plant Metabolism.** (3) N

General plant metabolism and typical plant products, emphasizing biosynthesis and functions of storage products, cell wall constituents, plant acids, pigments, hormones, and numerous secondary products. Prerequisite: PLB 340 or CHM 231 or instructor approval.

**PLB 550 Plant Molecular Biology.** (2) S 2001

Biochemistry and molecular biology of plant organelles, including protein targeting, plant viruses, and molecular designs for plant improvements. Prerequisite: instructor approval.

**PLB 552 Plant Genetic Engineering.** (3) S

Plant transformation utilization of transgenic plants, transient gene expression assays, and applications of plant genetic engineering. Prerequisite: instructor approval.

**PLB 553 Plant Genetic Engineering Laboratory.** (2) S

Plant transformation, utilization of transgenic plants, transient gene expression assays, and applications of plant genetic engineering. 6 hours lab. Prerequisite: instructor approval.

**PLB 554 Plant Biotechnology.** (3) N

Aseptic, clonal propagation of plants and in vitro culture of cells, organs, and tissues. 2 hours lecture, 3 hours lab. Prerequisite: PLB 308 or 340 or 370.

**PLB 558 Molecular Mechanisms of Photosynthesis.** (3) S

Structure and function of photosynthetic complexes; mechanism of energy conversion in plants, bacteria, and model systems. Cross-listed as CHM 568. Credit is allowed for only CHM 568 or PLB 558. Prerequisite: instructor approval.

**URBAN HORTICULTURE****PLB 472 Greenhouse/Nursery Management.** (3) N

Greenhouse structures, environment, and nursery operation. Includes irrigation, nutrition, and other principles relative to container-grown species. Prerequisite: ERS 130 (or 225 or 226).

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Political Science

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 Chair  
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 www.asu.edu/clas/polisci

---

### PROFESSORS

BALL, BERMAN, CHAUDHURI, DAGGER, JONES,  
 McDONOUGH, McGOWAN, SIMON,  
 WALKER, YOUNGBLOOD

### ASSOCIATE PROFESSORS

ASHLEY, CRITTENDEN, DANTICO, DOTY, HERRERA,  
 KAHN, KENNEY, MITCHELL, SIMHONY

### ASSISTANT PROFESSORS

C. ELMAN, M. ELMAN, GOLDSTEIN, NEVIT,  
 REDDICK, WARNER

### ASSOCIATE INSTRUCTIONAL PROFESSIONAL KEATING

The faculty in the Department of Political Science offer graduate programs leading to the M.A. and Ph.D. degrees in Political Science. Concentrations are available in American politics, comparative politics, international relations, and political theory.

Students admitted to the Master of Education degree with a major in Secondary Education may also elect political science as the subject matter field.

### MASTER OF ARTS

See "Master's Degrees," page 98, for general requirements.

**Admission.** The M.A. degree provides advanced education for those students preparing for teaching, research, or applied careers in political science. It may be taken as a terminal program or as a step toward eventual fulfillment of the requirements for the Ph.D.

In addition to the materials sent to the Graduate College, the following items should be submitted to the director of graduate studies of the Department of Political Science by April 15 in order to ensure recommendations for admission to the M.A. program beginning the following fall:

1. scores from the verbal, quantitative, and analytical sections of the Graduate Record Examination (GRE);
2. three letters of recommendation from persons who can evaluate the applicant's academic performance and potential;
3. a career overview statement which describes the applicant's educational objectives; and
4. a writing sample that best represents the applicant's thinking and writing skills.

Applicants for financial aid should submit these items and complete the application form for graduate assistantships by February 15.

Undergraduate course work in political science is not a prerequisite for admission.

It is assumed, however, that M.A. students have a basic understanding of elementary statistics and the undergraduate content of the political science fields of concentration that they wish to study. Students without such a background should allow sufficient time to acquire it.

**Program of Study.** A minimum of 30 semester hours is required for the Master of Arts degree. All candidates must take POS 501, 503, and the core course in each subfield. The core courses (POS 502, 530, 550, and 560) must be taken prior to enrolling in upper-level courses in the subfield. Six additional hours must be taken in graduate-level courses and seminars. Each student is expected to take seminars each semester in his/her major field, minor field, and an elective until course work is completed. If the thesis option is followed, the program must include a combination of at least six semester hours of research (POS 592) and the thesis (POS 599) credit. A maximum of six semester hours in approved courses taken outside the department or six hours of independent study (POS 590) courses may count towards the 30-hour requirement.

**Foreign Language Requirement.** None

**Thesis Option Requirements.** M.A. students seeking admission to the Ph.D. program are expected to complete the thesis early in their fourth semester. A copy of the *Format Manual* is available in the Graduate College. A careful review of this document well in advance of preparation for the final copy of the thesis is recommended. An oral examination in defense of the thesis is required.

**Non-Thesis Option Requirements.** The program of study must include 27-hours of approved course work and at least one three-hour reading and conference course (POS 590) in the fourth semester to enhance the student's research capabilities. A research paper must be defended by the end of the third semester before a faculty committee appointed by the Director of Graduate Studies.

### DOCTOR OF PHILOSOPHY

See "Doctor of Philosophy," page 101, for general requirements.

**Admission.** In addition to meeting Graduate College requirements, an applicant for the Ph.D. program must take the verbal, quantitative, and analytical sections of the GRE; supply a career overview statement that describes the applicant's educational objectives; submit three letters of recommendation from persons who can evaluate the applicant's undergraduate and graduate work; and provide a sample of writing. These items should be submitted to the director of graduate studies of the Department of Political Science by February 15. Applicants for financial aid should also complete and submit the application form for graduate assistantships by February 15.

It is assumed that Ph.D. students have a basic understanding of elementary statistics and the content of the areas of concentration that they wish to study. Students without such a background should allow sufficient time to acquire it.

**Program of Study.** A minimum of 60 semester hours of graduate courses beyond the baccalaureate degree and

approved by the student's supervisory committee shall constitute the formal course preparation, followed by a minimum of 24 semester hours of research and dissertation work. The supervisory committee has three members, including the committee chair from the student's major field, and two members from a minor field. As part of the 60 semester hours, the student must take POS 501, 503, and 603. A maximum of 12 semester hours of approved course work outside the department and 12 semester hours of approved independent study courses (POS 590 and 790) may count toward the 60 semester hours. Grades of "A," "B," or "Y," must be obtained in all course work counted for the Ph.D. degree.

**Master's in Passing.** For students without an M.A. who are admitted directly into the Ph.D. program, the department offers a Master's in Passing. Students opting for the Master's in Passing must, in the third semester of residence, pass an oral examination of their work. The examination will be conducted by a committee composed of members of the Graduate Committee who represent each student's primary and secondary subfields. Students who pass the oral examination and have completed 30 hours of course work toward the Ph.D. are then awarded the M.A.

**Foreign Language and Research Requirements.** Each Ph.D. student must show proficiency in a foreign language. The supervisory committee may also require up to six additional semester hours to build the student's research skills.

**Comprehensive Examination.** The student is required to take three examinations from the fields and subfields of American politics, international relations, comparative politics, and political theory. In the major field, the student takes a written general examination. Additionally, the student takes a written field or subfield examination in one of the remaining fields of political science. An oral examination over the dissertation proposal follows the written examinations.

**Dissertation Requirements.** The dissertation must be an original contribution to knowledge and demonstrate the student's proficiency as an independent investigator. The dissertation proposal is approved by the chair of the department upon the recommendation of the student's dissertation committee. The department chair also approves the dissertation committee. This committee must have a minimum of three members from the department of political science, including a chair from the student's major field.

**Final Examinations.** A final oral examination is required. This examination is the occasion for the student to defend the dissertation, both as to methods and conclusions, and to demonstrate general competence in the area of concentration.

## RESEARCH ACTIVITY

The political science faculty and curriculum are organized into four areas of concentration. The faculty in each area offer courses and conduct research from a variety of methodological orientations, all with a common thread of theoretically-oriented scholarship.

*American Politics.* Faculty emphasize political behavior and use survey research, experimental designs, and content analysis to collect data and conduct statistical analyses of mass

voting patterns, campaign strategies, party politics, the role of the media in political communication, and elite-mass linkages. Other faculty emphasize public law and policy while some conduct research at the state and local levels of government. They analyze aggregate and interview data, archival materials and legal texts with a focus on campaign finance regulations, intergovernmental relations, gender issues, electoral reform, third parties, and interest groups.

*International Relations.* One group of faculty focus upon foreign policy theory and international security, using event chronologies, institutional differences, archival materials, and public records to guide comparative analyses of foreign policy decision-making by different types of regimes, case studies of leaders and their decision-making strategies, and policy analyses of issues in the Asia-Pacific region. Another cluster of faculty emphasize critical theory and international political economy, employing archival sources, statistical data, and texts of legal norms and state practices to conduct analyses of global inequalities in wealth and income, the evolution of statecraft, and the impact of hierarchically-ordered gender and race categories in North-South relations.

*Political Theory.* Faculty research interests in the area of political theory cover a range of topics in the history of political thought and contemporary political theory. Historical topics include Rousseau, conceptual history, and positive idealisms of the 19th and 20th centuries. Research in contemporary political theory includes autonomy and freedom; rights and obligations; citizenship, civic virtues, and the idea of the common good; various issues in democratic political theory (with particular attention to education); aspects of political and legal theory regarding corporate personality; conceptions of self in various cultures; analysis of myths in aboriginal societies (particularly Native Americans); punishment; justice; community; language and politics; social ecology; and peace and nonviolence.

*Comparative Politics.* Faculty in the area of comparative politics investigate a variety of topics in several regions of the globe. Research interests include the political economy of uneven development in Africa, democratization processes within formerly authoritarian regimes in Europe, Latin America, and East Asia, church and state relations in the Philippines, ethnic minority problems in Brazil, problems of federalism in India, and party leadership in France and Italy.

Many of these research interests have recently been the basis for graduate seminars (POS 691) and for special topics courses (POS 598). Moreover, students have the opportunity to do advanced work in these areas through reading and conference courses (POS 590 and 790) and independent research (POS 592 and 792).

*Research Facilities.* The department has its own political data laboratory for research and teaching purposes. Both faculty and students have access to data processing equipment and machine-readable data collections. The ASU Library collection has extensive holdings in all of the fields of political science. The facilities of the ASU School of Public Affairs, School of Justice Studies, Latin American Studies Center, and the Center for Asian Studies are accessible to graduate students in political science.

## POLITICAL SCIENCE (POS)

### POS 501 Methods of Political Science. (3) A

Problems of method and knowledge in political science, strategies of political inquiry, and issues in philosophy of social science.

- POS 502 Philosophy of Political Inquiry.** (3) A  
Problems of knowledge and method in political science, with attention to both empirical and evaluative analysis.
- POS 503 Empirical Political Inquiry.** (3) A  
Research methods and techniques of the discipline, emphasizing empirical foundations and analytic methods employed in subfields. Prerequisites: POS 401 (or equivalent); instructor approval.
- POS 530 American Politics.** (3) A  
Examines major debates in the study of American political processes and institutions. Covers parties, media, elections, public opinion, interest groups, and the three branches of government. Seminar.
- POS 545 Themes in Political Thought.** (3) N  
Examination of a particular theme or problem in political thought from both a historical and contemporary perspective. Seminar. Course may be repeated with approval of the director of graduate studies. Prerequisite: instructor approval.
- POS 550 Comparative Politics.** (3) A  
Surveys major approaches across topical areas such as revolutions, authoritarianism, policy processes, interest groups, and electoral politics. Focus varies with instructor. Seminar.
- POS 560 International Relations.** (3) A  
Surveys major theoretical approaches and debates in international relations. Seminar.
- POS 563 Comparative Asian Security Policies.** (3) N  
Analyzes domestic and international constraints, belief systems, and economic components in security decisions by major powers and Asian nations. Seminar. Prerequisite: instructor approval.
- POS 591 Seminar.** (3) A  
(a) American Politics  
(b) Comparative Politics  
(c) Global Politics  
(d) Political Theory
- POS 598 ST: Special Topics.** (3) A  
(a) American Politics  
(b) Comparative Politics  
(c) Global Politics  
(d) Political Theory
- POS 601 Advanced Experimental Research.** (3) N  
Introduces experimental and quasi-experimental research designs in political research, including laboratory techniques and topics in the analysis of variance. Prerequisite: POS 503 or equivalent.
- POS 602 Advanced Survey Research.** (3) N  
Presents design and conduct of political surveys, including sampling, instrument design, scaling, and statistical and graphical analysis of survey data. Prerequisite: POS 503 or equivalent.
- POS 603 Polimetrics I.** (3) A  
Introduces theory and practice of linear regression analysis. Provides skills to read, understand, and evaluate professional literature using regression analysis. Prerequisites: POS 401 and 503 or instructor approval.
- POS 604 Polimetrics II.** (3) A  
Apply quantitative techniques to research topics producing publishable papers through exposure to time-series, logit and probit, and simultaneous equations. Prerequisites: POS 401 and 503 and 603 or instructor approval.
- POS 606 Qualitative and Textual Analysis.** (3) S 2001  
Method and theory for the analysis of qualitative materials, systematic approaches for case studies, content analysis, critical analysis of texts. Discussion, seminar.
- POS 635 State Politics and Public Policy.** (3) N  
Introduction to comparative state policy emphasizing policy or performance differences among the states and the reasons for these differences. Seminar. Prerequisites: POS 530 and 603 or instructor approval.
- POS 636 Electoral Behavior.** (3) N  
Introduces fundamental concepts of electoral behavior. Emphasizes presidential elections and examines why people vote and how their votes are determined. Seminar. Prerequisites: POS 530 and 603 or instructor approval.
- POS 638 Law and Politics.** (3) N  
Emphasizes research into such topics as constitutional law, women and the law, American legal system, judicial process, and judicial selection. Seminar. Prerequisite: instructor approval.

- POS 651 Politics of Change and Development.** (3) N  
Examines contending approaches to national, social, and political change. Seminar. Prerequisite: instructor approval.
- POS 660 The Modern World System.** (3) N  
Theoretically driven, historical analysis of the organization and operation of the international political economy since the 16th century. Seminar. Prerequisite: instructor approval.
- POS 661 The State.** (3) N  
Examines theories of state, state-society relations, and interstate politics emphasizing questions of sovereignty, territoriality, violence, representation, democracy, and change. Seminar. Prerequisite: instructor approval.
- POS 662 International Organization.** (3) N  
History, practical political significance, and future of international institutions, transnational regimes, and other approaches to international organization. Seminar. Prerequisite: instructor approval.
- POS 664 War, Peace, and Conflict Processes.** (3) N  
The systematic analysis of the causes of war, the preconditions for peace, and approaches to the resolution of conflict. Seminar. Prerequisite: instructor approval.
- POS 665 Foreign Policy Theory.** (3) N  
Examines foreign policy theory and methods. Development and critique of research designs analyzing foreign policy processes within and among nations. Seminar. Prerequisite: instructor approval.
- POS 691 Seminar.** (1–12) N
- POS 792 Research.** (3) F, S  
Projects in various areas of political science. Prerequisite: doctoral student.
- Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Psychology

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*Chair*

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### REGENTS' PROFESSORS

CIALDINI, EISENBERG, RUSSO

### PROFESSORS

AIKEN, BARRERA, BRAUN, BRAVER, CASTRO, CHASSIN,  
HOMA, KAROLY, KENRICK, KILLEEN, KNIGHT, LANYON,  
LINDER, OKUN, PARKINSON, PRESSON, REICH,  
SADALLA, SANDLER, SOMERVILLE, VAN ORDEN,  
WEST, WOLCHIK, ZAUTRA

### ASSOCIATE PROFESSORS

CASTANEDA, CHARTIER, FABRICIUS, FEHR,  
GOLDINGER, GONZALES, LESHOWITZ, MacKINNON,  
MILLSAP, NAGOSHI, NEISEWANDER, NEMEROFF,  
NEUBERG, ROSSI, SAENZ, STONE

### ASSISTANT PROFESSORS

DAVIS, GEST, KHOO, McBEATH

### LECTURERS

BARTON, PALMER, WEIGAND, WOSINSKI

The faculty in the Department of Psychology offer graduate programs leading to the Ph.D. degree in Psychology. Concentrations are available in clinical, developmental, environmental, quantitative, and social psychology, as well

as in cognitive/behavioral systems and behavioral neuroscience.

Although there is no formal M.A. program as such, doctoral students are required to complete an M.A. degree as part of their doctoral training.

All applicants are required to submit scores on the Graduate Record Examination (verbal, quantitative, and analytical sections; advanced section is required for clinical psychology), transcripts, three letters of reference, and a statement of purpose.

**Program of Study.** A minimum of 30 semester hours is required for the master's degree.

**Foreign Language Requirements.** None.

**Thesis Requirements.** A thesis is required.

**Final Examinations.** A final oral examination in defense of the thesis is required.

## DOCTOR OF PHILOSOPHY

See "Doctor of Philosophy," page 101, for general requirements.

**Application Deadline.** Completed applications for admission in the fall semester, including all letters and supporting documents, should be received by January 1.

The Department of Psychology requires all applicants to provide scores from the aptitude sections of the GRE for clinical psychology. A score from the advanced test in psychology is required. These scores are not used exclusively to determine admission but are viewed in the context of other supporting materials, such as GPAs and letters of recommendation.

**Program of Study.** At present the Department of Psychology offers the Ph.D. degree in the following research areas: clinical, developmental, environmental, cognitive/behavioral systems, behavioral neuroscience, quantitative, and social psychology. A minimum of 60 semester hours of course credit beyond the bachelor's degree is required, plus 24 semester hours of credit in research and dissertation.

In addition to a core curriculum, students take courses related to their area of interest as determined in consultation with their supervisory committees.

**First-Year Evaluation.** At the end of the first year of study, each student receives a comprehensive evaluation by the faculty based upon performance in courses and in professional or laboratory assignments and upon the evidence of professional responsibility and ethical behavior.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Written and oral examinations are required near the end or upon completion of all course work. After passing the comprehensive examinations and meeting other requirements (e.g., dissertation prospectus), the student is eligible to apply for candidacy.

**Dissertation Requirements.** The dissertation must be an original contribution to knowledge, demonstrating the student's proficiency as an independent investigator. (See "Doctoral Degrees," page 100.)

**Final Examinations.** A final oral examination in defense of the dissertation is required.

## RESEARCH ACTIVITY

*Clinical.* Three areas of emphasis: child-clinical, community, and health psychology. Topics include risk factors for mental health and substance abuse problems of children and adolescents; mental health of minority groups; stress and coping processes; self-regulation and goal systems; the interface of psychology and the law; women's health, cardiovascular reactivity, affect and health; development and testing of preventive interventions for children at risk; validation of cognitive, behavioral, and systems interventions for families in crisis; health promotion and relapse prevention in Hispanic populations; contagion theory, social support; adjustment to separation and divorce; measurement of self-deception; and processes underlying ethical judgments in professional contexts.

*Developmental.* Prosocial behavior, empathy, and moral development; sex roles; spatial cognition; child language and drawing; cooperation and competition; inference and reasoning; child and adolescent health psychology; development of ethnic identity; children's theory of mind; social psychology of aging; dynamics of college departure among adults.

*Environmental.* Psychology of resource conservation, memory for architectural form, information storage and spatial cognition, house form and identity, urbanization, territoriality, person-situation interaction, and aversive environments.

*Cognitive Systems.* Perception: perception of space and motion, psychophysics, speech perception, word recognition. Cognition: memory, categorization, attention, effective thinking. Modeling: dynamic systems models of cognition and perception.

*Behavior and Behavioral Neuroscience.* Neuroscience: biochemical and neural concomitants of behavior, behavioral recovery after brain damage, neurogenerative diseases, drug abuse. Learning: experimental analysis of behavior, reinforcement theory. Modeling: quantitative models of behavior.

*Social.* Persuasion and influence, attraction and relationships, prejudice and stereotyping, altruism, evolutionary psychology, impression formation and social cognition, ethnic and gender identity, social dilemmas and social traps, self-presentation, individual differences and personality, family relationships, behavioral genetics, perceptions of control, social development.

*Applied Social Psychology.* Health psychology, family relationships, alcohol and drug use, social psychology of sport and exercise, aging, prevention research and evaluation, gender roles and mental health, environmental psychology, criminal justice. Students interested in this area may choose it as a subspecialization in social psychology.

*Quantitative.* Field research methods; design innovations in intervention research, self-selection biases, treatment non-compliance, mediation of intervention effects. Applied statistics: categorical data analysis, latent growth modeling, multilevel modeling, structural equation modeling, missing data, multiple regression analysis, time series, meta-analysis, graphics and exploratory data analysis, statistical methods applied to health promotion and disease prevention research. Measurement: psychometric theory, factor analy-

sis, item response theory, group differences in test performance, cognitive models in test performance, measurement invariance and bias, cross-ethnic, cross-race, and cross-gender measurement equivalence, longitudinal measurement.

### PSYCHOLOGY (PSY)

#### **PSY 420 Analysis of Behavior.** (3) N

Research, applications, and philosophy of the analysis and control of human behavior. Prerequisite: PSY 290. *General Studies: L2.*

#### **PSY 424 Genetic Psychology.** (3) S

Introduction to the concepts, methodologies, and findings of behavioral genetics for Psychology majors. Prerequisites: PGS 100; PSY 230, 290. *General Studies: L2.*

#### **PSY 425 Biological Bases of Behavior.** (3) N

Critical study of physiological psychology; brain mechanisms underlying motivation, and learning. Prerequisite: PSY 325. *General Studies: L2.*

#### **PSY 426 Neuroanatomy.** (4) N

Structure and function of mammalian brain, including sheep brain dissection. 3 hours lecture, 3 hours lab. Prerequisite: PSY 325 or equivalent. *General Studies: L2.*

#### **PSY 434 Cognitive Psychology.** (3) S

The human organism as a processor of information, from perception to cognition. Abstract concepts, semantic memory, attention, and mental imagery. Prerequisite: PSY 323 or 324 or instructor approval. *General Studies: L2.*

#### **PSY 437 Human Factors.** (3) F

Emphasis on human factors in high technology systems. Specific topics include systems development, systems analysis techniques, displays, and controls. Prerequisites: PSY 290 and upper-division standing or instructor approval. *General Studies: L2.*

#### **PSY 470 Psychopharmacology.** (3) F, S

Basis of drug action at physiological and behavioral levels. Psychological and medical applications and limitations of drugs used in the treatment of mental illness. Prerequisites: PSY 325; 1 semester each of biology and chemistry.

#### **PSY 501 Supervised Teaching.** (4) F

Experience in and examination of perspectives on teaching undergraduate psychology. Prerequisites: graduate standing in psychology; instructor approval.

#### **PSY 506 Survey of Research in Environmental Psychology.** (3) F

Major topics and paradigms in the study of person-environment relationships. Prerequisite: instructor approval.

#### **PSY 512 Advanced Learning.** (3) N

Principles and theories of learning, emphasizing research literature. Prerequisite: instructor approval.

#### **PSY 524 Advanced Physiological Psychology.** (3) N

Contributions of physiological processes and brain function to fundamental behavioral processes. Prerequisite: instructor approval.

#### **PSY 528 Sensation and Perception.** (3) N

Principles of sensory and perceptual processes, emphasizing research literature. Prerequisite: instructor approval.

#### **PSY 529 Correlation and Psychometric Theory.** (3) S

Principles of correlational techniques, including regression and multiple correlation. Psychometric theory, including reliability and validity. Prerequisite: instructor approval.

#### **PSY 530 Intermediate Statistics.** (3) F

Continuation of PSY 529. Psychological statistics, emphasizing the analysis of variance and the design of experiments. Prerequisite: PSY 529 or instructor approval.

#### **PSY 535 Cognitive Processes.** (3) N

Theoretical/empirical treatment of the human organism as a processor of information, including abstraction, memory structure, problem solving, and thinking. Prerequisite: instructor approval.

#### **PSY 541 Research in Cognitive Development.** (3) N

Theoretical and empirical issues in the study of children's knowledge and cognitive processes. Comparison of research in Piagetian and other traditions. Prerequisite: admission to Psychology Ph.D. program or instructor approval.

#### **PSY 542 Social Development.** (3) N

Major issues in the area of social development are topics for review and critique. Theory, research, and content are covered. Prerequisite: instructor approval.

#### **PSY 550 Advanced Social Psychology.** (3) F, S

Theory and research concerning interpersonal perception, decision making, attitude formation and change, group processes, social motivation, and interaction processes. Prerequisite: instructor approval.

#### **PSY 551 Advanced Social Psychology.** (3) F, S

Continuation of PSY 550. Prerequisite: PSY 550 or instructor approval.

#### **PSY 553 Social Influence.** (3) N

Research literature relevant, for example, to attitude formation and change, conformity, obedience, power, compliance, and altruism. Prerequisite: PSY 551 or instructor approval.

#### **PSY 555 Experimental and Quasi-Experimental Designs for Research.** (3) N

Review of research techniques. Laboratory and field research analyzed; applications to specific topics. Prerequisite: instructor approval.

#### **PSY 569 Advanced Study of Personality.** (3) N

Personality as a theoretical concept in psychology, including definitional problems, behavioral and traditional approaches, the measurement of personality, and current research issues. Prerequisite: instructor approval.

#### **PSY 572 Psychological Assessment.** (3) F

Theory and research on assessment of personality, psychopathology, and intelligence, and construction of psychological assessment instruments. Prerequisite: admission to clinical Ph.D. program or instructor approval.

#### **PSY 573 Psychopathology.** (3) F

Theory and research relating to the contribution of psychological, social, physiological, and genetic factors to the development and persistence of abnormal behavior. Prerequisite: admission to Psychology Ph.D. program or instructor approval.

#### **PSY 574 Psychotherapy.** (3) S

A detailed survey of the theoretical and empirical literature relating to verbal psychotherapy and interviewing methods. Structured role-playing practice in the major procedures. Prerequisite: admission to the clinical Ph.D. program or instructor approval.

#### **PSY 578 Child Psychopathology.** (3) N

Major theories and research related to the development of deviant behaviors in children, including some supervised experience in child assessment. Prerequisite: PSY 572 or instructor approval.

#### **PSY 582 Community Psychology.** (3) SS

Community systems, intervention techniques, consultation models, history and current status of community mental health movement, and conceptualization of the roles of community psychologists in social system intervention. Prerequisite: advanced standing in Psychology Ph.D. program or instructor approval.

#### **PSY 588 Consultation Methods.** (3) N

Several theories and strategies of organizational consultation. The development of consultative skills through simulation and practical experience. Prerequisite: advanced standing in Psychology Ph.D. program or instructor approval.

#### **PSY 624 Clinical Neuroscience.** (3) S

An examination of the biological underpinnings of psychological disorders at the molecular, cellular, and system levels (schizophrenia, depression, anxiety, etc.). Lecture, pro-seminar. Prerequisites: graduate standing; instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### PSYCHOLOGY (PGS)

#### **PGS 414 History of Psychology.** (3) F, S

Historical development of psychology from its philosophical beginnings to the present. Prerequisites: PGS 101; PSY 230, 290. *General Studies: L2/SB.*

#### **PGS 461 Interpersonal Influence.** (3) N

Principles and procedures that affect the process of social influence, consideration of attitudinal, compliance inducing, and perceptual influences. Prerequisite: PGS 350. *General Studies: SB.*

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Public Administration

### Master's Program

Dickinson McGaw

*Director*

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www.asu.edu/copp/publicaffairs/

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#### PROFESSORS

CAYER, COOR, HALL, MANKIN, McGAW, MONTIEL,  
PERRY, WESCHLER

#### ASSOCIATE PROFESSORS

ALOZIE, BROWN, DeGRAW, LAN, VINZANT

#### ASSISTANT PROFESSORS

CAMPBELL, DELORENZO, McCABE

#### DISTINGUISHED RESEARCH FELLOW

PFISTER

The faculty in the School of Public Affairs prepare students and practitioners for leadership in public service. Faculty also engage in research and service programs that advance understanding of public affairs and serve the public's policymaking needs.

Faculty participate in offering an interdisciplinary degree leading to the Doctor of Public Administration (D.P.A.).

### MASTER OF PUBLIC ADMINISTRATION

Faculty in the School of Public Affairs offer a 42-semester-hour professional Master of Public Administration (M.P.A.) degree.

The M.P.A. is an interdisciplinary, professional degree designed to prepare students for public service, public management, and policy analysis at the local, state, and national levels of government. The M.P.A. degree is accredited by the National Association of Schools of Public Affairs and Administration (NASPAA).

**Admission.** Applicants to the M.P.A. program are considered for admission irrespective of undergraduate major, although students may be required to complete additional courses and/or workshops to prepare themselves for the core courses.

The applicant's undergraduate GPA, GRE scores (verbal, quantitative, and analytical), letters of recommendation, statement of educational and career goals, and professional experience are all considered in the admissions process. In addition, TOEFL scores (550 or higher) are required for international students. Admission may be limited by space availability.

Applications for admission can be sent at any time. Students requesting graduate assistantships and tuition scholarships should have their application files completed by March 1.

All applicants must submit the following materials to the Graduate College:

1. an official application;
2. official transcripts of all undergraduate and graduate work;
3. scores on the GRE (verbal, quantitative, and analytical; special subject tests not required); and
4. TOEFL scores for international students.

All applicants must submit the following materials to the School of Public Affairs:

1. three letters of recommendation, at least two of which should be written by faculty who can evaluate the applicant's academic performance;
2. a written statement of applicant's educational and career goals, which also is used as a sample of the applicant's writing abilities; and
3. resume or additional documents as the applicant sees fit.

**Program of Study.** The M.P.A. program consists of 42 hours of graduate credit. Students take 27 of these hours in nine core classes in the School of Public Affairs, and 15 additional hours in elective courses.

No more than nine semester hours of ASU graduate courses taken before admission to the school and approved by the M.P.A. Committee can be included in the Program of Study.

Students enrolling in core courses must demonstrate minimum competency in statistics, American government, and computer applications. Courses taken to fulfill the competency do not count toward the 42-hour degree program. Competency in statistics or American government is met with a grade of "B" or higher in approved courses, passing a diagnostic test approved by the M.P.A. Committee, or earning a grade of "B" or higher in such approved courses as PAF 401, POS 401, PSY 230, QBA 221, and SOC 390 for statistics and POS 310 for American government. Competency in computer applications is met by enrollment in university short courses and training seminars.

**Internship.** A public service internship is recommended for M.P.A. students without previous administrative experience in government. The purpose of the internship is to provide students with practical and professional experience in a specific career area. Students work in and for public organizations applying the knowledge, skills, and abilities acquired in their program of study. During the internship experience, students can develop a professional network that will aid them in their pursuit of a career in government or non-profit organizations. Students can apply three hours of internship credit to the degree program. To receive course credit for an internship, students are required to attend class sessions and submit a paper to the internship coordinator.

**Foreign Language Requirements.** None.

**Comprehensive Examination.** None.

**Thesis Requirements.** None.

**Capstone Requirement.** The M.P.A. degree requires students to demonstrate competency for public service by synthesizing and applying core course knowledge, skills, and abilities to public service problems. Students demonstrate their public service competency by earning an "A" or a "B" in the M.P.A. capstone course, PAF 509 Public Service.



### Morrison Institute for Public Policy

As an integral part of the School of Public Affairs, the Morrison Institute is an applied public policy research center that conducts research on public policy, informs policy-makers and citizens about issues, and advises leaders on choices and actions. In partnership with government officials, university faculty, and the private sector, the Morrison Institute conducts research, policy forums, program evaluations, and strategic planning for public, private, and non-profit clients. The Institute produces publications on a wide range of topics, including urban growth, education, natural resources, governmental systems and relations, health care, social services, quality of life, and economic development.

### Advanced Public Executive Program (APEP)

APEP is a continuing education program designed to provide public-sector executives with analytical approaches and skills in leadership, policy analysis, total quality management, media relations, organizational development, team-building, and communication. Located at the ASU Downtown Center, APEP sponsors the Certified Manager Program (CPM), the Institute for Public Executives, Total Quality Management in the Public Sector, the County Elected Officials' Certification Program, and presents custom-tailored professional development programs for public-sector managers.

### PUBLIC AFFAIRS (PAF)

#### PAF 401 Statistics. (3) F, S

Survey of statistical concepts and techniques with application to public administration. Does not count toward program of study. Satisfies statistics prerequisite requirement for PAF 501 and 502.

#### PAF 501 Public Service Research. (3) F, S

Philosophy, scope, and methods; public service research design, values, and ethics. Prerequisite: an approved course in statistics.

#### PAF 502 Computer Applications. (3) F, S

Computer applications in public affairs; software packages for data analysis, decision making, information dissemination, and problem solving. Prerequisite: PAF 501.

#### PAF 503 Public Affairs. (3) F, S

The development and context of American public administration and policy, the role of administration in governance, and values and ethics in administration.

#### PAF 504 Public Affairs Economics. (3) F, S

The basics of public sector economics, microeconomic and macroeconomic concepts applied to public sector decisions and policies.

#### PAF 505 Public Policy Analysis. (3) F, S

Institutional and formal analysis of policy processes, decision making, and problem solving; values, ethics, and the uses of policy analysis. Prerequisites: PAF 504; satisfaction of the statistics requirement.

#### PAF 506 Public Budgeting and Finance. (3) F, S

The legal, social, economic, political, institutional, and ethical foundations of governmental finance, budgets, and budgeting. Prerequisites: PAF 502, 504.

#### PAF 507 Public Human Resource Management. (3) F, S

Personnel systems, behavior and management of people in public organizations, collective behavior, unionism, conflict management, motivation, productivity, and ethics.

#### PAF 508 Organization Behavior. (3) F, S

Theory and application in the management of organizational behavior with emphasis on leadership and the public service.

#### PAF 509 Public Service. (3) F, S

Capstone application of core course knowledge, skills, and abilities required for public service. Prerequisites: PAF 501, 502, 503, 504, 505, 506, 507, 508.

#### PAF 510 Governmental Budgeting. (3) N

Theories, applications, and consequences of budget decision making. Prerequisite: PAF 504.

#### PAF 511 Governmental Finance. (3) N

Sources of funding, management of funds and debts, and general pattern of expenditures in states, counties, cities, and districts. Prerequisite: PAF 504.

#### PAF 520 Public Management. (3) N

The management process in government and public agencies, with emphasis on the executive leadership within the public sector.

#### PAF 521 Organization Theory. (3) N

Organization theory and current research emphasis with application to public administrative organizations.

#### PAF 522 Public Labor Relations. (3) N

Rise of public unionism, managerial policy toward unionism, conflict resolution, impact of unionism on budgets, personnel policies, and public policy.

#### PAF 523 The City and County Manager. (3) A

The manager's role and resources in the differing forms of administrative, legislative, and community sectors.

#### PAF 525 Public Program Management. (3) N

Governmental service programming: formulating, financing, operating, evaluating, and reporting. Analysis of interagency relationships and the role and conduct of research in the programming process.

#### PAF 526 Public Sector Human Resource Development. (3) N

Concepts and techniques of organizational development in the public sector, including staffing, supervisor training, executive development, resource planning, and employee training.

#### PAF 529 Organization Change and Development. (3) N

Exploring the nature and management of change and development as a tool to achieve organizational goals; effecting planned change.

#### PAF 530 Management of Urban Government. (3) N

Administrative practices and behavior within the urban political administrative environment. Functional areas such as citizen participation, urban planning, urban transportation, and the conflicts between urban politics and administrative efficiency.

#### PAF 531 Community Conflict Resolution. (3) N

Interdisciplinary approach to understanding the dynamics of community conflict. Strategic considerations in policy design and advocacy; potential reaction to conflict. Relevant models and research findings generated by both case studies and comparative methods.

#### PAF 532 Urban Planning Administration. (3) N

Historical and present day uses of urban planning and procedures for its implementation. Basic principles and practices.

#### PAF 533 Urban Growth Administration. (3) N

Examines the process of urban growth and change. Partnership roles played by public and private sectors in management are emphasized.

#### PAF 535 Urban Housing Policy. (3) N

Comprehensive consideration of the revitalization of American cities with major emphasis upon the housing process and related institutions and services.

#### PAF 536 Urban Policy Making. (3) N

Analysis of the opportunities and costs of influencing public policy and the roles of officials and bureaucracies in decision making.

#### PAF 540 Advanced Policy Analysis. (3) A

Emphasizes the structure of policy problems, forecasting policy alternatives, optimizing resources, and reducing uncertainty in policy making. Prerequisite: PAF 505 or instructor approval.

#### PAF 541 Program Evaluation. (3) N

Various methodologies available for the evaluation of public policies and programs. Prerequisite: PAF 501 or instructor approval.

#### PAF 546 Environmental Policy and Management. (3) N

Analysis of environmental policy and planning issues and principles related to the analysis and management of natural and urban/regional resources.

#### PAF 547 Science, Technology, and Public Affairs. (3) N

The influence of science and technology on governmental policy making, scientists as administrators and advisors, governmental policy making for science and technology, government as a sponsor of research and development.

#### PAF 548 Women, Politics, and Public Policy. (3) N

Explores how political philosophy, politics, and public policy affect and are affected by women.

#### PAF 549 Diversity Issues and Public Policy. (3) N

Examination of public policy issues concerning or affecting women, black, Latino, Asian, and American Indian communities, as well as those groups' impact on the policy process.

**PAF 550 Information Management.** (3) N

Concepts and theory of information and information technology in public sector organizations.

**PAF 551 Computers in Administration.** (3) N

Experience in use of computer technology for public administration problem solving.

**PAF 552 Public Information Systems.** (3) N

Systems analysis concepts and theory as applied to administration. Alternative modes of information organization and their impact on public decision making.

**PAF 555 Research Data Management.** (3) N

Techniques and problems associated with data management in a research environment. Database management systems, security and integrity, accessibility, and cost.

**PAF 556 Database Management Systems.** (3) N

Concept and use of modern database management systems in an administrative organization. Advantages and disadvantages of this approach.

**PAF 561 Comparative Administration.** (3) N

Literature on comparative public administration theory. Bureaucracies and their impact on the political development process. Selected nations are studied.

**PAF 562 Intergovernmental Relations.** (3) A

Evolution, growth, present status, and characteristics of the U.S. federal system of government. Federal-state relations, state-local relations, regionalism, councils of government, interstate cooperation, grants-in-aid, and revenue sharing.

**PAF 563 Report Preparation.** (3) N

Intensive practice in written and oral presentation of reports to conferences with problems in public administration. Visual aid techniques.

**PAF 564 Political Economy.** (3) A

Classical and contemporary literature and historical development of governmental and economic arrangements, with special emphasis on the role of the state.

**PAF 591 Seminar.** (1–12) F, S

Topics may include but are not limited to the following:

- (a) Business and Government
- (b) Emergency Management
- (c) General Public Administration
- (d) Information Management
- (e) Public Finance Administration
- (f) Public Management
- (g) Public Policy Analysis
- (h) Urban Affairs and Urban Planning

**Omnibus Graduate Courses:** See pages 51–52 for omnibus graduate courses that may be offered.

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## Public Administration

### Interdisciplinary Doctoral Program

**Nicholas O. Alozie**

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#### Agribusiness

Professors: Edwards, Thor

#### Communication

Professor: Petronio

#### Economics

Professor: Hogan

#### Geography

Professor: Burns

#### Health Administration and Policy

Professor: Johnson

#### Journalism and Telecommunication

Professor: Merrill

#### Justice Studies

Regents' Professors: Altheide, Palumbo;  
Professors: Hepburn, Musheno, Schneider

#### Management

Professor: Bohlander

#### Planning and Landscape Architecture

Professors: Mushkattel, Pijawka

#### Political Science

Professor: Berman

#### Psychology

Associate Professor: Castro

#### Public Affairs

Professors: Cayer, Hall, Mankin, McGaw, Monteil,  
Perry, Weschler;

Associate Professors: Alozie, Brown, Lan, Vinzant;  
Assistant Professors: Campbell, DeLorenzo, McCabe

#### Recreation Management and Tourism

Associate Professor: Virden

#### Social Work

Professors: Kettner, MacEachron

#### Sociology

Professor: Nagasawa;

Associate Professor: Benin

## DOCTOR OF PUBLIC ADMINISTRATION

The Committee on Public Administration offers an interdisciplinary graduate program leading to the Doctor of Public Administration degree.

The purpose of the Doctor of Public Administration (D.P.A.) degree program is to prepare skilled professional public administrators for high-level positions in the public sector, and to foster the next generation of public administration scholars in research and university teaching. The program is designed to emphasize both normative and conceptual content pertaining to value assessments, theoretical assumptions, ethics, and modes of decision making, as well as practitioner problem-solving skills in budgeting, public personnel management, public finance, planning, program evaluation, and policy analysis.

The D.P.A. degree program is interdisciplinary in nature and is offered by faculty from various colleges. One of the unique features of this interdisciplinary program is that, because it utilizes faculty research and teaching interests from a number of academic units, a student may tailor a course of study to fit individual needs and goals. The D.P.A. degree program is administered by an executive committee appointed by and responsible to the dean of the Graduate College.

**Admission.** Applications are reviewed by an admissions committee appointed by the director of the executive committee. Recommendations for admission are made by the director of the executive committee to the dean of the Graduate College. Minimum Graduate College admission requirements, as stated on page 93, must be met. Additionally, each applicant must provide a letter of career goals and statement of reasons for seeking the D.P.A. degree, a GRE

test score, a professional résumé, and six letters of recommendation (three from faculty and three from professional public administrators). International students must submit both TOEFL and TSE scores. Admissions recommendations are made only once each year, with admitted students beginning their studies in the fall semester. To assure consideration for the ensuing fall semester, submit applications for admission, graduate assistantship, and tuition waiver by February 15. Only applicants already holding a master's degree are considered. If deficiencies exist in public administration course work at the master's level, appropriate classes are prescribed.

**Program of Study.** When the program of study is filed, a supervisory committee consisting of at least three persons is appointed by the dean of the Graduate College upon the recommendation of the director of the executive committee. The chair of the supervisory committee serves as the student's graduate advisor. The supervisory committee advises the student in developing a program of study and assumes primary responsibility in assessing the student's progress in the program. The program consists of a minimum of 66 semester hours of graduate work beyond the master's degree. Of the 66 semester hours, at least 24 must be dissertation and research credit. A minimum of 30 semester hours of approved course work, exclusive of dissertation and research, must be taken at ASU after admission to the program. A sequence of four core courses is required of all students, followed by a screening examination. In addition to the four core courses, an approved program of study must have a course listed in each of the following areas: quantitative research methods, qualitative research methods, political economy, and democratic theory and governance.

**Residency.** The minimum residency requirement for the D.P.A. degree consists of 30 semester hours of doctoral program credit within a period of 24 consecutive months.

**Comprehensive Examinations.** Upon completion of course work, and before dissertation research, the student is given a written examination in each of the areas of specialization. The written examinations are followed by a single oral examination. If the student should fail one or more components of the examination, a re-examination may be administered no sooner than three months and no later than one year from the date of the original examination. Approval for this re-examination must be obtained from the supervisory committee, the director of the executive committee, and the dean of the Graduate College. A second failure is considered final and dismissal from the program is recommended to the Graduate College.

**Candidacy.** Doctoral students should apply for admission to candidacy immediately after they have met all requirements for the degree, *except the dissertation*. These requirements include passing the comprehensive examinations and other requirements specified by the executive committee.

**Dissertation Requirements.** A dissertation is required of each student. The dissertation must consist of a fully documented written analysis demonstrating a high level of skill and competence. Each student must register for a minimum of 24 hours of dissertation and research. The dissertation is supervised by a committee of at least three faculty members appointed by the dean of the Graduate College. (Each stu-

dent is required to complete at least two colloquium hours of 799 as part of the dissertation proposal.)

**Final Examinations.** The final oral examination in defense of the dissertation is scheduled by the dean of the Graduate College and conducted by the student's dissertation committee. A candidate must pass the final examination within five years after completing the comprehensive examination. Any exception must be approved by the dissertation committee, the director of the executive committee, and the dean of the Graduate College.

**Graduation.** The student is eligible for graduation when the Graduate College scholarship requirements have been met, the final oral examination has been passed, and the dissertation has been approved by the supervisory committee and accepted by the director of the executive committee and the dean of the Graduate College.

Applications for graduation should be made no later than the date specified in the Graduate College calendar.

#### PUBLIC AFFAIRS (PAF)

**PAF 600 Research Design and Methods.** (3) A

Advanced methods of research design and data collection. Prerequisites: formal graduate-level course work in statistics and in research methods.

**PAF 601 Seminar: Policy Analysis and Evaluation.** (3) A

Normative and conceptual issues of policy formulation, implementation, and evaluation; methods of policy analysis and evaluation.

**PAF 602 Seminar: Foundations of Public Administration.** (3) A

Ethical, social, legal, and philosophical foundations of public administration.

**PAF 603 Seminar: Organization and Behavior in the Public Sector.** (3) A

Structure, organization, conduct, and performance of public sector institutions in the administration of public policy. Prerequisite: PAF 602.

**Omnibus Graduate Courses:** See pages 51–52 for omnibus graduate courses that may be offered.

## Recreation

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#### PROFESSORS

ALLISON, HALEY, YOSHIOKA

#### ASSOCIATE PROFESSORS

TEYE, VIRDEN

#### ASSISTANT PROFESSORS

ASHCRAFT, BAKER, MARTINEZ, PRITCHARD,  
SCHNEIDER, SONMEZ

#### MASTER OF SCIENCE

The faculty in the Department of Recreation Management and Tourism offer a program leading to the M.S. degree in Recreation.

The M.S. degree program is designed to prepare students to analyze critical topics and issues pertinent to the field of leisure and recreation. Its four areas of concentration are: outdoor recreation, recreation administration, social/psychological aspects of leisure, and tourism and commercial recreation.

Students choose between two academic options: the thesis option or the nonthesis option that includes the completion of an applied project.

**Admission.** Students applying to the M.S. program must have achieved a GPA of 3.00 or the equivalent in the last two years of work leading to the bachelor's degree. Applicants should submit their application, application fee, and all undergraduate transcripts to the Graduate College prior to February 15. To be considered for fall admission, candidates must have their Graduate Record Examination (or Miller's Analogy Test) scores, a statement of professional and academic goals, and three letters of recommendation sent to the Department of Recreation Management and Tourism by March 1. Only complete application files will be reviewed by the graduate faculty for admission and assistantship consideration. Students without undergraduate academic work in the recreation/tourism disciplines will be required to take six semester hours of deficiency course work in addition to the M.S. degree requirements. Deficiency course work may be taken in conjunction with M.S. degree classes.

**Program of Study.** Completion of the M.S. degree in Recreation on the average requires approximately two years of study. Students may select a thesis or nonthesis option. The thesis option is a research-oriented degree and is recommended for students planning to continue graduate studies beyond the master's degree. The nonthesis option is intended for students seeking additional knowledge and expertise relevant to professional career development in the recreation field. Advisement and direction in both options are under the direct supervision of a faculty member.

**Program Requirements: Thesis Option.** The thesis option requires the successful completion of a minimum of 30 semester hours, of which six to nine hours can be taken outside of the Department of Recreation Management and Tourism. Included in the 30 semester hours are six hours of thesis (REC 599), which must be defended in an oral examination before a supervisory committee of at least three faculty members.

REC 500 Research Methods I .....	3
REC 501 Research Methods II .....	3
REC 552 Historical and Philosophical Foundations of Leisure .....	3
REC 555 Social and Psychological Aspects of Leisure Behavior.....	3
REC electives (within the major).....	6-9
Electives (outside the major) .....	6-9
Thesis .....	6
Minimum total .....	30

**Program Requirements: Nonthesis Option.** The nonthesis option consists of 39 semester hours, of which 12 semester hours may be taken outside the department. This option includes three hours of applied project (REC 593). The applied project should reflect a substantive analysis of a pro-

fessionally oriented topic related to the student's area of concentration. Before final approval, the student's project must be defended in an oral examination and must receive the written approval of two department faculty members who serve on the supervisory committee.

REC 500 Research Methods I .....	3
REC 552 Historical and Philosophical Foundations of Leisure .....	3
REC 555 Social and Psychological Aspects of Leisure Behavior.....	3
REC 593 Applied Project .....	3
REC 598 Special Topics .....	3
REC Electives (within the major).....	12
Electives (outside the major) .....	12
Minimum total .....	39

**Foreign Language Requirements.** None.

**Thesis Requirements.** A thesis is an option.

**Final Examinations.** A final oral examination in defense of the thesis or an applied project is required.

## RESEARCH ACTIVITY

The study of leisure and recreation is a multidisciplinary field of research, scholarship, and program development. Recent scholarly activity of departmental faculty and students reflects this approach. Major research areas include the following: international travel and tourism; philosophy of leisure; recreation resource planning; social and psychological analyses of leisure behavior; leisure and youth development; travel and tourism policy and planning; urban recreation administration; outdoor recreation and wilderness management; cross-cultural analysis of play and leisure; gender differences in leisure behavior patterns; non-profit agency leadership/management.

### RECREATION (REC)

#### REC 500 Research Methods I. (3) A

Introduction to recreation research methods, with emphasis on methodological questions, research issues, and techniques relevant to contemporary social research. Prerequisite: 500-level or higher approved statistics course.

#### REC 501 Research Methods II. (3) N

Advanced treatment of methodological issues, analysis of data, computer applications, and thesis proposal development. Prerequisite: REC 500.

#### REC 540 Recreation Services for the Aged. (3) N

An applied orientation to the social/psychological theories of recreation and the aged.

#### REC 552 Historical and Philosophical Foundations of Leisure. (3) A

An analysis of the fundamental historical and philosophical concepts, issues, and problems confronting the leisure studies profession.

#### REC 555 Social and Psychological Aspects of Leisure Behavior. (3) A

An empirical and theoretical analysis of social, cultural, and psychological foundations of leisure behavior.

#### REC 558 Integrative Seminar. (3) A

Advanced exploration and assessment of current trends within the leisure studies profession. This course has variable topics, including, but not limited to: cross-cultural analysis of leisure, urban recreation, planning and resources, sociocultural dimensions of tourism development, wilderness management. Prerequisite: REC 552.

#### REC 569 Current Issues in Tourism. (3) A

General survey of the tourism literature with an emphasis on relevant theories, concepts, and current research.

**REC 570 Social Aspects of Outdoor Recreation Management.** (3)  
A

An analysis of the social aspects of natural resource recreation management and planning. Prerequisite: REC 370 or equivalent.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Religious Studies

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*Chair*

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### PROFESSORS

CADY, FELDHAUS, FOARD, SAMUELSON, WENTZ

### ASSOCIATE PROFESSORS

COUDERT, GEREBOFF, MOORE, MORRISON, SCHOBER,  
SWANSON, WOODWARD

### ASSISTANT PROFESSORS

CLAY, FESSENDEN, UMAR

### LECTURER

DAMREL

The faculty of the Department of Religious Studies offer a graduate program leading to the M.A. degree in Religious Studies. This program is designed to serve three main purposes. It offers intensive training in research methods and in select special fields for students who seek to qualify for doctoral programs at leading universities. It serves as specialized training for those who plan to teach religious studies subject matters in colleges and high schools or who wish to bring cultural and cross-cultural analytical tools to professions such as business, social work, government, and journalism. It allows qualified persons in nonacademic occupations the opportunity to acquire competence in the study of religions, broadly defined, and in areas of special interest.

Course offerings and faculty appointments reflect the commitment of the department to a balance of Western and Asian, historical and conceptual, methodological, and subject-oriented areas of study. This programmatic diversity is maintained in a context of scholarly collegiality involving both faculty and graduate students.

### MASTER OF ARTS

See "Master's Degrees," page 98, for general requirements.

The graduate program leading to the M.A. degree provides two options: (1) a thesis option and (2) a portfolio option. While admission requirements and procedures are identical for both options, requirements for degree completion vary as indicated.

**Admission.** In order to be eligible for admission to the graduate program in Religious Studies, an applicant must meet Graduate College requirements. See "Master's Degrees," page 98, and provide the following:

1. The student must submit test scores from the Graduate Record Exam (older returning students may petition the department to have this requirement waived).
2. The student must have completed the equivalent of 15 hours of undergraduate work in the study of religions, including advanced courses in both Western and Asian or other non-Western religions. Students without the necessary background in religious studies may remove deficiencies by taking additional specified courses (which may or may not count toward the fulfillment of degree requirements) at the beginning of their program of study.
3. The student must request three academic letters of reference to be sent to the graduate coordinator of the department.
4. The student must submit an essay of approximately 1,000 words outlining the academic background, career goals, and specific area of interest in religious studies in relation to fields offered by the faculty.

Complete applications are due by February 1. Students will receive notification from the department by April 1. Graduate assistantship awards are also announced on or about April 1. Late applications and applications for spring semester are reviewed on an individual basis.

### GRADUATE PROGRAM REQUIREMENTS

**Thesis Option.** This option is recommended for students intending to seek admission to a doctoral program upon completion of the M.A. degree or planning to teach in the discipline at community colleges. For the thesis option the student must satisfy the following requirements:

1. reading knowledge of French, German, or another language relevant to the proposed thesis topic is normally required. At the discretion of the student's supervisory committee, the requirement may be waived for students who either are not planning to enter a doctoral program or are planning to pursue doctoral work that does not require proficiency in foreign languages;
2. 24 hours of course work, including six hours in methods and theory (REL 501, 502); three hours of research in the field of the thesis topic (REL 592); and six hours of graduate seminar (REL 591), offered each semester on varying topics within the academic study of religion;
3. a thesis that earns six semester hours of Thesis 599 credit; and
4. an oral defense of the thesis.

**Portfolio Option.** This option is recommended for students intending to augment their primary area of expertise and professional training in fields such as journalism, law, teaching K-12, counseling, social work, the ministry, and others. For the portfolio option, the student must satisfy the following requirements:

1. reading knowledge of a foreign language relevant to the proposed area of concentration. At the discretion of the student's supervisory committee, the requirement may be waived;

2. 30 hours of course work, including six hours in methods and theory (REL 501, 502); six hours of graduate seminar (REL 591); four courses in a major area of concentration; and two courses in a minor area;
3. a portfolio consisting of three papers: one on theory and method, one on the student's minor area of study, and one on the major area of study. Although portfolio papers may germinate from ideas generated in graduate seminars, they will be of publishable quality and make substantive contributions to the scholarship of the field. Credit towards completing the portfolio may be earned as part of the required credit hours outlined in (2); and
4. an oral defense of the portfolio.

## RESEARCH ACTIVITY

Areas of faculty research include the following: American folk religion, American civil religion, and American spirituality (Wentz); African American religions (Moore); Islam (Woodward, Damrel, Umar); medieval and folk Hinduism (Feldhaus); popular religion and culture in Japan from medieval times to present (Foard); Rabbinic Judaism and religion and ethics (Gereboff); Jewish philosophy and theology (Samuelson); North and South Native American religions, including issues in cross-cultural contact (Morrison, Swanson); Religion and Science (Samuelson, Coudert); Russian and East European religions (Clay); modern religious thought and religion and the public/private boundary (Cady); religion and gender (Fessenden); the religions of Southeast Asia, including issues of modernization (Schober, Woodward); and religion and nationalism (Damrel, Clay, Woodward, Umar).

## RELIGIOUS STUDIES (REL)

### REL 410 Judaism in Modern Times. (3) N

Variety of expressions of Judaism and Jewishness in the modern period. Topics may include American Judaism or religious responses to the Holocaust. *General Studies: HU, H.*

### REL 415 The Jewish Mystical Tradition. (3) A

Examination of some of the esoteric lore of Judaism. Movements and literature such as Hasidism and Kabbalah are studied. *General Studies: HU.*

### REL 420 Religion in American Life and Thought. (3) A

The influence of religion on American society, culture, and ideas; the distinctive character of religion in America. Prerequisite: REL 320 or 321 or equivalent. *General Studies: L2/HU.*

### REL 426 American Preachers and Preaching: The Sermon in America. (3) N

The life and work of notable American preachers. The emergence of the preacher as representative of American religion. Prerequisite: REL 320 or 321 or equivalent. *General Studies: L2/HU.*

### REL 427 American Religious Thought. (3) N

The thought of representative American religious thinkers, i.e., Jonathon Edwards, William Ellery Channing, Horace Bushnell, and Reinhold Niebuhr. Prerequisite: REL 320 or 321 or equivalent. *General Studies: HU, H.*

### REL 444 Religion in Japan. (3) F

Religion in Japanese history, especially the development of Japanese Buddhism, and religion in the modern transformation of Japan. Prerequisite: instructor approval. *General Studies: HU, G, H.*

### REL 460 Studies in Islamic Religion. (3) A

Issues in the interpretation and understanding of Islamic texts, history, society, culture, and rituals. Prerequisites: REL 365 and Religious Studies major or instructor approval. *General Studies: HU, G.*

### REL 470 Religion in the Middle Ages. (3) A

Religious aspects of medieval life and thought; variety of forms of dissent, heresy, and reform movements from the 4th to 13th centuries. *General Studies: HU, H.*

### REL 471 Reformation and Modern Christianity. (3) A

Protestant Reformation to contemporary Christian movements; includes factors in the dissolution of the Medieval Christian synthesis, variety of reform movements and reformation patterns, Catholic counter-reform measures, formation of liberal theology, ecumenical movement, and the World Council of Churches. *General Studies: HU, H.*

### REL 486 Modern Critics of Religion. (3) A

Major theories and critiques of religion among modern social, philosophical, and religious thinkers. *General Studies: HU.*

### REL 494 ST: Special Topics in Religious Studies. (3) N

Open to all students, freshmen by instructor approval only. Topics may be selected from various areas.

### REL 498 PS: Pro-Seminar in Religious Studies. (3) A

For students with a major or minor emphasis in Religious Studies.

### REL 501 Research Methods in Religious Studies. (3) F

An exploration of the major themes and methods in the study of religion, with primary focus on classical texts. Lecture, discussion.

### REL 502 Research Methods in Religious Studies. (3) F, S

An exploration of the major themes and methods in the study of religion, with primary focus on contemporary texts. Lecture, discussion.

### REL 591 Seminar. (3) N

Topics on methodological issues in the study of religion. Prerequisite: Religious Studies graduate student or instructor approval.

### REL 598 ST: Special Topics. (3) F, S

Topics are selected from the following areas:

- (a) Christianity, Greco-Roman Religion
- (b) Comparative Western, Ancient Near East, Judaism
- (c) Islam
- (d) Native American Religion
- (e) Problems in Religious Studies
- (f) Religion in America
- (g) Religion in East Asia
- (h) Religion in South Asia
- (i) Study of Religion, Comparative Religion
- (j) Western Religious Thought, Ethics

May be repeated for credit.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Renaissance Studies

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See "Medieval and Renaissance Studies," page 248.

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## Scholarly Publishing

### Certificate Program

**Beth Luey**

*Director*

(SS 225H) 480/965-5775

[aabel@asuvm.inre.asu.edu](mailto:aabel@asuvm.inre.asu.edu)

[www.asu.edu/clas/history/graduate/ScholarlyPublishing.html](http://www.asu.edu/clas/history/graduate/ScholarlyPublishing.html)

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## SENIOR INSTRUCTIONAL PROFESSIONAL

LUEY

Graduate students in any discipline may pursue a Certificate in Scholarly Publishing in conjunction with their degree programs. The program is also open to students who already hold graduate degrees. Students gain an understanding of the structure of scholarly publishing (scholarly books, journals, reference books, college textbooks, and scholarly

electronic media), its role and responsibility in society, the legal and ethical issues that impinge upon it, and its economics. They also learn to perform the responsibilities of editors, designers, or producers of scholarly publications. Course work includes a required core, required courses in editing or design, and electives from a variety of disciplines. The certificate requires 28 hours of course work, including six internship hours. Some courses may be applied to both the certificate and the student's degree program. Applicants are strongly urged to submit Graduate Record Examination aptitude scores; a writing sample is required. Application deadline is February 1. For more information, contact the director, Scholarly Publishing Program, SS 225H, 480/965-5775.

### SCHOLARLY PUBLISHING (PUB)

#### **PUB 501 Introduction to Scholarly Publishing.** (3) F

An introduction to the purpose, organization, and operation of scholarly publishing, including its history, societal role, and current issues. Lecture, discussion. Prerequisite: graduate standing.

#### **PUB 502 Scholarly Editing.** (3) F

Publishing procedures, proofreading, and manuscript editing of scholarly books, textbooks and scholarly journals. Lecture, discussion. Prerequisite: admission to scholarly publishing certificate program. Pre- or corequisite: PUB 501.

#### **PUB 503 Advanced Scholarly Editing.** (3) S

Advanced manuscript editing, acquisitions, developmental editing, and indexing of scholarly books, textbooks, and scholarly journals. Lecture, discussion. Prerequisites: PUB 501, 502.

#### **PUB 510 Research in Scholarly Publishing.** (3) S

Individual or group research projects on issues in scholarly publishing, including legal, economic, design, technological, and related topics. Directed research, discussion. Prerequisites: PUB 501; admission to scholarly publishing certificate program.

#### **PUB 584 Scholarly Publishing Internship.** (1–6) A

Structured, supervised, practical experience with a scholarly publisher or other appropriate publishing enterprise. Internship. Prerequisites: PUB 501; 9 hours in scholarly publishing core; instructor approval.

#### **PUB 598 ST: Special Topics in Scholarly Publishing.** (1) S

One-week short courses covering special topics in scholarly publishing, to be taught by visiting publishing professionals. Lecture, discussion. Prerequisites: PUB 501; admission to scholarly publishing certificate program.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Science and Engineering of Materials

### Interdisciplinary Doctoral Program

**James Adams**

**William Petuskey**

*Codirectors*

(PS A323) 480/965-2460

sem@asu.edu

www.asu.edu/graduate/SEM

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#### **Center for Solid-State Science**

Professor: Carpenter

Senior Research Scientist: Crozier

Research Scientist: McCartney;

Associate Research Scientists: McKelvy, Sharma

Assistant Research Scientist: Kim

#### **Chemical, Bio, and Materials Engineering**

Professors: Adams, Dey, Krause, Mahajan

#### **Chemistry and Biochemistry**

Regents' Professor: Buseck;

Professors: Glaunsinger, McMillan, Petuskey;

Assistant Professor: Kouvetakis

#### **Electrical Engineering**

Regents' Professor: Ferry;

Professors: Kozicki, Schroder, Zhang

#### **Mechanical and Aerospace Engineering**

Professor: Sieradzki

#### **Physics and Astronomy**

Professors: Bennett, Rez, Sankey, Scheinfein, Smith, Tsong, Venables;

Associate Professors: Culbertson, Herbots, Marzke

The Committee on the Science and Engineering of Materials offers an interdisciplinary graduate program leading to the Ph.D. degree in Science and Engineering of Materials, with concentrations in high-resolution nanostructure analysis and solid-state device materials design. The members of the faculty comprising the program are from several academic research units in the College of Liberal Arts and Sciences and the College of Engineering and Applied Sciences: the Center for Solid-State Science; the Departments of Chemical, Bio, and Materials Engineering; Chemistry and Biochemistry; Electrical Engineering; Mechanical and Aerospace Engineering; Physics and Astronomy.

### DOCTOR OF PHILOSOPHY

The Ph.D. degree in the Science and Engineering of Materials is an interdisciplinary program of study that integrates courses offered by faculty representing various disciplines noted above, along with courses in mathematics, to provide a sound foundation for research leading to a dissertation. Emphasis is placed upon applications of the core fundamentals for investigation of the relationships between microstructure and properties and performance of solids, and the dependence of microstructure on processing.

**Admission.** Admission to the SEM Program is a two-step process. First, all prospective students must satisfy the general admission requirements of the Graduate College. International students must submit a Test of English as a Foreign Language (TOEFL) score. The minimum TOEFL score required by the SEM Program is 600. Second, students must satisfy the requirements of the SEM Program. These requirements are: a GRE (verbal, quantitative, analytical), a professional resume, a statement of purpose, and three letters of recommendation. International students who wish to be considered for teaching assistantships must provide the program with a Test of Spoken English (TSE) score. Application materials must be received by the SEM Program Office by the following established deadlines: for fall, documents must be received (postmarked) by February 1; for spring, by October 1.

**Program of Study.** The program consists of a minimum 84 semester hours beyond the bachelor's degree, at least 24 of which are research and dissertation credit. Programs of study for individual students are defined during discussions between the student and the faculty supervisory committee. At least 30 semester hours of the approved program of study, including the core, exclusive of research and dissertation, must be completed after admission to the Ph.D. at ASU.

A minimum of 10 graduate-level courses beyond the bachelor's degree is required.

The curriculum includes core courses that define the essential course work for all students, involving 22 semester hours of selected courses in the science and engineering of materials, chemistry, and physics. Students who previously have taken courses fulfilling some of the core requirements may select electives.

#### Interdisciplinary Core Courses

CHM 471	Solid-State Chemistry	3
	or CHM 453 Inorganic Chemistry (3)	
CHM 541	Materials Thermodynamics	3
CHM 545	Quantum Chemistry I	3
	or EEE 591 PS: Quantum Mechanics for Engineers (3)	
	or PHY 471 Quantum Mechanics (3)	
MSE 514	Physical Metallurgy	4
MSE 550	Materials Characterization	3
PHY 481	Solid-State Physics	3
SEM 598	Graduate Student Seminar	3
Total		22

Students may choose one of the following concentrations in their program of study: (1) high-resolution nanostructure analysis and (2) solid-state device materials design, or may tailor a program of study in the science and engineering of materials to meet their professional and academic needs. Students achieve the desired concentration by completing three or more of the courses in the appropriate concentration group of courses. The courses in these concentrations are a part of the elective portion of the degree course requirements.

**High-Resolution Nanostructure Analysis.** The courses comprising the high-resolution nanostructure analysis concentration are the most comprehensive education in the theory and application of transmission electron microscopy in the U.S. This group of courses is highly interdisciplinary. Because of the strict and important correspondence between the properties of materials and their nanostructure, transmission electron microscopy plays a central role in modern materials science, far beyond its role in other fields of natural science and engineering. Nanostructure analysis is fully one-third the field of materials research and is often the critical knowledge necessary to understand the behavior of materials. The development and applications of high-resolution nanostructure analysis methods is one of ASU's strongest materials research and education specialities and is an important part of the SEM Program. Required courses are as follows:

SEM 556	Electron Microscopy Laboratory	3
SEM 557	Electron Microscopy Laboratory	3
SEM 558	Electron Microscopy I	3
SEM 559	Electron Microscopy II	3
Total		12

**Solid-State Device Materials Design.** The courses specified for the solid-state device materials design concentration are materials applications and characterization courses that introduce SEM students to the culture of device engineering. Students apply their knowledge in depth of basic materials science to contemporary problems of the solid-state electronics industry. Required courses are as follows:

EEE 435	Microelectronics	3
EEE 436	Fundamentals of Solid-State Devices	3

EEE 536	Semiconductor Characterization Design of Engineering	3
IEE 572	Design of Engineering Experiments	3
MSE 518	Integrated Circuit Materials Science	3
Total		15

**Preliminary/Qualifying Examination.** The student must take a preliminary examination at the end of the first year in the program. Under exceptional circumstances, the student can petition to the Curriculum and Examination Committee to postpone taking the exam until the third or fourth semester. The examination is principally for diagnostic purposes and unsatisfactory performance may require additional course work or study. The examination addresses topics central to the science and engineering of materials, such as classical thermodynamics, physical metallurgy, materials science and materials characterization, kinetics and diffusion, structure, continuum mechanics and defects in solids, quantum mechanics and chemistry, solid structure, inorganic chemistry, statistical thermodynamics, and experimental methods. Results of the examination are used by the student's advisor and/or faculty supervisory committee in formulating a program of study for the student. Students with thorough undergraduate preparation in physical chemistry, engineering physics, solid-state physics, engineering science, solid-state device engineering, physical metallurgy, physical ceramics, applied mathematics, and similar backgrounds are best prepared for study of the science and engineering of materials.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Near completion of course work and no later than three years after admission to the program, the student is given a comprehensive examination with oral and written components. The written component examines the student's knowledge in the core course subjects as well as those topics covered in the preliminary examination. The examination is administered by the Curriculum and Examination Committee. The oral component requires the presentation of a research proposition to the student's faculty supervisory committee. The student must define a research problem of current relevance to the materials science field. The problem may be experimental, theoretical, or a combination of both. The presentation should be based on the study of literature and discussions with members of the supervisory committee and materials researchers. The student will define the problem, describe its significance in the field, propose a method of investigation leading to a solution of the problem, and defend the problem and proposed solution before the faculty supervisory committee. The proposed problem may be from any area of materials research but it may not be directly related to the student's dissertation topic. The student must prepare and deliver to the members of the supervisory committee a written proposal describing the research proposition not less than two weeks prior to the scheduled examination date. The comprehensive exams may be taken no more than twice upon formal application to, and under conditions specified by, the student's faculty committee, the director of the supervisory program, and the dean of the Graduate College. Upon successful completion of this examination, the student is



expected to apply to the dean of the Graduate College for formal admission to candidacy for the degree.

**Dissertation Requirements.** The dissertation, which is the final and most important product of the student's effort in this program, must report original research in the field and demonstrate the student's ability to conduct creative, independent research. Each candidate must register for at least 24 semester hours of research and dissertation credit as part of the requirement.

**Final Examinations.** The final oral examination in defense of the dissertation is conducted by the student's dissertation committee and others appointed by the dean of the Graduate College.

## RESEARCH ACTIVITY

The faculty in the Science and Engineering of Materials Program have established vigorous research programs in the field. Current results are discussed regularly by faculty, research staff, graduate students, and external invited speakers in several regular seminar series. Students in the program have the opportunity to participate and interact directly with speakers.

Areas of current research include the structure and properties of semiconductors such as the following: silicon and gallium arsenide; fabrication of ultrasmall solid-state electronic devices; the structure of the free surfaces of crystalline solids; the structure and properties of intercalated layer compounds; the effects of ion implantation on solids (lattice defect formation, mixing, phase transformations); environmental effects on spectral emissivity of solids; the effects of high pressure on solids; study of phase transformation mechanisms in many different types of solids; atomic structure of interfaces in metal matrix/ceramic and crystal/polymer composites. Several different laboratories containing specialized equipment and computing facilities are available to students conducting research in the program. These include the following: the Facility for High Resolution Electron Microscopy; the Center for Solid-State Electronics Research; electron spin and nuclear magnetic resonance spectroscopy laboratories; several materials preparation laboratories; a Raman spectroscopy laboratory; atomic absorption, X-ray fluorescence, and mass spectroscopic laboratories; X-ray diffraction laboratories; optical microscopy laboratories; computer-controlled high temperature mechanical deformation facilities for constant or variable strain rate plasticity and fracture research; creep research; high temperature electron emission and thermionic energy conversion research.

Courses applicable to the Science and Engineering of Materials interdisciplinary program are taught by faculty in related departments such as chemistry and biochemistry, physics and astronomy, electrical engineering, chemical, bio and materials engineering, mechanical and aerospace engineering, and mathematics. For descriptions of these courses, see the listings under appropriate headings in this catalog.

### SCIENCE AND ENGINEERING OF MATERIALS (SEM)

**SEM 556 Electron Microscopy Laboratory.** (3) F  
Lab support for SEM 558. Cross-listed as MSE 556. Credit is allowed for only MSE 556 or SEM 556. Pre- or corequisite: MSE/SEM 558.

**SEM 557 Electron Microscopy Laboratory.** (3) S  
Lab support for SEM 559. Cross-listed as MSE 557. Credit is allowed for only MSE 557 or SEM 557. Pre- or corequisite: MSE/SEM 559.

**SEM 558 Electron Microscopy I.** (3) F  
Microanalysis of the structure and composition of materials using images, diffraction, and X-ray and energy loss spectroscopy. Knowledge of elementary crystallography, reciprocal lattice, stereographic projections, and complex variables is required. Cross-listed as MSE 558. Credit is allowed for only MSE 558 or SEM 558. Prerequisite: instructor approval.

**SEM 559 Electron Microscopy II.** (3) S  
Microanalysis of the structure and composition of materials using images, diffraction, and X-ray and energy loss spectroscopy. Knowledge of elementary crystallography, reciprocal lattice, stereographic projections, and complex variables is required. Cross-listed as MSE 559. Credit is allowed for only MSE 559 or SEM 559. Prerequisite: instructor approval.

**SEM 594 Vacuum System Science and Engineering.** (3)  
Vacuum concepts, equipment, and systems are studied to give the student an operational knowledge of modern vacuum technology. Equal emphasis will be placed on theoretical and practical instruction. Class time is equally distributed between lecture and laboratory sessions. Lab sessions will consist of exercises and tours to provide hands-on experience with and a working perspective of the vacuum techniques and systems principally used in industry, academia and government laboratories. Undergraduates take two written exams; graduate students take two written exams and complete a vacuum system design project. Prerequisite: college algebra.

**SEM 700 Research Methods.** (1–6)

**SEM 790 Reading and Conference.** (1–6)

**SEM 791 Seminar.** (1)

**SEM 792 Research.** (1–12)

**SEM 799 Dissertation.** (1–12)

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Social and Philosophical Foundations of Education

Mary Lee Smith  
Program Coordinator  
(ED 104) 480/965-6248  
delps@asu.edu

### PROFESSORS

APPLETON, GLASS, RENDÓN, SMITH, STOUT

### ASSOCIATE PROFESSORS

CASANOVA, HARTWELL-HUNICUTT

### MASTER OF ARTS

The faculty in the Division of Educational Leadership and Policy Studies offer a graduate program leading to the M.A. degree in Social and Philosophical Foundations of Education. Students may also select policy analysis as an area of study.

Applicants for admission to the M.A. degree program must submit scores on the Graduate Record Examination. Candidates for the M.A. degree must pass a written comprehensive examination, in addition to writing a thesis or equivalent. An oral examination in defense of the thesis or equivalent is required.

## RESEARCH ACTIVITY

Faculty research incorporates both qualitative and quantitative methodologies. Studies are being conducted on minority education, including cultural pluralism, multicultural and bilingual education, and education of women. Philosophical, sociological, historic, economic, and comparative approaches are employed. Research also focuses on the theory of evaluation and educational policy. In addition to the social and philosophical foundations of education faculty, students have the opportunity to collaborate on research projects with the faculty in higher education, educational administration and supervision, and policy studies.

### EDUCATIONAL POLICY STUDIES (SPF)

#### SPF 501 Culture and Schooling. (3) F, S

Introduction to social science concepts of culture and the cultural milieu in which schooling takes place in the United States. Lecture, recitation.

#### SPF 510 Introduction to Organization and Administration of American Public Schools. (3) F, S

Organizational structure and administration of public education are explored through the application of legal and ethical concepts and relevant information of the social sciences. Cross-listed as EDA 510. Credit is allowed for only EDA 510 or SPF 510.

#### SPF 511 School and Society. (3) F, S, SS

Interrelationship of school and society and the role of education in social change.

#### SPF 520 Cultural Diversity in Education. (3) S

Philosophic and sociological investigation of cultural diversity in the United States and how it relates to education.

#### SPF 533 Comparative Education in the Western World. (3) N

Educational practices and traditions in the leading nations of Europe and the Soviet Union.

#### SPF 544 Philosophical Foundations of Education. (3) F

Theories of education in ancient, medieval, and modern classical and contemporary philosophies.

#### SPF 566 History of Education. (3) S

Development of educational institutions and ideas in the Western World, from ancient times to the 20th century.

#### SPF 612 Evaluation Theory. (3) F

Explores the major theories of evaluation (inquiry leading to value judgments) in educational policy through examination of cases.

#### SPF 622 Organizational Theory. (3) S

Major views of organizations and their influence on role definition and participant behaviors in educational organization. Seminar, discussion. Cross-listed as HED 688. Credit is allowed for only HED 688 or SPF 622.

#### SPF 711 Social and Historical Foundations of Education. (3) N

Problems of American education and their sociohistorical context.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Social Work

**Elizabeth A. Segal**  
*Interim Director*  
 (WHALL 135) 480/965-3304  
 social.work@asu.edu  
 ssw.asu.edu

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### PROFESSORS

ASHFORD, COUDROGLOU, DALEY, KETTNER,  
 LeCROY, MacEACHRON, MARTINEZ-BRAWLEY,  
 MORONEY, SEGAL

### ASSOCIATE PROFESSORS

GUSTAVSSON, LEYBA, MONTERO, NICHOLS, PAZ,  
 RISLEY-CURTISS, WALLER, ZORITA

### ASSISTANT PROFESSORS

BELL, BRZUZY, GERDES, HURDLE, MARSIGLIA, NAPOLI,  
 STEINER, STROMWALL, VILLEREA

### ACADEMIC PROFESSIONALS

GONZALEZ-SANTIN, JOHNSTON, KNUTSON-WOODS

The faculty in the School of Social Work offer programs leading to the Master of Social Work degree and the Ph.D. degree in Social Work.

## MASTER OF SOCIAL WORK

The professional program leading to the Master of Social Work degree prepares social workers for advanced direct practice, planning administration, and community practice. The program is designed to prepare social workers capable of responding effectively to the needs of special populations in the Southwest—the ethnic groups of the region; the aged; urban and rural poor; children at risk; the disabled; and women who are victims of poverty, discrimination, and violence—in its curriculum and its practicum assignments. The Master of Social Work degree program is accredited by the Council on Social Work Education.

**Application Procedures.** Students applying to the graduate program in Social Work must follow the procedures for admission to the Graduate College (see “Admission to the Graduate College,” page 89). In addition the applicant must submit the following to

ACADEMIC SERVICES  
 SCHOOL OF SOCIAL WORK  
 ARIZONA STATE UNIVERSITY  
 PO BOX 871802  
 TEMPE AZ 85287-1802

1. application to the graduate Social Work program,
2. statement of educational and career goals in sufficient detail to indicate compatibility with the educational objectives and capabilities of the School of Social Work,
3. three letters of reference using the reference letter forms provided by the School of Social Work, and
4. test scores from either the GRE or the MAT.

**Admission**

**Regular Admission.** In addition to the requirements listed above, the school also requires one of the following:

1. a liberal arts undergraduate degree;
2. a B.S.W. from a Council on Social Work Education accredited school of social work; or
3. another undergraduate degree, with 30 semester hours in liberal arts courses at the undergraduate or graduate level.

The 30 semester hours described in item three above must include course work from the social/behavioral sciences, natural sciences, and humanities. The distribution should approximate the current policy for the B.S.W. program: 18 hours in social and behavioral sciences, six hours in natural sciences with at least one course in human biology, and six hours in humanities.

All students are required to successfully complete a course in human biology prior to enrollment in the graduate program. Additionally, all students must have successfully completed a course in statistics before admission. If the statistics requirement has not been met, then an equivalent course must either be successfully completed by December 31 or prior to registering for SWG 519.

**Provisional Admission.** Applicants with lower test scores or grades below minimum levels may be considered for provisional admission if there is counterbalancing evidence suggesting the potential of outstanding performance in the M.S.W. program. Normally, final determination of removal of provisional status is made by the time the student has completed 12 hours of approved graduate study. The provisional student does not begin field work until this status has been changed. However, the student carries the same academic load as a regularly admitted student and is expected to meet the same standards for continuation in the program.

All students are required to successfully complete a course in human biology before enrollment in the graduate program. Additionally, all students must have successfully completed a course in statistics either prior to admission or by the end of the first year in the M.S.W. program.

Applications to the M.S.W. program are accepted from November 1 to March 1 preceding the fall semester to which the applicant is seeking admission. All applicants are reviewed for admission for the fall semester only.

**Program of Study.** The standard program consists of 60 hours including both classroom instruction and field practicum. It is divided into a foundation year (core curriculum) and a concentration year. During both years, students spend two days a week in a practicum setting. The foundation curriculum is the same for all students and must be completed before entering the concentration year. The following are the required foundation courses:

SWG 501 Human Behavior in the Social Environment I .....	3
SWG 502 Human Behavior in the Social Environment II .....	3
SWG 510 Foundation Practice I .....	3
SWG 511 Foundation Practice II .....	3
SWG 519 Research Methods in Social Work .....	3
SWG 531 Social Policy and Services I .....	3
SWG 533 Diversity and Oppression in Social Work Context .....	3

SWG 541 Field Practicum I .....	3
SWG 542 Field Practicum II .....	3
SWG 580 Community and Organizational Change .....	3

In the second year, students concentrate in either direct practice or planning, administration and community practice. Six to nine hours of electives are available for students either to take additional course work in their concentration or to increase knowledge and skill in such areas as health and mental health, family and child welfare, or aging.

The following are required concentration courses:

**Direct Practice (DP)**

SWG 606 Assessment of Mental Disorders .....	3
SWG 611 Social Work with Families .....	3
SWG 619 Practice-Oriented Research .....	3
SWG 621 Integrative Seminar .....	3
SWG 632 Social Policy and Services II .....	3
SWG 641 Advanced Practicum: Direct Practice I .....	3
SWG 642 Advanced Practicum: Direct Practice II .....	3
One of the following five approved advanced courses .....	3
SWG 613 Social Work with Individuals (3)	
SWG 614 Social Work with Families in Transition (3)	
SWG 616 Social Work with Chemically Dependent Families (3)	
SWG 617 Social Work Practice with Children and Adolescents (3)	
SWG 618 Family Violence (3)	
Electives .....	6
Total .....	30

**Planning, Administration and Community Practice (PAC)**

SWG 623 Agency Research in Social Work .....	3
SWG 632 Social Policy and Services II .....	3
SWG 643 Advanced Practicum/PAC I .....	3
SWG 644 Advanced Practicum/PAC II .....	3
SWG 680 Program Planning in Social Services .....	3
SWG 681 Social Work Administration .....	3
or SWG 682 Community Participation Strategies (3)	
Electives .....	12
Total .....	30

Electives may be selected from offerings at the School of Social Work or courses offered through other departments with the approval of the M.S.W. program coordinator. The total semester hours for each concentration equals 30.

**Transfer Credit.** Upon recommendation of the admissions committee, the first year of graduate study (up to 30 graduate semester hours) earned at another CSWE accredited school of social work may be transferred and applied toward the M.S.W. degree at ASU. Under these circumstances, the student must complete the second full year of graduate study (at least 30 semester hours of graduate work) at ASU, resulting in a 60-hour program composed of the work from both schools. A full report from the school at which the intended transfer credit was obtained is required.

In other cases, with the approval of the M.S.W. program coordinator, up to six semester hours of graduate work completed at another university may be transferred as elective credit.

Consideration for acceptance of prior graduate credits must be applied for at the time of admission. The grades of all transfer credit must be a "B" or higher.

**Nondegree Course Work.** A maximum of nine graduate semester hours earned as a nondegree student in the ASU School of Social Work or six semester hours earned at another graduate degree program at ASU may be applied toward the program of study as elective credit. A combination of credit earned as a nondegree student—at ASU or transferred from another university—may not exceed nine hours.

Course work toward a master’s degree must be completed within six consecutive years. The six-year period begins with the first course included on the student’s approved program of study.

Consideration for acceptance of nondegree work must be applied for at the time of admission.

**Exemptions and Waiver Examinations.** The number of hours required to complete the M.S.W. degree ranges from 40 to 60 semester hours, with 60 hours representing the standard program. In addition to transferring credit (see policy on transfer credit), admitted students may meet requirements of up to 20 hours of credit towards the degree by (1) exempting up to nine hours of foundation course work without examination or (2) successfully completing examinations in any of the foundation courses except field practicum.

*Exemptions.* Only students from B.S.W. programs accredited by the Council on Social Work Education can be considered for exemptions. In order to be eligible for an exemption from any course, students must have received their B.S.W. degree no more than five years prior to the date of admission or must demonstrate current continuing education credits. Admitted B.S.W. students from ASU are exempted from the courses listed below without examination if they meet the stated GPA requirements. B.S.W. students from other accredited programs may also be exempted from the same courses, but must submit their course content material (course description, syllabus, and outline) for review by the M.S.W. program coordinator for an equivalency review to determine exemption. B.S.W. students may be exempted from the following courses:

1. SWG 519, if the student has at least a “B” in SWU 320 or 420 or an equivalent social work course;
2. SWG 531, if the student has at least a “B” in SWU 432 or equivalent social work courses; and/or
3. SWG 533, if the student has at least a “B” in SWU 374 or 474 or an equivalent social work course.

*Waiver Examinations.* Students who believe they have successfully completed equivalent undergraduate courses or have related work experience covering content taught in the courses listed below can request to take a written waiver examination.

SWG 501 Human Behavior in the Social Environment I .....	3
SWG 502 Human Behavior in the Social Environment II .....	3
SWG 510 Foundation Practice I .....	3
SWG 511 Foundation Practice II* .....	3
SWG 519 Research Methods in Social Work .....	3
SWG 531 Social Policy and Services I .....	3
SWG 533 Diversity and Oppression in Social Work Context .....	3

SWG 580 Community and Organizational Change .....	3
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\* Only students who successfully pass the waiver exam for SWG 510 Foundation Practice I are allowed to take the waiver exam for SWG 511 Foundation Practice II.

**Comprehensive Examinations.** ASU requires a comprehensive examination for graduation in all professional master’s programs that do not have a thesis requirement. All Social Work students must pass a written comprehensive examination, administered by the school, before graduation.

**Academic Standing and Curriculum Sequencing.** In order to remain in good academic standing, the student must maintain an overall GPA of 3.00 at the end of each semester. Most courses in the program are sequential; successful completion of the prior course in the sequence is required to enroll in the following course. Students may not enroll in any second-year required courses until all foundation courses have been successfully completed.

**Tucson Component.** The School of Social Work offers the full foundation year (30 semester hours of credit) and some concentration-year course work in Tucson. Students may be required to commute to Tempe during both semesters of their concentration year. Courses are scheduled, however, so that the minimum of travel time is required of students. For information about or application to the Tucson component, call 520/884-5507.

**Part-Time Program.** A limited number of students are admitted each year to a planned part-time program. Students interested in this option must specifically apply to the part-time program. A maximum of one year of field work may be completed at the agency where the student is employed.

**Financial Assistance.** Recent federal reductions in support of human services and educational programs have severely limited the resources available for stipends. Therefore, it is important that applicants have a sound financial plan to cover expenses for the duration of the degree program.

Financial assistance information is available from Student Financial Assistance Office, Student Services Building, 480/965-3355.

**DOCTOR OF PHILOSOPHY**

The program seeks to prepare future social work scholars who are cognizant of the importance of practice-oriented and evaluative research in applied agency and community settings, who are involved in the development and application of theories in social work practice, and who plan to enhance social work knowledge through its communication and translation in the classroom and field settings.

The program introduces students to the complex range of roles and responsibilities of faculty leadership, to the challenging expectations of critical thinking and creativity in research and teaching, and to the multiple ways of integrating the tripartite demands of research, teaching, and service in the social work profession.

The Social Work faculty advocate for and support the human potential in the distinct experiences and perspectives of the Southwest region. The cultural and economic diversity of the Southwest makes it possible for faculty and students to engage in many issues in their community-based research and practice. Social Work graduates play key roles in creatively and ethically integrating their professional

applied activities with local, state, tribal, and regional interests in the realm of social welfare.

**Admission.** Admission decisions are made in odd-numbered years. Applicants must hold an M.S.W. degree from an accredited school of social work, preferably have a minimum of two years of post-M.S.W. professional social work paid employment, and apply to both the ASU Graduate College and the School of Social Work.

Admission to the Ph.D. program requires completion of all admission requirements and procedures set forth by the Graduate College and test scores from the Graduate Record Examination (GRE) (verbal, quantitative, and analytical). Applications are accepted up to March 1 preceding the fall semester to which the applicant is seeking admission. Students are admitted only in the fall semesters of odd-numbered years.

**Application Procedure.** The following should be submitted to

ADMISSIONS OFFICE  
GRADUATE COLLEGE  
ARIZONA STATE UNIVERSITY  
PO BOX 871003  
TEMPE AZ 85287-1003

1. the application for admission to the Graduate College;
2. two official transcripts from each institution the applicant has attended previously; and
3. test scores from the GRE.

The following should be submitted to

ACADEMIC SERVICES  
SCHOOL OF SOCIAL WORK  
ARIZONA STATE UNIVERSITY  
PO BOX 871802  
TEMPE AZ 85287-1802

1. application to the Ph.D. program in Social Work;
2. completed essay questions; and
3. four letters of reference that must use the reference letter forms provided by the School of Social Work.

**Program of Study.** Students must demonstrate scholarly competencies in several broad areas identified during the mentoring and advising process. These areas must include: micro/macro theories and perspectives on critical issues in social work and social welfare (24 semester hours), quantitative/qualitative research methodologies (12 semester hours), and professoriate training and mentoring in research, teaching, and service. The program requires a minimum of 36 semester hours beyond the M.S.W. degree and 84 semester hours beyond the baccalaureate degree. Because students must achieve competency requirements, they may need to take additional course work to achieve these competencies.

The program emphasizes enhancement of scholarship through:

1. applied social work research in diverse community settings and populations of the Southwest;
2. teaching, from syllabus development to classroom teaching across the professional continuum;
3. participation in collegial decision making; and

4. participation in field education and community services.

Students are expected to participate fully in research, teaching, and field liaison activities during their course of studies.

**Advisement.** The individualized plan for becoming a social work scholar and for learning associated faculty roles is developed by students and their faculty advisors over time.

**Residency.** Students should expect to complete the equivalent of four semesters of course work. The minimum residency requirement for the Ph.D. program is 18 semester hours in courses relating to the program of study, exclusive of dissertation. The residency must be completed in two consecutive semesters, not including summer sessions.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Upon completion of course work and the substantive paper, but before beginning dissertation research, the student is given a written examination covering research, theory, and methods in the substantive area. If the student should fail one or more components of the examination, a reexamination may be administered no sooner than three months and no later than one year from the date of the original examination. Approval of the reexamination must be obtained from the supervisory committee and the dean of the Graduate College.

**Dissertation Requirements.** Each candidate must register for a minimum of 24 semester hours of credit for research and dissertation. The final copy of the dissertation must be received by the supervisory committee and the dean of the Graduate College at least three weeks before the degree conferral date.

**Final Examinations.** The final oral examination in defense of the dissertation is scheduled and conducted by the student's dissertation committee. A candidate must pass the final examination within five years after completing the comprehensive examination.

## SPECIAL PROGRAMS

**Tucson Component.** The School of Social Work offers a part-time, cohort driven M.S.W. Program in Tucson in conjunction with the College of Extended Education. See "Tucson Component," page 286, for more information.

## RESEARCH ACTIVITY

The School of Social Work offers excellent opportunities for empirical research on social, community, and individual problems and issues. Computer facilities and research support are available to faculty and students. Research is carried out in diverse community settings in conjunction with social agencies, as well as with public and private institutions. The faculty and students are engaged in a number of projects of local, regional, and national significance.

The areas of study for typical faculty research in any given year might include such topics as child abuse, adoption, foster care, reconstituted families, minority aging, chemical dependency, mental health, social welfare planning, social service agency administration, and community practice.

## SOCIAL WORK (SWG)

### SWG 501 Human Behavior in the Social Environment I. (3) F

Analyzes theories of personality and life-span development from methodological, ecological, and systems perspectives up to adolescence.

### SWG 502 Human Behavior in the Social Environment II. (3) S

Life span development from middle childhood to maturity. Prerequisite: SWG 501.

### SWG 510 Foundation Practice I. (3) F

Basic social work methods with an emphasis on the problem-solving process as it pertains to individuals, families, and small groups. Prerequisite: Social Work major.

### SWG 511 Foundation Practice II. (3) S

Theory and methods of direct practice with groups and selected practice models. Lecture, lab. Prerequisite: SWG 510.

### SWG 519 Research Methods in Social Work. (3) S

Conceptual foundations and methods of nomothetic research in social work. Includes problem identification, hypothesis formulation, measurement, sampling, and experimental design. Prerequisites: Social Work major; an approved course in statistics.

### SWG 531 Social Policy and Services I. (3) F

Conceptual, analytical, and historical perspectives on the social welfare institution. Emphasis on poverty and inequality. Principles of policy analysis.

### SWG 533 Diversity and Oppression in a Social Work Context. (3) F, S

Explores issues of social inequality related to disability, ethnicity, gender, race, and sexual orientation. Emphasis on populations of the Southwest.

### SWG 541 Field Practicum I. (3) F, S

With SWG 542, two consecutive semesters (480 hours) of supervised social work practice in an approved placement. Pre- or corequisite: SWG 510.

### SWG 542 Field Practicum II. (3) F, S

See SWG 541. Pre- or corequisite: SWG 511.

### SWG 580 Community and Organizational Change. (3) F, S

Examines communities and human service organizations as social systems. Introduces strategies for initiating planned change.

### SWG 605 Substance Abuse. (3) N

Psychological and sociocultural determinants of substance abuse. Overview of social policies and treatment approaches. Prerequisite: SWG 502 or instructor approval.

### SWG 606 Assessment of Mental Disorders. (3) F

Theories and concepts of mental health and illness. Attention to classification systems and nomenclature used in assessing mental disorders. Prerequisite: SWG 502.

### SWG 611 Social Work with Families. (3) F

Theory, concepts, and skills for working with diverse family populations. Emphasis on a systems and integrative approach. Prerequisites: SWG 511, 542.

### SWG 612 Social Work with Groups. (3) N

Practice applications of knowledge and skill to social work with groups.

### SWG 613 Social Work with Individuals. (3) S

Treatment of prevalent disorders encountered by social workers, selected from the following: anxiety disorders, personality disorders, depression, and schizophrenia. Lecture, seminar. Prerequisite: SWG 611.

### SWG 614 Social Work with Families in Transition. (3) S

Analyzes the psychosocial dynamics of families disrupted by divorce, separation, or death of a parent. Offers differential social work interventions. Prerequisite: SWG 611.

### SWG 616 Social Work with Chemically Dependent Families. (3) S

The dynamics of the chemically dependent family are examined and clinical approaches for intervening in the family system and sub-systems are presented. Prerequisite: SWG 611.

### SWG 617 Social Work Practice with Children and Adolescents. (3) S

Theory, research, intervention that focus on children and adolescents. Prerequisite: SWG 611.

### SWG 618 Family Violence. (3) S

Theory, research, intervention, and prevention strategies relevant to child maltreatment, partner abuse, and elder abuse. Prerequisite: SWG 611.

### SWG 619 Practice-Oriented Research. (3) F

Accelerated course in application of scholarly and scientific principles to field practice, problem formulation, interventional procedures, and impact assessment. Prerequisite: SWG 519.

### SWG 621 Integrative Seminar. (3) S

Explores the fit between theoretical frameworks and practice with clients. Requires presentation of empirical studies with clients. Prerequisite: SWG 611. Pre- or corequisite: SWG 613 or 614 or 616 or 617 or 618.

### SWG 622 Community Research in Social Work. (3) N

Application of research design techniques to assessing need and measuring efficiency and effectiveness of community-wide programs. Prerequisite: SWG 519. Corequisite: SWG 680.

### SWG 623 Agency and Community-Based Research in Social Work. (3) S

Research design techniques to data collection in human service agencies and communities. Statistical analysis for program evaluation and needs assessment. Prerequisites: SWG 519, 541, 542. Corequisite: SWG 680.

### SWG 632 Social Policy and Services II. (3) S

Development of advanced knowledge and skills in social welfare policy analysis, policy formulation, and advocacy and intervention for policy change. Prerequisite: SWG 531.

### SWG 641 Advanced Practicum: Direct Practice I. (3) F, S

With SWG 642, two consecutive semesters (480 hours) of supervised social work practice in an approved placement related to the student's career goal. Prerequisites: SWG 541, 542. Pre- or corequisite: SWG 611.

### SWG 642 Advanced Practicum: Direct Practice II. (3) F, S

See SWG 641. Prerequisites: SWG 541, 542, 611. Pre- or corequisite: SWG 614 or 616 or 617 or 618.

### SWG 643 Advanced Practicum: Planning, Social Work Administration, and Community Practice I. (3) F, S

With SWG 644, two consecutive semesters (480 hours) in social work practice in an approved placement related to the student's career goal. Prerequisites: SWG 541, 542. Pre- or corequisite: SWG 680.

### SWG 644 Advanced Practicum: Planning, Social Work Administration, and Community Practice II. (3) F, S

See SWG 643. Prerequisite: SWG 643. Pre- or corequisite: SWG 681 or 682.

### SWG 680 Program Planning in Social Services. (3) S

The social services planning process includes needs assessment, goals and objectives, program design, budgeting, management information systems, and program evaluation. Prerequisites: SWG 681, 682. Corequisite: SWG 623.

### SWG 681 Social Work Administration. (3) F

Administrative skill building and theory application within human service nonprofit social work settings. Prerequisite: SWG 580.

### SWG 682 Community Participation Strategies. (3) F

Course reviews strategies to involve citizens and the consumers of social and human services in community decision making systems. Participation is viewed as means to facilitate the empowerment of oppressed peoples. Prerequisite: SWG 580.

### SWG 683 Developing Grants and Fund Raising. (3) N

Identification of potential funding sources, technical and interpersonal/political aspects of proposal development and fund raising. Prerequisite: SWG 580 or instructor approval.

### SWG 720 Philosophy of Science Issues in Social Work. (3) F

Critical examination of social science, social work practice and policy in terms of philosophical assumptions and varying frames of reference.

### SWG 721 Empirical Social Work Practice. (3) S

Application of scientific principles to problem formulation, assessment, and intervention procedures with an emphasis on the direct use of scientific tools in the conduct and evaluation of practice at all levels.

### SWG 730 Families Across the Life-Span. (3) F

Policy and practice analysis of issues which affect families with a focus on the development of interventive strategies.

### SWG 731 Social Welfare Policy Analysis and Development. (3) F

Methods of policy analysis, critique of social welfare policies against proposed models, and case studies of policy development emphasizing southwestern populations. Prerequisite: SWG 730.

**SWG 732 Social Work Administration in a Systems Context.** (3) F  
Case studies of social work administration from initial conceptualization of policy through implementation at national, state, and local levels.

**SWG 740 Community Research in Social Work.** (3) F  
Substantive, value, and methodological issues in community-based research as applied to social work topics.

**SWG 741 Integrative Research Seminar.** (3) F  
Integration of theory, research methods, and statistics in community social work topics of specific interest to students.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Sociology

Gary W. Peterson

*Chair*

(SS 321F) 480/965-6149

sociology@asu.edu

www.asu.edu/clas/sociology/graduate

### PROFESSORS

BOLIN, COBAS, GORDON, HACKETT, HARDERT, KULIS,  
LANER, NAGASAWA, PETERSON, SNOW,  
THOMAS, WEITZ

### ASSOCIATE PROFESSORS

BENIN, BLAIR, HARLAN, JACOBSON, KEITH,  
MILLER-LOESSI, SULLIVAN

### ASSISTANT PROFESSORS

AGADJANIAN, QIAN, RHEA

### LECTURERS

FINE, PADILLA

### INSTRUCTOR

WILLIAMS

The faculty in the Department of Sociology offer graduate programs leading to the M.A. and Ph.D. degrees in Sociology.

### MASTER OF ARTS

This degree program provides advanced training for those preparing for teaching, research, or applied careers in sociology, and may be taken either as a terminal program or as a step toward eventual fulfillment of requirements for the Ph.D. A detailed description of the graduate program (including opportunities in teaching and research assistantships) may be obtained from the department chair.

**Admission.** Admission to the program is determined by the following criteria: Graduate Record Examination (GRE) scores (verbal, quantitative, and analytical), three letters of

appraisal from persons familiar with the applicant's academic background, valid transcripts of the student's academic record, and a biographical narrative provided by the applicant. Application deadline is February 15.

**Program of Study.** A master's degree in Sociology requires the successful completion of a minimum of 30 semester hours, including a 12-hour core curriculum, six hours of theory (SOC 585 and 586), and six hours of research methods (SOC 500 and 505), two hours of Sociology as a Profession (SOC 503, 504), with the balance to be drawn from substantive courses and six hours earned through the M.A. thesis (SOC 599).

**Foreign Language Requirements.** None.

**Thesis Requirements.** A thesis is required.

**Final Examinations.** A final oral examination in defense of the thesis is required. This oral examination also tests the student's comprehension of the area of sociology exemplified by the thesis.

### DOCTOR OF PHILOSOPHY

This degree provides advanced training in theory, research methodology, and substantive fields to prepare sociologists for teaching and research with special emphasis on urbanism, urbanization, and related issues. A detailed description of this program (including opportunities in teaching and research assistantships) may be obtained from the department chair.

See "Doctor of Philosophy," page 101, for general requirements.

**Admission.** Admission to the program is determined by the following criteria: GRE scores (verbal, quantitative, and analytical), three letters of appraisal from persons familiar with the applicant's academic background, valid transcripts of the student's academic record, and a biographical narrative provided by each applicant. Applicants should have an M.A. or its equivalent in Sociology or a related field. Application deadline is February 15.

**Program of Study.** The Ph.D. requires 54 semester hours beyond the master's degree. Three hours each of theory, methods, and statistics are required, and 24 hours are earned through dissertation and research. The remaining 21 hours are in substantive courses reflecting the student's specialization. First-year Ph.D. students are required to take Sociology as a Profession (503, 504). A minimum of 30 semester hours of the approved Ph.D. program, exclusive of dissertation and research hours, must be completed after admission to the Ph.D. at ASU.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** Written comprehensive examinations focusing on two areas chosen by the student, and an oral defense of the dissertation proposal are required. After passing the comprehensive examinations and obtaining a formal approval of the dissertation proposal, the student is eligible to apply for candidacy.

**Dissertation Requirements.** A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required.

**Final Examinations.** A final oral examination in defense of the dissertation is required.

## RESEARCH ACTIVITY

The Department of Sociology is committed to teaching and research in the following six areas reflecting faculty expertise. Recent research is listed under each area heading.

*Demography/Urban Ecology.* Family and household demography; Hispanic fertility; demographic determinants of adoptions; growth of Sunbelt retirement communities; mass media formats and urban life.

*Family.* Courtship; dating violence; dual earner families; families with handicapped children; kinship; family structure; marital stability; adolescence; parent-child bonds in later life; religious ethnic intermarriage; support networks of the poor.

*Medical.* Social psychological effects of AIDS; AIDS and high risk behavior; stigmatization of illness; alternative health care practitioners; technology and public health; medicalization in the media; mortality/morbidity of parents with handicapped children; stress and well-being.

*Political.* Nation-state expansion, authority, and expenditures; world polity/culture; comparative historical analyses; large-scale change and religious/political movements; the university and the state; race riots; environmental and nuclear power issues.

*Race/Ethnicity.* Comparative historical analyses of ethnic/race relations; Mexican female immigrants; Cubans and minority traders; Asian American issues; Mexican Americans; public policy; minority housing; ethnicity and health.

*Stratification.* Incorporation of women and minorities into academia; affirmative action issues; women and work; sexual harassment; work and personality; organizations; black student collegiate success; educational environments; learning and academic success; rise of the university; sexual minorities.

**Research Facilities.** Research facilities in the department consist of a survey research laboratory, small groups research laboratory, computer terminals and linkages to mainframe and the supercomputer, computational laboratory, and Gould Memorial Research Archive. The survey research laboratory conducts campus and community surveys. Among the topics studied are transportation, citizen attitudes, recreation, judicial evaluation, occupational destinations of graduate students, academic advisement, student,

staff and faculty attitudes, student living arrangements, changing sex roles, and student activism and political involvement.

## SOCIOLOGY (SOC)

**SOC 501 Practicum in Survey Research.** (3) F, S

A research practicum in survey field work, analysis, and reporting in the Phoenix Area Study. Prerequisite: SOC 391 or equivalent.

**SOC 502 Practicum in Survey Research.** (3) F, S

Continuation of SOC 501. Prerequisite: SOC 501.

**SOC 503 Sociology as a Profession I.** (1) F

Becoming and working as a sociologist, including how to write a vita, choose a thesis topic, or find dissertation data. Prerequisite: graduate Sociology major.

**SOC 504 Sociology as a Profession II.** (1) S

Becoming and working as a sociologist, including how to write a vita, choose a thesis topic, or find dissertation data. Prerequisite: graduate Sociology major.

**SOC 505 Applied Regression Analysis.** (3) F, SS

Multiple linear regression topics relevant to sociological data analysis. Computer applications. Prerequisites: SOC 390 (or equivalent); a proficiency examination.

**SOC 507 Social Statistics IIIA: Categorical Data Analysis.** (3) F

Logistic regression and related topics relevant to categorical data analysis in sociology. Computer applications. Prerequisite: SOC 505 or instructor approval.

**SOC 508 Social Statistics IIIB: Structural Equation Analysis.** (3) S

Structural equation models are taught using LISREL and other computer packages. Topics include multiple group analyses and ordinal endogenous variable models. Prerequisite: SOC 505 or instructor approval.

**SOC 509 Social Statistics IIIC: Event History Analysis.** (3) F, S

Proportional hazards models and other methods for analyzing longitudinal data and establishing hazard rates of events for exploratory variables. Prerequisite: SOC 505 or equivalent.

**SOC 515 Studies of the Family.** (3) S

Current developments in the study of marriage and the family. Prerequisite: instructor approval.

**SOC 585 Development of Sociology.** (3) F

Major sociological theorists, including Durkheim, Weber, Marx, Parsons, Merton, Dahrendorf, Homans, and Mead. Prerequisite: instructor approval.

**SOC 586 Contemporary Sociological Theory.** (3) S

Analysis of major theories, including structural-functional, conflict, social exchange, symbolic interaction, and role theory. Prerequisite: instructor approval.

**SOC 587 Contemporary Issues in Sociology.** (3) S

Philosophy of social science. Contemporary issues in sociological theory and methods. Prerequisite: instructor approval.

**SOC 588 Methodological Issues in Sociology.** (3) S

Basic methodological issues in the application of scientific methods to the study of human social life. Emphasis on limited number of major works, with contrasting approaches to issues.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Spanish

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See "Languages and Literatures," page 231.



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## Special Education

Alfonso G. Prieto  
 Program Coordinator  
 (ED 305C) 480/965-6156  
 nlanders@imap3.asu.edu  
 tikkun.ed.asu.edu/coe/candi

---

### PROFESSORS

FAAS, PRIETO, RUTHERFORD, ZUCKER

### ASSOCIATE PROFESSORS

COHN, Di GANGI, McCOY, J. NELSON, R. NELSON

### ASSISTANT PROFESSOR

ROBERTS

The faculty in the Division of Curriculum and Instruction Special Education Program offer graduate programs leading to the M.A. and Master of Education degrees. M.Ed. degree concentrations are available in the education of gifted, mildly handicapped, the multicultural exceptional, and severely/multiply handicapped.

At the Ph.D. level, a concentration in special education is offered through the interdisciplinary Ph.D. degree program in Curriculum and Instruction. See "Curriculum and Instruction" section, page 164, for more information on the interdisciplinary Ph.D. in Curriculum and Instruction.

To be considered for admission, applicants must meet all Graduate College requirements. The applicant for master's degree program admission is required to provide the following:

1. Graduate Record Examination test scores or Miller Analogies Test scores, or a 3.00 or higher junior/senior GPA;
2. three letters of recommendation;
3. a summary of professional experiences; and
4. evidence of certification in special education for applicants to the M.Ed. program. (The M.Ed. Initial Teacher Certification sequence must be pursued concurrently with the M.Ed. degree by applicants not meeting this requirement.)

### MASTER OF ARTS

The M.A. program in Special Education requires at least 36 hours of course work. A thesis is required for the M.A. degree. Candidates are required to take an oral examination in defense of the thesis. For students in the M.Ed. or M.A. program lacking prerequisite courses, additional course work is required.

### MASTER OF EDUCATION

The M.Ed. degree in Special Education requires a minimum of 36 hours of course work and a written comprehensive examination paper. The program structure includes a 12-hour methods core, a 12-hour knowledge core, and a 12-hour elective block which includes four content/theme areas: learning and instruction, diversity, foundations and values, and research and technology.

M.Ed. Initial Teacher Certification sequences leading to standard certificates by the state of Arizona in mental retardation, learning and emotional disabilities, as well as endorsement in gifted education, are available.

Concurrent admission to the M.Ed. initial certification sequence and the M.Ed. degree is required. Students seeking initial certification by the state of Arizona in Special Education who have already completed a master's degree in another area may enroll for the M.Ed. initial certification sequence without enrolling in a second master's degree program. Contact the Office of Student Affairs for more information about specific admission requirements for the initial certification option. Further information is available in the Special Education Program Office.

### RESEARCH ACTIVITY

Faculty and student research and development activities focus on (1) improving instructional opportunities for exceptional individuals and those at risk for school failure and (2) increasing the effectiveness of teachers of exceptional and at-risk individuals. Recent research has included the following: academic precocity; instructional alternatives for preschool children; the cognitive development, linguistic proficiency, and academic achievement of minority students. Research focused on improving the preparation of teachers has included projects on field-based instruction, violence prevention, academic and behavioral interventions for students with disabilities and those at risk of school failure, and evaluation of alternative forms of technology integration. Program research efforts receive support from federal, state, and private sources.

### SPECIAL EDUCATION (SPE)

**SPE 411 Parent Involvement and Regulatory Issues.** (3) F, S  
 Emphasis on parent and school relations through effective communication and state and federal regulations impacting services for the handicapped. Prerequisites: SPE 311; majors only.

**SPE 455 Early Childhood and the Handicapped.** (3) F  
 Early childhood education as it applies to the handicapped child.

**SPE 511 The Exceptional Child.** (3) F, S, SS  
 Educational needs of exceptional children and adults. Not recommended for students who have completed SPE 311.

**SPE 512 Individuals with Mental Retardation.** (3) F, S, SS  
 Etiology, diagnosis, and management of individuals with mental retardation. Current trends in prevention, programming, and teacher preparation. Not recommended for students who have completed SPE 312.

**SPE 514 Bilingual/Multicultural Aspects of Special Education.** (3) F, S, SS  
 Theories and issues related to the education of bilingual and culturally diverse exceptional children.

**SPE 515 Methods for the Remediation of Learning Problems of Exceptional Children.** (3) S  
 Methods and materials for remediating the basic academic problems of exceptional children. Prerequisites: SPE 511; a methods course in the teaching of reading and mathematics.

**SPE 522 Academic Assessment of Exceptional Children.** (3) F  
 Normative and criterion referenced assessment of learning problems in exceptional children. Formative evaluation included. Practicum required. Lecture, practicum. Prerequisites: SPE 311 or 511; elementary methods courses; program approval.

**SPE 523 Prescriptive Teaching with Exceptional Children.** (3) F  
 Language, reading, and arithmetic methods, techniques, and materials used in individualized instruction. Practicum required. Lecture, practicum. Prerequisites: elementary methods courses; SPE 311 (or 511), 522 (or concurrent and program approval).

**SPE 524 Effective Classroom Behavior Management.** (3) S  
Organization and delivery of instruction including formative evaluation and techniques of academic behavior management for exceptional children. Practicum required. Lecture, practicum. Prerequisites: SPE 311 (or 511), 522, 523; program approval.

**SPE 525 Social Behavior Interventions.** (3) S  
Analysis and intervention into social behavior problems of exceptional students. Focus on strategies to change maladaptive social behavior. Practicum required. Prerequisites: SPE 311 or 511 or 522 or 523; program approval.

**SPE 531 Behavior Management Approaches with Exceptional Children.** (3) F, SS  
Behavior management approaches for classroom behavior of exceptional children. Prerequisite: SPE 511 or equivalent.

**SPE 536 Characteristics of Children with Behavioral Disorders.** (3) F, S, SS  
Variables contributing to behavior patterns of behaviorally disordered children.

**SPE 551 Teaching Young Children with Special Needs.** (3) S  
Methods, materials, and curriculum for preschool and primary-aged children with special needs. Prerequisites: SPE 455 and 511 or equivalents.

**SPE 552 Management of Individuals with Severe Handicaps.** (3) S  
Instruction and management of school-aged and adult individuals with severe, physical, or multiple handicaps. Prerequisites: SPE 511 or equivalent; instructor approval.

**SPE 553 Developmental/Functional Assessment.** (3) F  
Teacher-focused developmental/functional assessment of preschool and severely, physically, and multiply handicapped individuals. Field experience required. Prerequisites: SPE 511, 512, 574 or equivalents.

**SPE 554 The Parent/School Partnership.** (3) S  
Includes knowledge and procedures for involvement and training of parents and caregivers of preschool and severely handicapped individuals. Field experience required. Prerequisites: SPE 455 and 511 or equivalents.

**SPE 561 Characteristics/Diagnosis of Learning Disabilities.** (3) F, S, SS  
Theories related to learning disabilities, including identification and characteristics.

**SPE 562 Methods of Teaching Students with Learning Disabilities.** (3) N  
Various methods and intervention strategies for remediating learning disabilities of children and youth. Prerequisite: SPE 361 or 561.

**SPE 574 Educational Evaluation of Exceptional Children.** (3) F  
Design and statistical considerations of normative and criterion-referenced tests. Collection, recording, and analysis of data from formative evaluation. Prerequisites: SPE 511 or equivalent; a methods course in the teaching of reading and mathematics.

**SPE 575 Current Issues in the Education of Exceptional Children.** (3) F  
Mainstreaming, noncategorical, financing, legal diagnostic, labeling, legislative, and other critical and controversial issues related to the education of exceptional children.

**SPE 577 Mainstreaming Methods.** (3) S  
Successful mainstreaming methods, practical problem-solving sessions related to teacher's classroom needs, and individual contracts focusing on mainstreaming issues are addressed. General educators encouraged.

**SPE 578 Student Teaching in Special Education.** (9–15) F, S  
"Y" grade only. Prerequisites: completion of specified courses; approval by the special education program coordinator.

**SPE 582 Classroom Research with Exceptional Children.** (3) SS  
Introduction to interpreting research. Specific research techniques with primary emphasis on classroom research, including applied behavior analysis.

**SPE 585 Creativity: Research and Development.** (3) S  
Nature of creativity explored in terms of philosophical underpinnings, empirical evidence, human development, self-actualization, and the ecology surrounding the creative event.

**SPE 586 Advising the Gifted Child.** (3) A  
Focus on educational planning and guidance, social and emotional development, and family problem solving regarding needs of gifted children.

**SPE 587 Controversies in Educating the Gifted.** (3) F  
In-depth analysis of major controversies in educating the gifted, including nature/nurture, the role of mental tests, and sex differences.

**SPE 588 The Gifted Child.** (3) F, SS  
Gifted children's characteristics, identification, needs, school and home environments, definitions, and misunderstandings. Research by Pressey, Stanley, Terman, and others.

**SPE 589 Methods in Teaching the Gifted.** (3) S, SS  
Methods in teaching elementary and secondary school gifted children, including individualized and computer-assisted instruction, team teaching. Prerequisite: SPE 588.

**SPE 774 Characteristics and Causation of Exceptionality.** (3) F  
In-depth analysis of literature pertaining to causes of exceptionality and learning, educational, personal-social, and cognitive characteristics. Lecture, discussion.

**SPE 775 Evaluation and Intervention in Special Education.** (3) S  
In-depth analysis of research and literature on evaluation procedures and intervention approaches for exceptional individuals at all age levels. Lecture, discussion.

**SPE 781 Research and Evaluation in Special Education.** (3) S  
Issues and problems in conducting research and/or evaluation programs involving exceptional children.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Speech and Hearing Science

### Interdisciplinary Doctoral Program

Sid P. Bacon

*Director, Executive Committee*

(CSB 273A) 480/965-8227

shsgrad@asu.edu

www.asu.edu/clas/shs

### Chemical, Bio, and Materials Engineering

Associate Professor: Kipke

### Communication

Professor: Kastenbaum

### English

Professor: Nilsen;

Associate Professors: Adams, Bates

### Family Resources and Human Development

Professor: Roosa

### Nursing

Professor: Melvin

### Psychology

Professors: Braun, Killeen, Somerville;

Associate Professor: Goldinger

### Speech and Hearing Science

Professors: Bacon, Case, Dorman, Ingram, LaPointe, Wilcox;

Associate Professors: Liss, Sinex;

Assistant Professors: Azuma, Hadley, Rispoli, Sharma

The Committee on Speech and Hearing Science offers an interdisciplinary graduate program leading to the Ph.D. degree in Speech and Hearing Science.

The program is designed to prepare scholars for careers of basic and applied research in educational, industrial, or health care delivery environments. The student pursues a program with the unifying theme of the influence of the neurologic system on human communication and its disorder-

ders. After a core curriculum, which may include aspects of neuroscience, methodology, or speech and hearing science, the student completes a program of study under the guidance of the program committee. As part of the interdisciplinary doctoral program, a programmatic research experience prepares the student for basic or applied research leading to the dissertation.

### DOCTOR OF PHILOSOPHY

See “Doctor of Philosophy” section, page 101, for general requirements.

**Admission Requirements.** Admission to the program is competitive; therefore, applications are considered only for fall admission. Applicants typically have completed a master’s degree or equivalent in speech and hearing sciences, psychology, linguistics, or a related discipline. Applicants with a bachelor’s degree and a strong research background are also considered.

Applicants must submit the following materials for admission review:

1. application for Admission to the Graduate College and official transcripts of undergraduate and graduate study;
2. verbal, quantitative, and analytical scores of the Graduate Record Examination (GRE);
3. professional résumé;
4. a statement describing academic and professional goals, specifying the focus of study desired in the Ph.D. program; and
5. three letters of recommendation.

All applicants whose native language is not English must submit a score from the Test of English as a Foreign Language (TOEFL) and the Test of Spoken English (TSE). Expected minimum scores are 600 on the TOEFL and 230 on the TSE.

Application materials are reviewed beginning February 1. Applications are reviewed by a three-member interdisciplinary admissions committee. Recommendations for admission or denial are forwarded to the dean of the Graduate College. Criteria for admission include the following:

1. evidence of high scholarship and research potential from GRE scores and previous academic record,
2. professional goals compatible with the degree program, and
3. scholarly interests compatible with one or more of the faculty active in the interdisciplinary degree program.

**Areas of Concentration.** Eighteen semester hours are taken in an area of concentration that focuses on some aspect of human communication. The student’s program committee guides selection of these courses.

**Program Committee.** The program committee consists of a chair and at least two other members appointed by the dean of the Graduate College upon recommendation of the director of the Committee on Speech and Hearing Science. The program committee must consist of members from more than one academic discipline. The purpose of the committee is to guide the student through the completion of the program of study, the initiation of programmatic research,

and the comprehensive examination. Upon completion of the comprehensive examination, the student may initiate forming a dissertation committee.

**Dissertation Committee.** Upon completion of the comprehensive examination and based on the recommendation of the director of the Committee on Speech and Hearing Science, the dean of the Graduate College appoints the student’s dissertation committee consisting of a chair and at least two other members. The dissertation committee must consist of members from more than one academic discipline. This committee approves the design and implementation of the dissertation. Members of the program committee also may serve as members of the dissertation committee.

**Preliminary Examination.** The preliminary examination is composed minimally of the first-year research project. This project, to be completed by the end of the second semester of the first year, consists of an oral presentation and defense of the research, as well as a written manuscript. The program committee decides whether an optional written examination is necessary. The format of that examination is determined by the program committee and depends, in part, upon the background of the student. Results of the preliminary examination are used to determine shortcomings that should be offset by course electives, the level at which the student is capable of pursuing various topic areas, and whether deficiencies are of sufficient magnitude to preclude recommendation for continued doctoral study.

**Research Methods and Statistics.** The student is required to demonstrate proficiency in research methods (research design, statistics, computer languages). Evidence of required proficiency may be demonstrated by examination or by successful completion of a sequence of courses designated by the program committee.

**Program of Study.** The program consists of a minimum of 54 semester hours of graduate work beyond the master’s degree or 84 semester hours of graduate work beyond the bachelor’s degree. Of the required semester hours, at least 24 must be research (SHS 792) and dissertation (SHS 799) credit completed at ASU. A minimum of 30 hours of the approved Ph.D. program, exclusive of dissertation and research hours, must be completed after admission to the Ph.D. at ASU.

**Comprehensive Examinations.** Near the completion of course work and before commencing dissertation research, the student is given a written examination covering the field of study. The written examination, when passed, may be followed by an oral examination.

**Programmatic Research.** Twelve semester hours of programmatic research (SHS 792) are required before the dissertation prospectus meeting. The student must conduct several studies, each representing a facet of a research problem or a step toward a progressive solution. Each component study must be reviewed by the program committee and conducted in collaboration with a faculty member of the interdisciplinary degree program. This research program allows the doctoral student to use different methodologies in various component studies, to exercise progressively

tighter experimental controls as determined by serial investigations, or to pursue significant or unexpected outcomes of a study.

This systematic or serial research program engages the student and faculty in an ongoing research activity, the components of which allow increasing discretion and independence of the student investigator. The program is designed to prepare students for careers in basic or applied research and enhance the quality of the dissertation research.

**Research and Dissertation Proposals.** (1) Before conducting the programmatic research, the student is advised by the program committee on the appropriateness of the planned research. (2) Before conducting the research for the dissertation, each student must submit a dissertation proposal that is defended orally and approved by the dissertation committee.

**Dissertation Requirements.** The dissertation must consist of a fully documented written product of mature and original scholarship. It must be a significant contribution to knowledge that reflects the student's creativity and competence in independent research.

**Final Examinations.** A final oral examination in defense of the dissertation, conducted by the dissertation committee, is required.

## RESEARCH ACTIVITY

Members of the Committee on Speech and Hearing Science are engaged in a variety of research activities. Current activity is in the following areas.

**Hearing.** Psychoacoustics; neurophysiology; physiological correlates of psychoacoustic phenomena; complex signal processing; effects of hearing loss on auditory perception and physiology; relationship between psychoacoustics and speech perception; speech perception in the normal and impaired auditory system; speech and auditory processing in persons with cochlear implants; auditory electrophysiology.

**Speech.** Phonetics and phonological theory; speech motor control; neuromotor disorders of speech; voice disorders; voice and speech characteristics associated with craniofacial anomalies; phonological development and disorders.

**Language Science.** First language acquisition; pragmatics; discourse analysis; psycholinguistics; semantics; lexical ambiguity; word and sentence processing.

**Language Disorders.** Language assessment and intervention in early childhood; characteristics of language in children with specific language impairment; language disorders in school-age children; prelinguistic interventions; social consequences of language disorders; aphasia and related neurogenic communication disorders; language and memory in dementia.

**Basic and Applied Neurobehavioral Science.** Neurophysiology; applied neural control; central sensory processes; neural prosthesis design and development; neural modeling; cortical mechanisms of learning and memory; brain mechanisms involved in chemical and mechanical senses; information processing.

**Developmental and Neurogenic Disabilities.** Behavioral recovery following brain damage; adaptive technology; augmentative communication programming; developmental

outcomes of high-risk children; pediatric neurogenic disabilities; cognitive-linguistic interactions; human memory processes and disorders; adult neurogenic disabilities; communication intervention for infants and toddlers who are at-risk for or have disabilities; swallowing disorders.

**Gerontology.** Aging and short-term memory; communication changes accompanying aging; geriatric communication disorders; psychosocial effects of aging.

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## Statistics

### Interdisciplinary Master's Program

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### Accountancy and Information Management

Associate Professor: St. Louis

#### Biology

Associate Professor: Carroll

#### Economics

Professors: Burdick, Mayer;  
 Associate Professors: Reiser, Wilson

#### Management

Associate Professor: Brooks

#### Mathematics

Professor: Young;  
 Associate Professors: Driscoll, Lohr;  
 Assistant Professors: Prewitt, Zuo

The Committee on Statistics offers a program leading to the M.S. degree in Statistics. The program is interdisciplinary in the sense that it draws upon faculty research and teaching interests from a number of academic units so that programs of study can be tailored to reflect individual needs and goals. The committee, which sets program requirements and supervises programs of study, is composed of faculty from several departments in the College of Business and the College of Liberal Arts and Sciences.

## MASTER OF SCIENCE

The program for the M.S. degree in Statistics provides preparation for either a research-oriented or a practice-oriented career. Requirements specific to this program (see "Master's Degrees" section, page 98, for general requirements) ensure balanced attention to the theoretical and applied aspects of the discipline of statistics. Flexibility in the program reflects the fact that statistical analysis is one of the most widely used tools of modern scientific reasoning.

**Admission.** Applicants must satisfy the general requirements for admission to the Graduate College (see "Admission to the Graduate College" section, page 89) and must, in addition, have three letters of academic recommendation submitted to the admissions subcommittee of the Committee on Statistics. Although most applicants earn the

bachelor's degree in a quantitative area (such as statistics, quantitative business analysis, mathematics, engineering, or computer science), this is not required for admission to the program.

Applicants should have completed the following courses (equivalents at ASU are given in parentheses): calculus (MAT 270, 271, and 272), advanced calculus (MAT 371), linear algebra (MAT 342), computer programming (CSE 100 or 183), and introductory applied statistics (QBA 221 or STP 420). Applicants who lack more than two of these seven prerequisite courses should expect to be admitted with deficiencies or provisionally. The submission of the Graduate Management Admission Test or Graduate Record Examination test scores is strongly recommended.

**Supervisory Committee.** Upon entering the program, the student should contact the program director for assistance in selecting a three-member supervisory committee. (Typically, the student progress subcommittee of the Committee on Statistics serves as the student's initial supervisory committee.) The faculty member who directs the student's work on the thesis or applied project must be a member of the Committee on Statistics and serves as the chair of the student's final supervisory committee.

**Program of Study.** The student's program of study must contain at least 30 semester hours of credit, none of which may be from the prerequisites and at least 18 of which must be at or above the 500 level. The program must include the nine hours from three required theory courses: theory of probability (STP 421 or QBA 560), mathematical statistics (STP 427), and theory of statistical linear models (STP 526). The program must also include either three hours of applied project (QBA 593 or STP 593) or six hours of thesis (QBA 599 or STP 599).

The remaining 15 or 18 hours may come from elective courses chosen by the student with the approval of supervising faculty. A maximum of six hours may be chosen from a related field on which statistics relies (such as computer science) or in which statistics is an essential tool (e.g., biostatistics, quality control).

The required theory courses are fundamental to the education of statisticians and are necessary for more advanced graduate study. The elective courses allow the student to emphasize a particular area of statistical inference, culminating in an applied project report or a thesis on a topic in that area. The student has considerable flexibility in selecting an area of specialty. Possible areas of specialty include, among others, mathematical statistics, biostatistics, applied data analysis, statistical modeling, time series analysis, statistical process control, variance components analysis, statistical computing, and survey research. Sample programs of study for such areas of specialty may be obtained from the director of the program.

**Foreign Language Requirements.** None.

**Comprehensive Examinations.** None.

**Thesis Requirements.** Either an applied project or a thesis is required.

**Final Examinations.** An oral examination in defense of the applied project or thesis is required. The content of the applied project report or thesis must, in its final form, be suitable for submission to an academic journal or confer-

ence proceedings. The thesis must conform to Graduate College format requirements.

## RESEARCH ACTIVITY

Research interests of the current members of the Committee on Statistics include the following: regression, variance components, generalized linear models; multivariate analysis, latent structure models, categorical data analysis; biostatistics, biomedical research; time series analysis, econometrics, statistical process control, statistical decision support systems; statistical computing, statistical graphics; panel data analysis, complex sampling designs; decision-theoretic methods, risk assessment. Students and faculty have access to excellent computing facilities, including mainframes, work stations, and personal computers running a broad selection of statistical software.

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## Taxation

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*Director*

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[www.cob.asu.edu/acct/acctmst2.html](http://www.cob.asu.edu/acct/acctmst2.html)

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### PROFESSORS

J.R. BOATSMAN, BOYD, FLAHERTY, JOHNSON, KAPLAN, PANY, PHILIPPAKIS, RECKERS, RENEAU, SCHULTZ, SHRIVER, R. SMITH, STEINBART, TIDWELL, WYNDELTS

### ASSOCIATE PROFESSORS

CHRISTIAN, GOLEN, GOUL, GUPTA, KEIM, KIANG, KULKARNI, MOECKEL, O'DELL, O'LEARY, PEI, REGIER, ROY, ST. LOUIS, VINZE

### ASSISTANT PROFESSORS

CHEN, CHENOWETH, DAVID, DOWLING, HWANG, IYER, MISHRA, SANTANAM, K. SMITH, WHITECOTTON

### SENIOR LECTURERS

MacCRACKEN, SHREDNICK

### LECTURERS

BALO, J.L. BOATSMAN, GEIGER, HAYES, TAYLOR

## MASTER OF TAXATION

The faculty in the School of Accountancy and Information Management offer a professional program leading to the Master of Taxation degree. The M.Tax. degree is a specialized program providing persons with technical skills required to administer the tax laws in both the private and public sectors of the economy.

The Master of Taxation (M.Tax.) degree is a specialized program providing persons with the highly technical and demanding skills required to administer the tax laws in both the private and public sectors of the economy. Students applying to this program must submit scores on the GMAT. International applicants whose native language is not English must submit scores from the TOEFL and the TSE or SPEAK exams.

**Prerequisites.** Students whose transcripts do not include certain undergraduate courses or their equivalents must complete these courses. Most persons holding an undergraduate degree in accountancy should have satisfied these requirements. Contact the School of Accountancy and Information Management for a current list of the program prerequisites.

**Program of Study.** The program of study consists of a minimum of 30 semester hours. The following courses are required:

ACC 515 Professional Practice Seminar .....	3
ACC 521 Tax Research.....	3
ACC 571 Taxation of Corporations and Shareholders.....	3
ACC 573 Taxation of Partners and Partnerships.....	3
ACC 575 Estate and Gift Taxation.....	3
Total .....	15

Additional courses in accountancy, finance, general business, law, public affairs, or other acceptable areas to complete the degree program are selected in consultation with a faculty advisor. The program of study must include a minimum of 15 semester hours of credit in graduate-level accounting courses and a minimum of 24 semester hours of resident credit in courses open exclusively to graduate students. A maximum of six hours may be taken outside the College of Business.

**Course Load.** Students are limited to 12 hours per trimester.

**Foreign Language Requirements.** None.

**Thesis Requirements.** A thesis is optional.

**Final Examinations.** A final comprehensive written examination is required of all candidates. In addition, an oral examination in defense of the thesis is required of candidates who elect to write a thesis.

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## Teaching English as a Second Language

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*Director*

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[www.asu.edu/clas/english/tesl.htm](http://www.asu.edu/clas/english/tesl.htm)

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**PROFESSOR**  
NILSEN

**ASSOCIATE PROFESSORS**  
ADAMS, BATES, MAJOR, VAN GELDEREN

**ASSISTANT PROFESSOR**  
JOHNSON

The faculty in the Department of English offer a professional program leading to the Master of Teaching English as a Second Language degree (M.TESL). The M.TESL degree is a specialized program training students for the knowledge

and the skills necessary to teach English as a second language. See "Linguistics (LIN)," page 192, for descriptions of the courses.

**Admission Requirements.** All applicants must meet the general requirements for admission to the Graduate College (see "Admission to the Graduate College" section, page 89). International students must submit a TOEFL score of at least 580.

**Program of Study.** The program requires a minimum of 30 hours of approved graduate course work and must include LIN 500 RM: Linguistics, 510 English Linguistics, 572 Theories Underlying the Acquisition of English as a Second Language, 574 The Teaching of English as a Second Language, and a three-hour applied project (LIN 593) overseen by the supervisory committee.

**Foreign Language Requirements.** A foreign language is required. International students whose native language is not English may fulfill the foreign language requirement by (1) providing evidence that English is not the medium of instruction at their native-language universities and (2) satisfactory completion of the TSE.

**Applied Project.** A three-hour applied project, LIN 593, which is overseen by the director, chosen from the English department linguistics/TESL faculty, is required. Two additional faculty members serve with the director to form a committee for the final oral examination on the project.

**Final Examinations.** An oral examination on the applied project is required.

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## Technology

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The Master of Science in Technology degree program is offered by the faculty in four departments of the College of Technology and Applied Sciences: Aeronautical Management Technology, Electronics and Computer Engineering Technology, Information and Management Technology, and Manufacturing and Aeronautical Engineering Technology. Courses are offered at ASU East. Contact the college for available concentrations.

The professional programs leading to the Master of Science in Technology degree are intended as preparation for a career in a selected branch of technology or as the foundation for further advanced study. Graduates of this program are provided with technical and professional skills for use in leadership positions in industry and education.

Faculty members administering the program have been selected because of relevant backgrounds in industry and business along with their academic training and teaching experience.

**Admission.** Admission to the degree program requires the completion of all general admission requirements and procedures set forth by the Graduate College. The College of Technology and Applied Sciences also requires an appropriate baccalaureate degree from an accredited college or university, with a minimum of 30 semester hours in technology or equivalent and 16 hours of physical science and

mathematics appropriate to the program pursued. The specific requirements vary within each department.

Graduate work presupposes an adequate technical preparation in a selected technology at the undergraduate level. Deficiencies for admission to the graduate program, if any, are specified at the time of admission. The applicant's past work and professional experience is also evaluated and taken into consideration when determining admission classification.

To be considered for regular admission, a 3.00 GPA is required.

**Program of Study.** The program of study is designed to promote greater depth of understanding and preparation in technology as it can be applied to industry and education. The program of study is planned in consultation with the appointed supervisory committee. It is designed for flexibility, permitting the student to select a combination of courses in a technological area and a supporting area to meet individual career goals.

A minimum of 32 semester hours is required for the degree program. Of these, a minimum of 15 semester hours must be 500-level courses and part of the approved program. Specific credit requirements vary within each department. The minimum requirements are as follows:

Technical area .....	15-18
Supporting area .....	9-11
Research course .....	3
Applied project .....	3
Total .....	32

A maximum of nine semester hours of appropriate course work completed before admission may be included in the program of study for the degree program.

A master's degree candidate forms a supervisory committee, the chair of which is from one of the three technology departments within the College of Technology and Applied Sciences. The chair and the committee members assist the student in selecting appropriate courses to meet the degree requirements and the student's goals. Specific program patterns are approved by the committee.

The Department of Aeronautical Management Technology provides students the opportunity to select courses, to be included in the technical area of their program of study, in aeronautical management technology.

The Department of Electronics and Computer Engineering Technology offers several areas of study. These include electronic communication systems, digital/computer systems, systems control and instrumentation, microelectronics, and electronics engineering technology education.

The Department of Information and Management Technology provides students the opportunity to study in graphic communications technology, industrial management and supervision, safety management, hazardous materials and waste management, and interactive computer graphics.

The Department of Manufacturing and Aeronautical Engineering Technology provides students the opportunity to select courses to be included in the technical area of their program of study, under the areas of aeronautical engineering technology, manufacturing engineering technology, mechanical engineering technology, and welding engineering technology. Students may also select course work from

computer integrated manufacturing engineering technology and from robotics and automation engineering technology.

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## Department of Aeronautical Management Technology

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**PROFESSOR**  
 GESELL

**ASSOCIATE PROFESSORS**  
 McCURRY, TURNEY

**ASSISTANT PROFESSORS**  
 JACKSON, KARP, PEARSON

**LECTURERS**  
 BORRMANN, O'BRIEN

**Admission.** Applicants are expected to satisfy all requirements for admission to the Graduate College. Industrial experience beyond completion of a baccalaureate degree is strongly recommended. Applicants having deficiencies or not meeting the prerequisites may be required to complete them before being admitted to the Master of Science in Technology degree program.

**Program of Study.** All candidates for the degree program are required to complete 32 semester hours. Additional courses may be assigned by the supervisory committee depending on the background of the candidate.

Students must complete a minimum of 32 semester hours of approved courses. An applied project or research project is required. Upon completion of the approved course of study or during the last semester, an oral defense of the written applied or research project is required.

The program is designed for flexibility, permitting the student to select a combination of courses in a technical area and supporting area to meet individual goals.

Students may take courses in two areas of interest: aviation management and aviation human factors. Students will work with faculty advisor to define specific courses that satisfy degree requirements.

**Final Examinations.** A final oral examination in defense of the applied or research project is required.

### RESEARCH ACTIVITY

Aeronautical Management Technology faculty interests and facilities support applied research in testing aerodynamics, fixed wing and helicopter performance, reciprocating and gas turbine engine development, aviation safety, aviation human factors, and aviation management. Research support facilities consist of reciprocating engine and jet propulsion laboratories, materials and fabrication laboratories, nondestructive inspection laboratory, and a subsonic wind tunnel. The research activities complement course work supporting Master of Science in Technology degree

program emphasis in aeronautical management technology. The emphasis is individualized to accommodate each student's background and interests.

### AERONAUTICAL MANAGEMENT TECHNOLOGY (AMT)

*Flight instruction costs are not included in university tuition and fees.*

#### **AMT 400 Flight Safety IV.** (1) F, S, SS

Multiengine and crew training and safety briefings. Continuous enrollment required until completion of rating and multicrew training. Lecture, lab. Prerequisite: AMT 300. Pre- or corequisite: AMT 387.

#### **AMT 408 National Aviation Policy.** (3) F

Examination of aviation and airspace policies and policy process, including agencies involved in formulation, implementation, and evaluation of aviation policy. Prerequisite: AMT 308.

#### **AMT 409 Nondestructive Testing and Quality Assurance.** (1) N

Purpose of inspection and quality assurance. Theory and application of nondestructive inspection methods. Application of pertinent standards, specifications, and codes. Lecture, lab. Cross-listed as AET 409. Credit is allowed for only AET 409 or AMT 409. Prerequisite: AMT 280 or MET 230.

#### **AMT 410 Aviation Safety and Human Factors.** (3) F

Aviation accident prevention, human factors, life support, fire prevention, accident investigation, and crash survivability. Development and analysis of aviation safety programs. Prerequisites: junior standing; completion of 1 semester of L1 requirement.

#### **AMT 442 Aviation Law/Regulations.** (3) F

Aviation within context of U.S. Common Law system. Public law, administrative rule making, sovereignty, enforcement, and case law analysis. Prerequisite: junior standing.

#### **AMT 444 Airport Management and Planning.** (3) S

Orientation to administration and management of modern public airports, including overview of planning, funding, and development of airport facilities. Prerequisite: AMT 308.

#### **AMT 482 Airline Instrument Procedures.** (3) F

Advanced instrument flight using airline instrument procedures and airline crew and cockpit resource management. Lecture, lab. Prerequisites: AMT 322, 382.

#### **AMT 484 Aeronautical Internship.** (1–12) F, S, SS

Work experience assignment with aerospace industry commensurate with student's program. Special project guidance by industry with university supervision. Prerequisites: advisor approval; junior standing.

#### **AMT 489 Airline Administration.** (3) S

Administrative organizations, economics of airline administration, operational structure, and relationship with federal government agencies. Prerequisites: AMT 308; instructor approval.

#### **AMT 491 Aviation Management Capstone.** (3) S

Integration and overview of management tools, current business problems and topics related to aviation industry. Group project with industry and government and business partners. Prerequisite: senior standing.

#### **AMT 496 Airline Aircraft Systems Capstone.** (3) S

Commercial airline aircraft systems and flight procedures. Includes theoretical education for large, commercial passenger aircraft. Lecture, lab. Prerequisite: senior standing.

#### **AMT 521 Air Transportation Regulation.** (3) N

Reviews evolutionary history of government regulations. Explores alternatives for economic, safety, social, and administrative regulatory reform in air transportation. Prerequisite: AMT 444 or 489 or equivalent.

#### **AMT 523 Aviation Systems Management.** (3) N

Systems theory applied to intermodal transportation networks. Survey of air and ground transportation infrastructure, institutional frameworks, and intermediaries promoting connections between modes. Prerequisite: AMT 444 or 489 or equivalent.

#### **AMT 525 Airport Planning and Design.** (3) N

Students complete various phases of airport master planning process. Provide guidance for logical and timely development of airports. Project work groups assigned. Prerequisite: AMT 444 or 489 or equivalent.

#### **AMT 527 Airline Management Strategies.** (3) N

Since deregulation, airlines have undergone profound changes through mergers, consolidation, and acquisition. In-depth look at airline management strategies for the 21st century. Prerequisite: AMT 444 or 489 or equivalent.

#### **AMT 528 International Aviation.** (3) N

Major issues of international aviation, historical review of institutional framework. Bilateral route agreements, freedom versus sovereignty, current legal and political arrangements. Prerequisite: AMT 444 or 489 or equivalent.

#### **AMT 529 Fixed-Base Operations Management.** (3) N

Examination of FBO role in the national aviation system. Organization of flight line operations, aircraft maintenance, and administration for multiple aircraft types. Prerequisite: AMT 444 or 489 or equivalent.

#### **AMT 541 Aviation Physiology.** (3) N

Survey of human physiology and human performance principles related to modern aircraft and aircraft systems operating in multiple environments. Prerequisite: AMT 410 or equivalent.

#### **AMT 543 Ergonomics in High-Technology Environments.** (3) N

Examination of ergonomic design principles regarding man-machine interface requirements of high-technology workstations. Emphasis on computer workstation design issues. Prerequisite: AMT 410 or equivalent.

#### **AMT 545 Human Factors in Aviation.** (3) N

Overview of human role in aviation. Issues, problems of unsafe acts and attitudes in human behavior. Human engineering capabilities and limitations. Prerequisite: AMT 410 or equivalent.

#### **AMT 546 Crew Resource Management /Line-Oriented Flight Training.** (3) N

Evaluation of in-depth, multicrew coordination issues for commercial aviation pilots. Stresses importance of critical thinking, decision making, integrated resource utilization. Prerequisite: AMT 410 or equivalent.

#### **AMT 547 Modern Human Factors Design Issues.** (3) N

Research and discussion of current human factors issues. State-of-the-art analyses of information regarding rapidly evolving designs and applications. Prerequisite: AMT 410 or equivalent.

#### **AMT 549 Human Factors Research.** (3) N

Aviation human factors research principles applied and tested in operational settings. Group projects assigned in conjunction with industry partners. Prerequisite: AMT 410 or equivalent.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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## Department of Electronics and Computer Engineering Technology

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### PROFESSORS

McHENRY, MUNUKUTLA, NOWLIN

### ASSOCIATE PROFESSORS

ABUELYAMAN, FORDEM WALT, MACIA, WOOD, ZENG

### ASSISTANT PROFESSORS

LIPARI, PETERSON, SUNDARARAJAN

The faculty in the Department of Electronics and Computer Engineering Technology offer a graduate program leading to the Master of Science in Technology professional degree in Technology with electronics and computer engineering technology as an area of study. Further areas of



study include electronic systems, digital/computer systems, systems control and instrumentation, microelectronics, and electronics engineering technology education.

**Admission and Proficiency Requirements.** For general admission requirements, see "Admission to the Graduate College" section, page 89, and "Technology," page 296. Admission and proficiency requirements and course work may be obtained from the department.

**Program of Study.** The minimum requirements for the Master of Science in Technology degree offered by the Department of Electronics and Computer Engineering Technology are as follows:

Technical area of emphasis .....	17
Supporting area .....	9
Research methods course (EET 500).....	2
Graduate seminar (EET 591).....	1
Applied project (EET 593) .....	3
<hr/>	
Total minimum semester hours.....	32

A minimum of 16 hours must be 500-level courses in the approved program. At least nine hours of 500-level course work must be included in the technical area of emphasis. A maximum of three semester hours of EET 593 Applied Project may be applied toward the 16-hour, 500-level minimum. The applied project requires a supporting technical report and is defended in a final oral examination. All course work applied toward the minimum 32-hour total must be at the 400 and 500 level, excluding courses taken to remove deficiencies.

For more information concerning the Master of Science in Technology degree, see "Technology," page 296.

## RESEARCH ACTIVITY

Research activities in the Department of Electronics and Computer Engineering Technology emphasize, but are not limited to, systems and circuit applications, hardware design, fabrication and manufacturing in the technical areas of electronics engineering technology (with emphases in electronics, digital or systems control, and instrumentation), computer engineering technology, and microelectronics engineering technology. In addition, research activities in electrical/electronics, computer and microelectronics engineering technology education emphasize programs and projects for students interested in post-secondary teaching.

Master of Science in Technology degree candidates find a broad range of applied project activities of interest to students and faculty, as well as the user-public in industry and education. Faculty research interests are concentrated in, but not limited to, the general areas and topics listed below.

*Electronic Systems and Circuits.* Analog and digital/data communication circuits and systems applications, antenna array systems, micro-strip techniques, MPSK signaling techniques in modern digital radio communications, coherent receivers and transponders, optoelectronic systems, microwave techniques, digital radio communications, digital signal processing and hardware design, and computer-aided design.

*Digital Circuits and Systems and Computers.* Digital systems logic design and applications, controller design and application, and programmed logic design and applications; digital IC switching circuits and logic design and applica-

tions; microcomputer and minicomputer hardware, programming, and interfacing and software systems application; computer-aided design and applications; automatic digital testing; computer process control hardware, techniques, and applications.

*Systems Control and Instrumentation.* Electrical power equipment and systems, control, and distribution; direct solar energy conversion; analog and digital process control components, instrumentation, systems, and process applications; electronic measurements and instrumentation circuits, systems, and applications; automatic test systems, test programming, and failure-tolerant design; computer-aided design; analog and digital simulation.

*Microelectronics.* Solid-state device design, testing, and fabrication; monolithic bipolar and MOS and thin-film/thick-film hybrid circuit fabrication and manufacturing techniques; vacuum vapor deposition and sputtering techniques and applications; new photolithographic processes; new computer-aided interconnection techniques and imprinted circuit techniques; device and system packaging; computer-automated manufacturing techniques; new hybrid materials and processing techniques; computer-aided design and manufacturing robotics applications.

*Engineering Technology Education.* Educational systems studies emphasizing curriculum and laboratory design and development in electronic/electrical, computer, and microelectronics engineering technology at the bachelor's and master's levels; studies involving faculty, student, administrative, and graduate characteristics; industry utilization and manpower needs; program curriculum and math science articulation requirements and characteristics; characteristics of excellence in engineering technology education; computer-aided educational design.

## COMPUTER ENGINEERING TECHNOLOGY (CET)

**CET 426 Software Tools for the Semiconductor Industry.** (3) S Introduction to software tools commonly used in the semiconductor industry, such as SUPREM IV, PSPICE, VIEWLOGIC, and ICED. Cross-listed as UET 426. Credit is allowed for only CET 426 or UET 426. Prerequisite: UET 331.

**CET 452 Digital Logic Applications.** (4) S Design of sequential machines using system design techniques and complex MSI/LSI devices with lab. Prerequisite: CET 350.

**CET 454 Microcontrollers.** (4) S Microcontroller interfacing, organization, programming, and structure. Lecture, lab. Prerequisite: CET 354.

**CET 456 Assembly Language Applications.** (3) F Programming using BIOS and DOS routines. High-level language interfacing. Disk operations, TSR routines, and device drivers. Prerequisite: CET 354.

**CET 457 Microcomputer Systems Interfacing.** (4) S Applications of microcomputer hardware and software. Special purpose controllers, interface design. Lecture, lab. Prerequisites: CET 354; CSE 183; EET 310.

**CET 458 Digital Computer Networks.** (3) A Network technology, topologies, protocols, control techniques, reliability, and security. Prerequisite: CET 354.

**CET 473 Digital/Data Communications.** (4) F Signals, distortion, noise, and error detection/correction. Transmission and systems design. Interface techniques and standards. Lecture, lab. Prerequisites: CET 354; EET 372.

**CET 483 UNIX with C Applications.** (3) F Generate user proficiency in the use of the UNIX operating system, its shells, environment, and 4th generation language and tools. Prerequisite: senior standing in the ECET department or equivalent.

**CET 485 Digital Testing Techniques I.** (3) A

Hardware/software aspects of digital testing technology; systems, board, and logic testing and equipment. Lecture, lab. Cross-listed as UET 485. Credit is allowed for only CET 485 or UET 485. Prerequisites: CET 350; EET 310.

**CET 486 Electronics Computer-Aided Design.** (3) F

CAD/EHDL for digital logic simulations and electronic circuit designs. Various software packages will be used. Prerequisites: CET 350; EET 310.

**CET 487 Hardware Description Languages: VERILOG.** (3) F

Introduction to hardware description languages, digital modeling, and simulation techniques using the VERILOG HDL. Prerequisites: CET 350, 354.

**CET 488 UNIX Systems Administration.** (3) F

Generate user proficiency in administration of UNIX operating system, its processes, system calls, kernel, file structure, and interprocess communication tools. Prerequisites: CET 483 (or equivalent); C or C++ language.

**CET 489 Network Programming.** (3) F

Generate user proficiency in writing C programs and scripts to control and administer a UNIX operating system network. Prerequisites: CET 473 and 488 or equivalents; C or C++ language.

**CET 520 Computer Architecture.** (3) F

The basics of computer architecture. RTN, RISC, CISC concepts; computer arithmetic; ALUs; memory systems; I/O. Prerequisite: CET 354.

**CET 552 Digital Systems Design.** (3) S

Digital system design techniques and applications. Prerequisite: CET 452 or instructor approval.

**CET 556 Windows Programming.** (3) F

Programming techniques in the MS Windows and X Window environments. Prerequisite: CET 256 or equivalent.

**CET 557 Microcomputers and Applications.** (3) F

Applications of small computer systems, mini- and microcomputer hardware and software. Prerequisites: CET 354; CSE 100 (or 183); EET 310.

**CET 583 Network Programming.** (3) F

Generate user proficiency in writing C programs and scripts to control and administer a UNIX operating system network. Prerequisites: CET 473 and 488 or equivalents; C or C++ language.

**CET 585 Digital Testing Techniques II.** (3) F

Testing technology as applied to digital systems, boards, and chips. Lecture, lab. Prerequisite: CET 354.

**CET 586 Digital Modeling Techniques.** (3) S

Digital system modeling and simulation using hardware description languages. Prerequisites: CET 350, 354.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**ELECTRONICS ENGINEERING TECHNOLOGY (EET)****EET 401 Digital Filters and Applications.** (3) S

Analysis and design of digital filters. Time frequency and Z-transform techniques and waveform analysis. Computer applications. Prerequisites: EET 301; MAT 262.

**EET 406 Control System Technology.** (4) S

Control system components, analysis of feedback control systems, stability, performance, and application. Lecture, lab, computer simulations. Prerequisites: EET 301; MAT 262.

**EET 407 Energy Conversion and Applications.** (4) F

Electricity, magnetism, mechanics, heat and units, and three-phase circuits. Electrical machines, transformers, generation, transmission, and distribution of electrical energy. Lecture, lab. Prerequisite: EET 208.

**EET 410 Electronic Circuits II.** (3) F, S

Analysis and design of OP-amps, power amplifiers, and digital logic families. Feedback design using frequency response. Computer analysis and design. Prerequisites: EET 301, 310.

**EET 420 Analog Filters and Applications.** (3) A

Active and passive analog filter design. Frequency domain approximations, computer simulations using PSPICE. Lecture, lab. Prerequisites: EET 301, 410.

**EET 422 Electronic Switching Circuits.** (4) A

Analysis and design of electronic circuits operating in a switching mode. Waveshaping, timing, and logic. Computer simulation. Lecture, lab. Prerequisites: CET 350; EET 301, 310.

**EET 430 Instrumentation Systems.** (4) F

Measurement principles and instrumentation, techniques. Signal and error analysis. Lecture, lab. Prerequisites: EET 301, 310.

**EET 440 Electrical Power Systems Technology.** (4) S

Principles and analysis of rotating machines, transformers, and related control equipment. Lecture, lab. Prerequisite: EET 407.

**EET 460 Power Electronics.** (4) S

Analysis of circuits for control and conversion of electrical power and energy. Lecture, lab. Prerequisites: EET 301, 310, 407.

**EET 470 Communication Circuits.** (4) S

Analysis and design of passive and active communication circuits. Coupling networks, filters, and impedance matching. Modulation and demodulation techniques. Computer solutions. Lecture, lab. Prerequisites: EET 372; MAT 262.

**EET 478 Digital Communication Systems.** (3) S

Theory, design, and application of digital, data, and fiber optics communication systems. Prerequisites: EET 304, 372; MAT 262.

**EET 500 Research/Writing.** (2) F, S

Designed to help master's students develop their projects and write the first three chapters of their projects. Lecture, seminar. Prerequisite: instructor approval.

**EET 501 Digital Signal Processing and Applications I.** (3) F

Applications of discrete-time signals and systems, design of IIR and FIR filters using computer-aided design techniques. Prerequisites: EET 401 (or instructor approval); MAT 262.

**EET 502 Digital Signal Processing and Applications II.** (3) S

Application of FFT, fundamentals of probability theory and random processes, and quantization effects in digital filters. Prerequisite: EET 501.

**EET 506 System Dynamics and Control.** (3) S

Time, frequency, and transform domain analysis of physical systems. Transfer function analysis of feedback control systems performance and stability. Compensation. Prerequisites: EET 301, 501 (or MAT 262).

**EET 508 Digital Real-Time Control.** (3) A

Sample data control techniques and applications to process control. Prerequisites: CET 354; EET 406.

**EET 510 Linear Integrated Circuits and Applications.** (3) F

Analysis, design, and application of linear integrated circuits and systems. Prerequisites: CET 350; EET 301, 310.

**EET 522 Digital Integrated Circuits and Applications.** (3) S

Analysis, design, and application of integrated circuits and systems. Prerequisites: CET 350; EET 301, 310.

**EET 530 Electronic Test Systems and Applications.** (3) F

Analysis, design, and application of electronic test equipment, test systems, specifications, and documentation. Prerequisites: CET 354; EET 301, 310.

**EET 540 Electrical Power Systems.** (3) S

Electrical power system analysis, transmission, distribution, instrumentation, protection and related system components. Prerequisites: EET 301, 407.

**EET 560 Industrial Electronics and Applications.** (3) S

Analysis, design, and application of special electronic devices and systems to industrial control, power, communications, and processes. Prerequisites: CET 350; EET 301, 310, 407.

**EET 574 Microwave Amplifier-Circuits Design.** (3) F

Analysis and design of microwave amplifier-circuits using s-parameter theory and computer-aided design. Prerequisites: EET 304, 470.

**EET 576 Modern Telecommunication Systems.** (3) F

Applied design and integration of microwave and satellite communication systems. Prerequisites: CET 473 and MAT 262 or instructor approval.

**EET 578 Digital Filter Hardware Design.** (3) S

Hardware design of FIR and IIR filters, including adaptive filters, based on DSP chips. Develop new applications using DSP microprocessor systems. Prerequisites: CET 354; EET 401.

**EET 579 Digital Image Communication.** (3) S

Image capture, transform, compression, storage, and transmission. Computer environment (software and hardware) is provided to emphasize the practical aspect. Prerequisite: EET 401 or instructor approval.

**EET 591 Graduate Seminar.** (1) N

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**MICROELECTRONICS  
ENGINEERING TECHNOLOGY (UET)**

**UET 411 Applied Vacuum Technology.** (3) S

Fundamentals, applications, and practical aspects of vacuum systems and their uses in semiconductor fabrication. Prerequisite: UET 331.

**UET 416 Monolithic Integrated Circuit Devices.** (3) F

Physics and electronics of bipolar and MOS devices used in integrated circuits. Prerequisite: UET 331. Corequisite: UET 417.

**UET 417 Monolithic Integrated Circuit Laboratory.** (2) F

Laboratory practice in the fabrication of integrated circuits. Lab. Prerequisite: UET 331. Corequisite: UET 416.

**UET 418 Hybrid Integrated Circuit Technology.** (4) S

Layout, fabrication, design, and manufacture of thin and thick film hybrid circuits. Lecture, lab. Prerequisites: EET 310; UET 331.

**UET 421 Applied Device Physics.** (3) F

Band structures of solids, physics of current carriers in solids, pn junctions, MOS and bipolar transistors. Prerequisite: senior standing in the department.

**UET 424 Integrated Circuit Mask Making Technology.** (3) F

Fundamentals, applications, and techniques for the fabrication of integrated circuit masks. Prerequisite: UET 331.

**UET 426 Software Tools for the Semiconductor Industry.** (3) S

Introduction to software tools commonly used in the semiconductor industry, such as SUPREM IV, PSPICE, VIEWLOGIC, and ICED. Cross-listed as CET 426. Credit is allowed for only CET 426 or UET 426. Prerequisite: UET 331.

**UET 432 Semiconductor Packaging and Heat Transfer.** (3) S

Packaging theory and techniques; hermetic and plastic assembly; thermal management; electrical characteristics and reliability. Prerequisites: ETC 340 and UET 331 or equivalents.

**UET 437 Integrated Circuit Testing.** (3) S

Principles, techniques, and strategies employed at wafer level and final product testing, both destructive and nondestructive. Prerequisite: UET 416.

**UET 485 Digital Testing Techniques I.** (3) A

Hardware/software aspects of digital testing technology; systems, board, and logic testing and equipment. Lecture, lab. Cross-listed as CET 485. Credit is allowed for only CET 485 or UET 485. Prerequisites: CET 350; EET 310.

**UET 513 VLSI Circuit Design and Layout.** (3) F

Techniques and practice for the design and layout of very large-scale integrated (VLSI) circuits. Emphasis on "system on silicon" using tools for computer-aided design layout. Seminar. Prerequisite: UET 416.

**UET 516 Semiconductor Process Simulation and Integration.** (3) S

Modern IC processes and process integration; design of modern IC processes using SUPREM. Lecture, lab. Prerequisite: UET 416.

**UET 518 Hybrid IC Technology and Applications.** (3) S

Theory, processing, fabrication, and manufacturing of hybrid microelectronics devices and products. Applications. Prerequisite: UET 331 or equivalent or instructor approval.

**UET 521 Device Physics.** (3) F

Band structure of solids, electron hole-pairs, mobility, lifetime, fermi-level, pn junctions, diodes, and bipolar and MOS transistors. Prerequisite: graduate standing in the department.

**UET 532 IC Packaging.** (3) S

IC packaging theory and techniques; assembly techniques, material issues; thermal management; electrical performance and reliability. Lecture, lab. Prerequisites: ETC 340 and UET 331 or equivalents.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

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**Department of Information and  
Management Technology**

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**PROFESSORS**

DANEKE, DUFF, HILD, SCHILDGEN

**ASSOCIATE PROFESSORS**

GROSSMAN, HIRATA, HUMBLE, MATSON, OLSON

**LECTURERS**

DOLIN, LESTAR, WILSON

The faculty in the Department of Information and Management Technology through the College of Technology and Applied Sciences, ASU East, offer a Master of Science in Technology degree. The student may select one of five areas of study to meet the requirement of 15–26 hours: graphic communications technology and industrial management and supervision (with further areas of study available in safety management; hazardous materials and waste management; and interactive computer graphics).

**Admission.** Applicants are expected to satisfy all requirements for admission to the Graduate College. Industrial experience beyond completion of a baccalaureate degree is strongly recommended. Applicants with deficiencies or not meeting the prerequisites may be required to complete them before being admitted to the degree program.

**Program of Study.** All candidates for the Master of Science in Technology degree program are required to complete a minimum of 33 semester hours of graduate credit. Additional courses may be assigned by the faculty supervisory committee depending on the background of the candidate.

**Final Examinations.** An applied project is required. Upon completion of the approved course of study or during the last semester, an oral defense of the written applied or research project is required.

For more information concerning the Master of Science in Technology degree, see "Technology," page 296.

Research interests of the faculty in the Department of Information and Management Technology include computer-assisted design (CAD), graphic communications, Internet/Web development, multimedia, animation, 3-D modeling, hazardous materials and waste management, environmental regulations, remediation processes, interactive computer graphics, simulation and modeling of industrial process, operations management, manufacturing processes, motivation, quality control, production supervision, decision making, technical communications, industrial training.

## RESEARCH ACTIVITY

Master's degree candidates are required to complete a research block that includes three courses (ITM 549 Research Techniques and Applications, ITM 598 Quantitative Research Analysis, and ITM 593 Applied Project).

The program is designed for flexibility, permitting the student to select a combination of courses in a technical area and supporting area to meet individual goals.

### COMPUTER GRAPHIC COMMUNICATIONS (CGC)

#### **CGC 410 Graphics User Interfaces and Database Programming (C++).** (3) F, S

GUI design and programming: Window standards, protocols, tools and files; use of project managers, database components, visual libraries and OOPS. Lecture, lab. Prerequisites: CGC 310 (or equivalent C++ language programming course) and 314 or instructor approval.

**CGC 411 Computer Animation and Special Effects (F/X).** (3) F  
2D and 3D computer animation principles and methods: project planning, scripting; character generation; storyboards; and modeling, lighting, rendering, special effects, and plug-in techniques. Lecture, lab. Prerequisites: CGC 313 and 314 or instructor approval.

**CGC 412 Multimedia Authoring, Scripting, and Production.** (3) F  
Production of multimedia projects using authoring software applications, including project management, client considerations, interactive navigation, cross-platforming, testing, and documentation issues. Lecture, lab. Prerequisites: CGC 314 and 336 and 352 and 411 or instructor approval.

**CGC 413 Professional Portfolio Design and Presentation.** (3) S  
Digital media portfolio: planning, targeted audience(s), design appearance, authoring, packaged media formats, media presentation formats, production, marketing, and copyright considerations. Lecture, lab, field trips. Prerequisites: CGC 411 and 412 or instructor approval.

**CGC 414 Web Site Design and Internet/Web Technologies.** (3) S  
Web site design, authoring, standards, protocols, tools, and development techniques; HTML, CGI and Perl coding; Web servers, browsers, interfaces and URLs. Lecture, lab. Prerequisites: CGC 311 and 314 or instructor approval.

**CGC 415 Computer Graphics: Business Planning and Management Issues.** (3) S  
Implementation planning: feasibility and application studies; needs assessment and operational analysis techniques; organization, managerial and technology considerations; business plan development. Lecture, lab, field trips. Prerequisite: CGC 412 or instructor approval.

**CGC 416 Emerging Computer Graphics and Digital Media Technologies.** (3) S  
Emerging computer graphics and digital media technologies and databases: VR/VRML; inverse kinematics; F/X plug-ins; hybrid modeling; Web intermedia; GIS/mapping. Lecture, lab, field trips. Prerequisites: CGC 410 and 411 or instructor approval.

**CGC 417 JavaScript, VBScript, HTML, and ActiveX Programming.** (3) S  
Use of JavaScript, VBScript, HTML, and ActiveX software programs and standards to create customized, interactive, Internet/Web site applications. Lecture, lab. Prerequisites: CGC 410 and 412 and 414 or instructor approval.

**CGC 433 Graphic Production Processes.** (3) N  
Systematic production planning experience involving a mock enterprise and defined management responsibilities. Lecture, lab. Prerequisites: CGC 333, 334.

**CGC 436 Gravure Technology.** (3) S  
In-depth study of the market profile and production sequences related to the gravure method of printing. Prerequisite: CGC 135 or instructor approval.

**CGC 437 Color Reproduction Systems.** (3) F  
Scientific analysis for the engineering of color reproduction systems used in industry. Prerequisite: CGC 336.

**CGC 438 Graphic Arts Techniques and Processes.** (3) N  
Survey of production sequences and profile of the printing and publishing industry. Lecture, lab. Prerequisite: junior standing.

**CGC 439 Digital Prepress.** (3) N  
The study of digital prepress systems, hardware, software, networks, and direct imaging technology. Lecture, lab. Prerequisite: IMC 233.

#### **CGC 510 Computer Graphics Programming: Design, Customization, and Development.** (3) N

Advanced design, development, and documentation of Windows application programs, including GUIs, OOP, RAD, API, DLLs, and GDI in C++ and Java. Lecture, lab. Prerequisites: CGC 310 and 410 (or equivalent GUI/OOP course) or instructor approval.

#### **CGC 511 Procedural and Physically Based Character Animation.** (3) N

Creative and aesthetic design, storyboarding, planning, development, and documentation of constraint-based, procedural, and interactive character, avatar-actor, and product animations/simulations. Lecture, lab. Prerequisites: CGC 411 and 510 (or equivalents) or instructor approval.

**CGC 512 Multimedia-Based Education and Training.** (3) F, SS  
Creative design, planning, development, documentation, and production of technology-based learning and multimedia-based education and training materials and programs. Lecture, lab. Prerequisites: CGC 412 and 413 (or equivalents) or instructor approval.

#### **CGC 513 Computer Graphics Systems Design and Development.** (3) N

Research, design, and development of computer graphics systems; involves project proposal, scheduling, management, production, analysis, testing, evaluation, documentation, and implementation. Lecture, lab, field trips. Prerequisites: CGC 414 and 415 or instructor approval.

#### **CGC 514 Interactive Virtual Reality Environments and Technologies.** (3) N

Research and development of passive, exploratory, and interactive VR environments in education and training, infotainment, Internet/Web, and VRML programming and simulation arenas. Lecture, lab, field trips. Prerequisites: CGC 510 and 511 and 513 (or equivalents) or instructor approval.

**CGC 537 Current Issues in Quality Assurance.** (3) N  
Directed group study of selected issues relating to quality assurance in the printing, publishing, and information industry.

**CGC 538 Personnel Development for the Graphics Industry.** (3) N  
Employee training and development specific to production and management in the graphics industry.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### ENVIRONMENTAL TECHNOLOGY MANAGEMENT (ETM)

**ETM 401 Hazardous Waste Management.** (3) F, S  
Definition of hazardous waste, RCRA classification, and OSHA criteria. Overview of requirements and methods of waste management. Prerequisite: ETM 301.

**ETM 402 Unit Treatment Technologies.** (3) S  
Addresses various treatment technologies for contaminated air, water, and soil. Emphasizes design based upon medium, type of contamination, and concentration. Prerequisite: ETM 302.

**ETM 406 Environmental Chemistry.** (3) F, S  
Examines reactions, transport, and fates of hazardous chemicals in water, soil, air, and living organisms. Prerequisites: CHM 113 and 115 or CHM 114; MAT 170.

**ETM 407 Occupational Hygiene.** (3) S  
Overview of occupational health hazards, including recognition, evaluation, and control. Includes regulatory status and health standards. Prerequisites: CHM 101 (or 113 or 114); MAT 170.

**ETM 424 Comprehensive Emergency Management.** (3) SS  
Addresses theory and management techniques for emergency preparedness, including mitigation, preparedness, response, and recovery. Pre- or corequisite: ETM 301.

**ETM 426 Environmental Issues.** (3) S  
Exploration of the science and policy implications of contemporary problems that threaten the environment. Pre- or corequisites: CHM 113; MAT 170.

**ETM 428 International Environmental Management.** (3) SS  
Emphasis on technological and economic pressures experienced by developing countries. Prerequisite: ETM 301.

**ETM 501 Principles of Hazardous Materials and Waste Management.** (3) F  
Foundation for courses in curriculum. Topics include definitions of toxic and hazardous substances and wastes, RCRA classification, and OSHA criteria. Pre- or corequisites: CHM 113 and 115 or CHM 114.

**ETM 502 Regulatory Framework for Toxic and Hazardous Substances.** (3) F  
Examination of federal, state, and local regulations for hazardous materials and wastes. Includes history and trends in regulatory development. Prerequisite: ETM 501.

**ETM 503 Principles of Toxicology.** (3) S  
Interaction of chemicals with life and environment. Mechanisms of toxic action, dose-response relationships, toxicity testing models, predictive toxicology, and epidemiology. Prerequisites: CHM 113 and 115 or CHM 114.

**ETM 504 Technology for Storage, Treatment, and Disposal of Hazardous Materials.** (3) F  
Current and state-of-the-art technologies and future trends for storage, treatment, and disposal of hazardous materials and waste. Prerequisites: CHM 113 and 115 or CHM 114; ETM 501.

**ETM 505 Quantitative Analysis and Practical Laboratory Techniques.** (3) F, S  
EPA methodologies for sampling and analysis of soils and water. Includes quality assurance and regulatory requirements. Lab will be arranged off site. Prerequisites: CHM 113 and 115 (or CHM 114), 231; MAT 170.

**ETM 506 Chemistry of Hazardous Materials.** (3) F  
Chemistry and toxicology of hazardous chemicals. Topics include proper handling, storage, transportation, and disposal. Prerequisites: CHM 113 and 115 (or CHM 114); MAT 170. Corequisite: CHM 231.

**ETM 507 Industrial Hygiene.** (3) N  
Emphasis on chemical hazards in industrial settings. Topics include recognizing and measuring hazards, control techniques, and regulatory standards. Prerequisites: CHM 113 and 115 (or CHM 114); MAT 170.

**ETM 522 Air Pollution and Toxic Chemicals.** (3) F  
Examines issues in the measurement analysis and control of toxic chemicals in air pollution. Prerequisites: CHM 113 and 115 (or CHM 114); ETM 501; MAT 170.

**ETM 523 Soils and Groundwater Contamination.** (3) F  
Theoretical and practical hydrogeology as it applies to cleaning up contamination. Investigative techniques, monitoring, risk assumptions, and assessment methodology. Prerequisites: CHM 113 and 115 (or CHM 114); ETM 501; MAT 170. Corequisite: CHM 231.

**ETM 524 Emergency Preparedness, Response, and Planning for Hazardous Materials.** (3) SS  
In-house or on-site emergency response contingency planning. Pre-emergency assessment, resources for cooperation, equipment requirements, and coordination with other agencies. Prerequisites: CHM 113 and 115 (or CHM 114); ETM 501; MAT 170.

**ETM 525 Risk Assessment for Hazardous Materials.** (3) S  
Application of the risk assessment process in situations ranging from hazardous facilities regulation to toxic substances in the environment. Prerequisites: CHM 113 and 115 (or CHM 114); ETM 501; MAT 170.

**ETM 526 Current Issues: Radon, Asbestos.** (3) F  
Topics of current interest in environmental technology and management. Prerequisites: CHM 113 and 115 (or CHM 114); ETM 501; MAT 170.

**ETM 527 Environmental/Resources Regulations Concepts.** (3) S  
Development of environmental regulations from common law to statutory requirements. Emphasis on Superfund, hazardous materials, toxics, and liability contracts. Pre- or corequisite: ETM 501.

**ETM 598 ST: Advanced Bioremediation.** (3) S  
Management and policy issues related to bioremediation of minetailing and animal waste and replacement of chemical control with biological methods. Lecture, case studies.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### INDUSTRIAL TECHNOLOGY MANAGEMENT (ITM)

**ITM 402 Industrial Laws, Contracts, and Regulations.** (3) F  
Review of city, state, county, and federal laws that affect industrial and construction operations, materials, supplies, and acquisition procedures. Prerequisite: IMC 346.

**ITM 430 Ethical Issues in Technology.** (3) S  
Topics in social responsibility for industrial technology and engineering. Prerequisite: IMC 346.

**ITM 440 Introduction to International Business.** (3) S  
International business principles and operations, including partnerships, trade agreements, currency issues, international sales, and cultural differences between countries. Prerequisite: IMC 346. *General Studies: G.*

**ITM 445 Industrial Internship.** (1–10) F, S, SS  
Work experience assignment in industry commensurate with student's program. Specialized instruction by industry with university supervision. Pass/fail. Prerequisites: advisor approval; junior standing; 2.50 GPA.

**ITM 451 Materials Control.** (3) N  
Activities of material handling, including purchasing, receiving, warehousing, traffic, plant layout, inventory, and production control and shipping relating to technical procedures. Prerequisites: IMC 346; ITM 343.

**ITM 452 Industrial Human Resource Management.** (3) F  
Concepts and practices of human resource management in a global industrial environment. Prerequisite: IMC 346.

**ITM 453 Safety Management.** (3) N  
Development and management of safety programs, education and training, and relationships within an organization. Prerequisite: ITM 343 or instructor approval.

**ITM 455 Industrial Marketing Concepts.** (3) N  
Customer and sales strategies for industrial organizations, including current practice and future planning. Prerequisites: ECN 111; IMC 346; junior standing.

**ITM 456 Introduction to Organized Labor.** (3) S  
Introduction to labor relations, unions, federations, collective bargaining, grievances, and labor legislation. Prerequisites: IMC 346; ITM 344.

**ITM 461 Operations Management.** (3) F  
Introduction to supervisory principles as applied to production of goods and services. Prerequisites: IMC 346; ITM 344.

**ITM 480 Organizational Effectiveness.** (3) S  
Human aspects of supervisory behavior in the industrial setting and how they influence efficiency, morale, and organizational practices. Prerequisite: IMC 346.

**ITM 501 Managerial Economics.** (3) N  
Basic managerial economic tools and techniques applied to unique concerns of scientifically intensive firms operating in rapidly evolving industrial sectors.

**ITM 502 Financial Management.** (3) N  
Examination of corporate financial and managerial accounting systems, budgeting, and financial policy, using microcomputers to analyze, forecast, and report information.

**ITM 503 Marketing Management.** (3) N  
Modern methods and industrial case studies of planning, pricing, promoting and distributing, goods and services in the global marketplace. Prerequisites: ITM 480 (or equivalent); instructor approval.

**ITM 504 Law and Ethics for Technical Professionals.** (3) N  
Analysis of legal and ethical framework for making managerial decisions in the corporate environment of engineering- and technology-related industries.

**ITM 520 Strategic Management of Technology.** (3) N  
Analysis of entrepreneurial dynamics and technology development, methods of research and development management, new technology implementation, and start-up organization. Prerequisites: ITM 480 (or equivalent); instructor approval.

**ITM 540 International Management.** (3) N  
Practices and procedures for effective management of multinational business organizations, including partnerships, joint ownerships, and global subsidiaries.

**ITM 548 Quantitative Research Methods.** (3) F, S  
Use of statistical techniques to analyze and interpret data. Concentration on computerized statistical software and practical applications. Prerequisite: STP 420.

**ITM 549 Research Techniques and Applications.** (3) F, S  
Selection of research problems, analysis of literature, individual investigations, preparing reports, and proposal writing. Prerequisite: STP 420 or equivalent.

**ITM 550 Industrial Training and Development.** (3) N  
Training techniques and learning processes. Planning, developing, evaluating, and managing industrial and governmental programs. Prerequisite: ITM 480.

**ITM 552 Global Management Philosophies.** (3) N

Analysis and comparison of significant supervision philosophies developed in various industrial nations and their potential application in the United States.

**ITM 560 Managerial Decision Making.** (3) F

Analysis of common decision-making bias and techniques to overcome them. Uses both subjective quantitative decision tools and computerized decision aids.

**ITM 570 Advanced Project Management.** (3) S

Planning, organizing, coordinating, and controlling staff and project groups to accomplish the project objective.

**ITM 598 ST: Special Topics.** (1–4) N

(a) Quantitative Research Analysis

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Department of Manufacturing and Aeronautical Engineering Technology

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**PROFESSOR**  
COLLINS

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**ASSISTANT PROFESSORS**  
RAJADAS, ROGERS

**LECTURER**  
OKONKWO

The faculty in the Department of Manufacturing and Aeronautical Engineering Technology (MAET) in the College of Technology and Applied Sciences, ASU East, offer the Master of Science in Technology degree. A minimum of 32 semester hours of approved courses is required. The flexible program permits the student to select a combination of courses in the relevant concentration and supporting areas to meet individual career goals in technology or to provide the foundation for further advanced study.

The department provides the student with a number of programs of study that presuppose a sound technical undergraduate degree. The programs are designed to provide the graduates with technical and professional skills that will facilitate preparation for and advancement in leadership positions in industry, education, government, and military. Laboratories and classrooms are well equipped, and the faculty members administering the classes have the relevant teaching, research, industry and training experience and background. Areas of study include manufacturing engineering technology, aeronautical engineering technology, and mechanical engineering technology.

The student may select one of the above areas to meet the requirement of 15–18 semester hours. Careful program selection in coordination with a faculty advisor and/or advisory committee is an essential aspect of this process result-

ing in a focused program for the student. The selection process also facilitates the potential for expanding the depth and breadth of the training the student may receive in related areas. The supporting area (six hours) may be selected from outside the department upon approval from the supervisory committee. MET 593 Applied Project and MET 592 Research are also required.

**Admission.** Applicants are expected to satisfy all requirements for admission to the Graduate College. Industrial experience beyond completion of a baccalaureate degree is strongly recommended. Applicants with deficiencies or those not meeting the prerequisites may be required to complete them before being admitted to the degree program.

**Program of Study.** All candidates for the Master of Science in Technology degree program are required to complete a minimum of 32 semester hours of graduate credit as follows:

Technical area of emphasis .....	17
Supporting area .....	6
Research methods course .....	3
Applied project .....	3
Research .....	3
Total .....	32

Additional courses may be assigned by the supervisory committee depending on the background of the candidate. The program is designed for flexibility, permitting the student to select a combination of courses in a technical area and supporting area to meet individual goals.

**Final Examinations.** An applied project or research project is required, upon completion of the approved course of study or during the last semester. An oral defense of the written applied or research project is required.

### RESEARCH ACTIVITY

Research interests of the faculty include computer-assisted design (CAD), computer-assisted manufacturing (CAM), computer-integrated manufacturing (CIM), decision making, energy conversation system design and analysis, energy management, simulation and modeling of industrial processes, machinability, manufacturing processes, motivation, numerical control (N/C), quality control, robotics and automation, supervision, weld-ability of metals, and welding-related metallurgy.

The aeronautical engineering technology faculty interests and facilities support applied research in testing aerodynamics, fixed wing and helicopter performance, and reciprocating and gas turbine engine development. Research support facilities consist of reciprocating engine and jet propulsion laboratories, materials and fabrication laboratories, and a subsonic wind tunnel.

### AERONAUTICAL ENGINEERING TECHNOLOGY (AET)

**AET 409 Nondestructive Testing and Quality Assurance.** (1) N  
Purpose of inspection and quality assurance. Theory and application of nondestructive inspection methods. Application of pertinent standards, specifications, and codes. Lecture, lab. Cross-listed as AMT 409. Credit is allowed for only AET 409 or AMT 409. Prerequisite: AMT 280 or MET 230.

**AET 415 Gas Dynamics and Propulsion.** (3) F  
Introduction to compressible flow, internal and external flow, and aerodynamic analysis of propulsion systems. Prerequisites: ETC 340; MAT 262.

**AET 417 Aerospace Structures.** (3) F

Analysis and design of aircraft and aerospace structures. Shear flow. Semimonocoque structures. Effects of dynamic loading. Prerequisites: AET 300, 312, 420; MAT 262; MET 313.

**AET 420 Applied Aerodynamics and Wind Tunnel Testing.** (4) F

Introduction to viscous and inviscid flow and their relationship to aircraft lift and drag. Wind tunnel design and testing. Lecture, lab. Prerequisites: AET 300; MAT 262.

**AET 432 Applied Heat Transfer.** (3) F

Steady-state and transient conduction, heat transfer by convection and radiation. Applications of heat transfer. Prerequisite: MET 434 or instructor approval.

**AET 487 Aircraft Design II.** (3) S

Basic aerodynamics and airplane performance analysis methods applied to practical design project. Prerequisite: AET 300.

**AET 490 Advanced Applied Aerodynamics.** (3) N

Study of fluid motion and aerodynamics. Essentials of incompressible aerodynamics and computational fluid dynamics. Elements of laminar and turbulent flows. Prerequisites: AET 312; ETC 100; MAT 262.

**AET 524 Application of Heat Transfer.** (3) F

Energy conservation, steady-state and transient conduction, convection transfer, free and forced convection Reynolds analogy, blackbody and environmental radiation. Prerequisite: MET 434 or instructor approval.

**AET 525 Advanced Propulsion.** (3) S

Mechanics and thermodynamics of propulsion systems. Solid, liquid propellant rocket design performance. Electrical nuclear propulsion systems. Space missions. Prerequisites: AET 420 (or MET 434) and 415 or instructor approval.

**AET 531 Experiments and Design in Aeronautics.** (3) N

Advanced measurement techniques for fluid flows, wind tunnel testing, and treatment of experimental data. Automatic control systems.

**AET 560 Numerical Methods in Engineering Technology.** (3) N

Analyzing problems in physical sciences, modeling of physical problems, perturbation techniques, curvefitting, data analysis, numerical solutions, ordinary and partial differential equations.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

**MANUFACTURING ENGINEERING TECHNOLOGY (MET)****MET 401 Quality Assurance.** (3) F

Introduction to statistical quality control methods design of experiments, sampling, gage requirements, specifications, quality assurance tools emphasizing CNC-CMM programming. Lecture, lab. Prerequisite: junior standing.

**MET 420 Welding Metallurgy I.** (4) N

Metallurgical principles applied to structural and alloy steel and aluminum weldments; laboratory emphasis on welding experiments, metallography, and mechanical testing. Lecture, lab. Prerequisites: MET 300, 302.

**MET 421 Welding Metallurgy II.** (3) N

Metallurgical principles as applied to stainless steel, super alloy, titanium, and other refractory metal weldments and braze joints. Prerequisite: MET 300.

**MET 432 Thermodynamics II.** (3) S

Thermodynamics of mixtures. Combustion process. Applications of the thermodynamics to power and refrigeration cycles. Prerequisite: ETC 340.

**MET 433 Thermal Power Systems.** (4) N

Analysis of gas power, vapor power, and refrigeration cycles. Components of air conditioning systems. Direct energy conversion. Psychrometry. Analysis of internal combustion engines and fluid machines. Lecture, lab. Prerequisite: MET 432 or instructor approval.

**MET 434 Applied Fluid Mechanics.** (3) N

Fluid statics. Basic fluid flow equations. Viscous flow in pipes and channels. Compressible flow. Applications to fluid measurement and flow in conduits. Prerequisite: ETC 340.

**MET 435 Alternate Energy Sources.** (3) F

Alternate energy systems, energy use and its impact on the environment, and demonstrating practical alternative energy sources to fossil fuels. Prerequisite: instructor approval.

**MET 436 Turbomachinery Design.** (3) N

The application of thermodynamics and fluid mechanics to the analysis of machinery design and power cycle performance predictions. Prerequisite: MET 432 or instructor approval.

**MET 438 Design for Manufacturing II.** (4) F

Application of mechanics in design of machine elements and structures. Use of experimental stress analysis in design evaluation. Lecture, lab. Prerequisite: AET 312 or MET 331 or instructor approval.

**MET 442 Specialized Production Processes.** (3) F

Nontraditional manufacturing processes, emphasizing EDM, ECM, ECG, CM, PM, HERF, EBW, and LBW. Prerequisite: MET 231.

**MET 444 Production Tooling.** (3) F

Fabrication and design of jigs, fixtures, and special industrial tooling related to manufacturing methods. Lecture, lab. Prerequisite: MET 345.

**MET 448 Expert Systems in Manufacturing.** (3) F

Introduction to expert systems through conceptual analysis, with an emphasis on manufacturing applications. Prerequisite: MET 231.

**MET 452 Implementation of Robots in Manufacturing.** (3) N

Robotic workcell design, including end effectors, parts presenters, and optimum material flow. Prerequisite: MET 451 or instructor approval.

**MET 453 Robotic Applications.** (3) S

Lab course utilizing robots and other automated manufacturing equipment to produce a part. Students are required to program robots, as well as interface the robots with other equipment. Prerequisite: MET 303 or 325 or instructor approval.

**MET 461 Manufacturing Capstone Project II.** (3) S

Small-group projects applying manufacturing techniques, with an emphasis on demonstrating state-of-the-art technology. Lecture, lab. Prerequisite: MET 460 or instructor approval.

**MET 462 Capstone Project/Weldment Design.** (3) S

Design of welded structures and machine elements in terms of allowable stresses, joint configurations, process capabilities, and cost analysis; welding procedures emphasized. Prerequisites: MET 302, 313.

**MET 501 Statistical Quality Control Applications.** (3) S

SPC problem-solving techniques for implementation in industrial setting, design and analysis of experiments. Prerequisite: instructor approval.

**MET 502 Specialized Production Processes.** (3) F

Specialized production processes including lasers, electronic beam, abrasive and water jet, and chemical and thermal processes. Prerequisite: instructor approval.

**MET 504 Applications of Production Tooling.** (3) F

Design and fabrication of fixtures, jigs, templates, and specialized industrial tooling for manufacturing. Lecture, lab. Prerequisite: instructor approval.

**MET 507 Manufacturing Enterprise.** (3) F, S

Organization and project management of cellular manufacturing methods, including IIT and lean manufacturing. Prerequisite: instructor approval.

**MET 512 Introduction to Robotics.** (3) N

Introduction to industrial robots. Topics include: robot workspace, trajectory generation, robot actuators and sensors, design of end effectors, and economic justification. Application case studies. Prerequisite: MET 303 or instructor approval.

**MET 513 Advanced Automation.** (3) F

Analysis and design of hard and flexible automation systems. Particular attention to material handling technology. Prerequisite: instructor approval.

**MET 514 N/C Computer Programming.** (3) S

Point-to-point and continuous path control system programming emphasizing metal removal procedures and processes. Lecture, lab. Prerequisite: instructor approval.

**MET 517 Applied Computer-Integrated Manufacturing.** (3) F

Techniques and practices of computer-integrated manufacturing, with an emphasis on computer-aided design and computer-aided manufacturing. Prerequisite: MET 346 or instructor approval.

**MET 560 Fundamentals of Security Engineering.** (3) F

Definitions of threats, fundamentals of design of physical protection systems, computer modeling and analysis of security systems.

**MET 571 Waste Minimization and Waste Prevention.** (3) S  
Life cycle analysis, selection of environmentally compatible materials, design of waste minimization equipment and operation, economics of waste minimization and prevention. Prerequisite: ETC 340 or instructor approval.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Theatre

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### PROFESSORS

BARKER, BARTZ, BEDARD, ECKARD, KNAPP, MASON,  
SALDAÑA, THOMSON, WILLS

### ASSOCIATE PROFESSORS

ACKER, EDWARDS, ENGEL, HOLLOWAY, RISKE, VINING

### ASSISTANT PROFESSORS

REYES, THOMSEN

### FINE ARTS SPECIALIST

TAYLOR

### LECTURERS

IRVINE, SMITH-DAWSON

The faculty in the Department of Theatre offer graduate programs leading to the M.A., the Master of Fine Arts, and the Ph.D. degrees in Theatre. Areas of concentration are performance, scenography and theatre for youth at the M.F.A. level (see “Master of Fine Arts,” page 306) and theatre for youth at the Ph.D. level. Students may also pursue an interdisciplinary program leading to the M.F.A. degree in Creative Writing. This program is offered by the faculties in the Departments of English and Theatre (see “English,” page 188).

## MASTER OF ARTS

The M.A. degree in Theatre is a flexible program of advanced theatre studies that provides preparation for teaching in secondary schools and colleges and for graduate study beyond the master’s level. The program primarily emphasizes theoretical studies.

See “Master’s Degrees,” page 98, for general requirements.

**Admission.** Applicants must meet all admission requirements of the Graduate College. In addition, the Department of Theatre requires comprehensive undergraduate preparation in theatre (at least a Theatre minor or its equivalent), acceptable scores on either the Graduate Record Examination (GRE) or Miller Analogies Test, three letters of recommendation, and an undergraduate GPA of 3.00.

**Application Deadline.** The first deadline for receipt of applications and test scores is March 1 (February 1 for Creative Writing). After that date, admission is subject to space availability.

**Deficiencies.** Deficiencies in undergraduate preparation (not to exceed 12 hours) may be removed while pursuing the M.A. degree; courses taken to remove deficiencies may not be counted toward the degree.

**Program of Study.** The required courses are THE 500, 504, 505, 520, and 521. Additional course work to complete the degree is selected by the student with the approval of the supervisory committee. Theatre courses must be completed with a grade of “B” or higher. A thesis or equivalent is required.

**Foreign Language Requirements.** Optional, depending upon research area, and with the approval of the supervisory committee.

**Thesis or Equivalent Requirements.** For students electing to prepare a thesis, the program consists of a minimum of 24 semester hours of graduate work and three hours each of thesis (599) and research (592) credit. A research thesis is especially recommended for students planning to continue graduate study beyond the master’s degree and may be elected with the approval of the supervisory committee.

In consultation with their supervisory committee, students may elect to prepare a thesis equivalent. This option consists of 36 semester hours of graduate work, of which six hours are research (592) credit, and three hours of THP 593 Applied Project. Each student develops an approved project and supports this project with a written document. In addition, at least 18 semester hours of course work on the program of study must be 500-level courses and 20 semester hours must be in the major field.

**Final Examinations.** Both final written and oral examinations are required of all candidates. The written examination is based on the required courses; the oral examination is a defense of the thesis or equivalent.

## MASTER OF FINE ARTS

The M.F.A. degree in Theatre is a 60-semester-hour professional program with concentrations in performance, scenography, and theatre for youth. It is a terminal degree for students interested in pursuing careers in professional and educational theatre. The concentration in performance is focused on the actor as a creative artist. It emphasizes skills for approaching and creating new work and developing entrepreneurship, performance applications in multimedia interdisciplinary collaboration, artistic integrity, and social responsibility.

In the scenography concentration, students learn skills and methodologies to create and execute designs in costumes, lighting, and scenery.

The concentration in theatre for youth is designed to prepare candidates for work as drama specialists; for college and university teaching in the field of theatre for youth; for professional careers in children’s theatre; and for work in community theatres, recreational programs, and various social agencies.

**Admission.** Applicants must meet all admission requirements of the Graduate College. In addition, the Department of Theatre requires a minimum of 30 semester hours of course work in theatre, a minimum GPA of 3.20 for all course work in theatre, and acceptable scores on either the GRE or MAT.



For the concentration in acting, requirements include:

1. an interview and audition consisting of two selections, one classical and one contemporary, not to exceed four minutes total;
2. three letters of recommendation; and
3. a statement of educational and career goals.

Dates and sites for interviews may be obtained from the Department of Theatre.

For the concentration in scenography, three letters of recommendation are required from leaders in the field of theatre, education, or art. In addition, applicants must provide a portfolio of 12 slides or photographs of their work with a return envelope and postage, as well as a statement of educational and artistic objectives. An interview is recommended; dates and sites may be obtained from the Department of Theatre.

For the concentration in theatre for youth, three letters of recommendation are required from leaders in the field of theatre for youth, theatre education, or recreation, as well as a statement of educational and career goals. Submission of a current resume is also necessary. An interview is suggested but not required.

More detailed information regarding admission requirements for the concentration may be obtained from the Department of Theatre.

**Application Deadline.** The first deadline for receipt of applications and test scores is March 1. After that date, admission is subject to space availability.

**Program of Study.** Each student works closely with a supervisory committee to develop a program of study in required and elective course work. All M.F.A. candidates majoring in Theatre are evaluated at the end of each semester by their supervisory committee, with the responsibility resting on each student for documenting professional development. The advancement of each student through each of the three years in the M.F.A. program is dependent upon a positive recommendation of the supervisory committee.

The program for the performance concentration consists of a minimum of 60 semester hours, distributed as follows: 48 hours of course work in the major (THE 500, 504, 505, 520, 521; THP 501, 502, 503, 504, 509, 519; six hours of THP 684 Internship; and six hours of THP 693 Applied Project).

The program for the scenography concentration consists of 60 semester hours distributed as follows: 43 hours of required course work in the major (THE 500 [one hour], 504, 505, 520, 521; THP 506, 530, 540, 545, 649 [three hours], 691, six hours each of THP 684 Internship and THP 693 Applied Project); 12 hours of additional design and/or technical theatre classes which may be selected from THE 430, 431; THP 419, 431, 435, 441, 442, 444, 445, 494; and five additional hours of electives subject to the approval of the supervisory committee.

The program for theatre for youth consists of 60 semester hours, distributed as follows: 39 hours of required course work in the major (THE 500, 504, 505, 520, 521, 524; THP 411, 511, and 611 or 618, six hours each of THP 684 Internship and THP 693 Applied Project); and 21 hours of approved electives in the major and related areas.

**Credit Before Admission.** Subject to approval by the supervisory committee, a maximum of 24 semester hours of graduate work from a completed master's degree program earned at ASU or another accredited institution may be applied to the program of study. In other cases, a maximum of nine semester hours of nondegree graduate work from ASU or another institution may be applied (see "Credit Completed Before Admission," page 99). All course work for the degree must be completed within the six-year time limit.

**Foreign Language Requirements.** Optional.

**Final Examinations.** A comprehensive examination or comprehensive review in the area of concentration is required. In addition, students failing to receive a grade of "B" or higher in THE 504, 505, 520, and 521 must pass a written comprehensive examination on the subject matter of those courses. A final project THP 693 Applied Project (six hours), supported by written documentation and defended in an oral defense, is required.

**Deficiencies.** Deficiencies in undergraduate preparation of no more than 12 hours may be removed while pursuing the M.F.A. degree; courses taken to remove deficiencies may not be counted toward the degree.

## DOCTOR OF PHILOSOPHY

The Ph.D. degree is designed to give students a broad knowledge of theatre as well as special research, production and teaching skills in theatre for youth. A detailed description of the program may be obtained from the Department of Theatre.

See "Doctor of Philosophy," page 101, for general requirements.

**Admission.** Applicants must meet all admission requirements of the Graduate College. In addition, the Department of Theatre requires a master's degree in theatre or education; a minimum of 36 hours of undergraduate and graduate course work in theatre (to include courses in dramatic literature, acting, directing, stagecraft, improvisation with youth, theatre for children, children's literature, research methods, theatre history, and theatre theory/criticism); acceptable scores on the GRE, and on the Test of English as a Foreign Language (where applicable); and three letters of recommendation.

**Application Deadline.** The first deadline for receipt of applications and test scores is March 1. After that date admission is subject to space availability.

**Program of Study.** A total of 90 semester hours is required for this degree, consisting of (1) a minimum of 66 semester hours of graduate course work (including a maximum of 30 semesters accepted from the first year of graduate study, a core of 15 semester hours of required courses, and 21 semester hours of elective and research credits); and (2) 24 semester hours of research and dissertation preparation.

A minimum of 30 semester hours of the approved Ph.D. program, exclusive of dissertation and research hours, must be completed after admission to the Ph.D. at ASU.

In meeting these requirements, students, with the advice of the supervisory committee, may select theatre courses in areas such as theatre education, directing, acting, design,

playwriting, theatre history, and theatre theory/criticism, in addition to tutorial courses as well as courses offered by other departments in areas such as pertinent research methodologies, educational theory and methodology, aesthetic theory, the arts and arts education, and children's literature. Students are encouraged to be involved in on- and off-campus production and teaching. All activities are selected to help students meet the goals of the program and develop the capability of becoming leaders in the field.

**Research Technique Requirement.** Students must successfully complete an additional graduate level course in qualitative or quantitative research, or they must successfully pass an examination in a foreign language approved by their committee.

**Preliminary Reviews.** Reviews of a student's performance in courses and development of research skills, artistic skills, and teaching competencies are conducted by the supervisory committee at the end of each semester.

**Comprehensive Examinations.** These examinations are composed of written and oral components centering upon: theatre history, literature, and criticism; theatre for youth and theatre in education; and the research area.

**Dissertation Requirements.** A dissertation based on original research work of high quality, demonstrating proficiency in the student's special field, is required. (See "Doctoral Dissertations," page 100.)

**Financial Assistance.** University scholarships, fellowships, grants, and other forms of financial assistance are available. See "Financing Graduate Studies" section, page 47, and "Assistantships and Associateships," page 96. Graduate assistantships are granted by the Department of Theatre; application forms and information concerning graduate assistantships are available through the graduate secretary, Department of Theatre. A current résumé and a minimum of three letters of recommendation must accompany applications for graduate assistantships.

## RESEARCH ACTIVITY

Recent and continued research by members of the Department of Theatre includes the following: workshops and production of new scripts for audiences of all ages and cultural backgrounds; voice production; study and performance of Shakespeare; history of American theatre; new production utilization in lighting, scene design, and production; aesthetic education; implementation of national standards and assessment for theatre education K-12; teacher training; history; criticism; and theory of theatre for youth.

### THEATRE (THE)

**THE 400 Focus on Film.** (3) F, S, SS  
Specialized study of prominent film artists, techniques, and genres. Emphasis is on the creative process. May be repeated for credit. Prerequisite: ENG 101 or 105.

**THE 401 Focus on Multiethnic Film.** (3) N  
Specialized study of major ethnic films and prominent film artists. Emphasis is on the creative process. Lecture, film viewing, papers. Prerequisite: ENG 101. *General Studies: HU, C.*

**THE 420 History of the American Theatre.** (3) F  
History of the plays, artists, and events in the development of American theatre from colonial to modern times. *General Studies: HU, H.*

**THE 421 History of the English Theatre.** (3) S  
History of the artists, events, and plays in the development of English theatre from medieval times to the present. Lecture, group and independent work. *General Studies: L2/HU.*

**THE 424 Trends in Theatre for Youth.** (3) N  
A survey of the history, literature, and contemporary practices in theatre for youth.

**THE 425 History of Asian Theatre.** (3) N  
History and production techniques of theatre forms in India, China, and Japan. Prerequisite: 6 hours of theatre history or written instructor approval. *General Studies: L2/HU.*

**THE 430 History of Costume: Western Tradition.** (3) N  
Study of major costume styles throughout history of Western civilization and how these fashions reflected society. Exploration of how styles can be used by theatrical costumers.

**THE 431 History of Costume: Non-Western Tradition.** (3) N  
Study of major costume styles of India, Asia, Eastern Europe, and the Middle East and how these fashions reflected society. Exploration of how styles can be used by theatrical costumers.

**THE 480 Methods of Teaching Theatre.** (4) F  
Application of materials, techniques, and theories for theatre with ninth- through twelfth-grade students. Emphasis on curriculum development and praxis. Prerequisite: theatre education concentration or written instructor approval.

**THE 500 Research Methods.** (1-3) F  
Introduction to graduate study in theatre.

**THE 504 Studies in Dramatic Theory and Criticism.** (3) F  
Dramatic theory, criticism, and aesthetics from the classical period to the 19th century. Related readings in dramatic literature. Prerequisite: Theatre major.

**THE 505 Studies in Dramatic Theory and Criticism.** (3) S  
Dramatic theory, criticism, and aesthetics from the 19th century to the present. Related readings in dramatic literature. Prerequisite: Theatre major.

**THE 510 Studies in Literature.** (1) F, S  
Assigned individual reading programs in standard sources and masterpieces in theatre literature. Topics may be selected from the following:

- (a) Acting-Directing
- (b) Criticism
- (c) Design-Technical
- (d) History

May be repeated for credit in different sections.

**THE 520 Theatre History and Literature I.** (3) F  
A survey of historiographical issues, historical periods, and theatre literature, through the 17th century.

**THE 521 Theatre History and Literature II.** (3) S  
A survey of historiographical issues, historical periods, and theatre literature, from the 17th century to present.

**THE 524 Advanced Studies in Theatre for Youth.** (3) F  
An in-depth study of the history, literature, and contemporary practice of theatre for youth. Prerequisite: written instructor approval.

**THE 591 Seminar.** (3) A  
Selected topics in child drama, community theatre, and theatre history. Prerequisite: written instructor approval.

**THE 700 Advanced Research Methods.** (3) F  
Critical review of research, development, and design of research in theatre and theatre for youth.

**THE 791 Seminar.** (3) N  
Selected topics offered on a revolving basis. May be repeated for credit when topic changes.

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

### THEATRE PERFORMANCE AND PRODUCTION (THP)

**THP 401 Theatre Practicum.** (1-3) F, S, SS  
Performance and production assignments for advanced students of acting, technical production, stage and business management, and design. May be repeated for credit. Prerequisite: written instructor approval.

**THP 406 Scenography.** (3) N  
The process of production collaboration. Taught in conjunction with THP 419. Prerequisites: THP 330 and 340 and 345 or written instructor approval.

**THP 411 Methods of Teaching Drama.** (3) F

Application of materials, techniques, and theories with grades K–8 youth. Regular participation with children. Prerequisite: THP 311 or written instructor approval.

**THP 414 Directing: The Production Concept.** (2) A

Play analysis, development, and implementation of the director's concept. Studio. Prerequisites: THP 315; written instructor approval.

**THP 415 Directing the Actor.** (3) A

Practical applications of directing for the stage. Rehearsal and presentation of scenes and short plays. Prerequisites: THP 414; written instructor approval.

**THP 419 Preproduction Workshop: Director/Designer Collaboration.** (3) A

Study and practice of the collaborative process necessary for developing a production concept. Various styles (realism, nonrealism, theatre for youth). Taught in conjunction with THP 406/506; cannot be enrolled concurrently with THP 406 or 506. Prerequisite: THP 415 or written instructor approval.

**THP 430 Costume Design.** (3) N

Principles of costume design, with projects in both modern and period styles. Prerequisite: THP 330.

**THP 431 Advanced Costume Construction.** (3) A

Specialized training in costume construction problems and crafts with projects in tailoring, millinery, and period accessories. Prerequisites: THP 330 and 331 or written instructor approval.

**THP 435 Advanced Technical Theatre.** (3) A

Selection of materials, drafting of working drawings, tool operation, and construction techniques. 2 hours lecture, 2 hours lab. Prerequisites: THP 340 and 345 or written instructor approval.

**THP 440 Advanced Scene Design.** (3) A

Advanced studio projects in designing scenery for a variety of stage forms. Prerequisite: THP 340 or written instructor approval.

**THP 441 Scene Painting.** (3) N

Studio projects in painting stage scenery. Prerequisite: THP 340 or written instructor approval.

**THP 442 Drawing.** (3) N

Techniques in drawing and rendering for scenic, costume, and lighting design. Prerequisite: written instructor approval.

**THP 444 Drafting for the Stage.** (3) N

Fundamentals of and practice in graphic techniques for the stage. Introduction to computer-aided design for the stage. 2 hours lecture, 3 hours studio. Prerequisites: THP 213; written instructor approval.

**THP 445 Advanced Lighting Design.** (3) N

Specialized techniques in stage lighting. Advanced application of design process, graphic techniques of design presentation, and use of qualities of light. Lecture, class workshops. Prerequisite: THP 345 or written instructor approval.

**THP 450 Theatre Organization and Management.** (3) N

Box office, house management procedures, production budgeting, and publicity. Prerequisite with a grade of "C" or higher: THE 220.

**THP 460 Playwrights Workshop.** (3) F, S

Practice and study of creating characters, dialogue, scenes, plays, and monologues for the stage. May be repeated for credit. Studio, lecture. Prerequisite: written instructor approval.

**THP 461 Scripts-in-Progress.** (3) F, S

Studio work with the instructor, centered on revisions of original plays. Preparing the script for productions, and rewriting while in production. May be repeated for credit. Studio. Prerequisite: THP 460 or written instructor approval.

**THP 472 Advanced Movement for the Stage.** (3) F

Movement techniques for the classical and nonrealistic theatre; stage combat and special skills. Prerequisites: THP 385 and acting concentration or written instructor approval.

**THP 477 Advanced Voice for the Stage.** (3) F

Exercises to develop vocal flexibility and power; mastery of elevated American diction and language skills applied to classical and nonrealistic drama; stage dialects. Prerequisites: THP 385 and acting concentration or written instructor approval.

**THP 481 Secondary School Play Production.** (3) F

Methods of directing, designing, and coordinating play production experiences at the secondary school level. Off-campus practicum. Prerequisites: THP 315 and theatre education concentration or written instructor approval.

**THP 484 Internship.** (1–4) A**THP 485 Acting: Advanced Classical Scene Study.** (3) S

Rehearsal and performance of period, classical, and nonrealistic plays. Emphasis on delivery of poetic language. Prerequisites: THP 385 and acting concentration or written instructor approval.

**THP 487 Acting for TV and Film.** (3) A

Professional television and film acting techniques, terminology, and on-camera experience. Prerequisites: THP 101 (or 102), 285; junior standing.

**THP 494 ST: Special Topics.** (1–4) A

Topics may be selected from the following:

- (a) Advanced Acting Techniques
- (b) Advanced Scene Painting
- (c) Advanced Screenwriting
- (d) Advanced Stage Management
- (e) Performance and Technology
- (f) Problems in Directing
- (g) Properties and Dressings Design and Construction
- (h) Solo and Collaborative Performance
- (i) Solo Performance
- (j) Stage Dialects
- (k) Standards in the School K–12
- (l) Storytelling
- (m) Technical Theatre III
- (n) Theatre of the Oppressed
- (o) Theory and Practice of Performance
- (p) Video and Industrial Scene Design

**THP 498 PS: Pro-Seminar.** (1–6) A

Topics may be selected from the following:

- (a) Directing
  - (b) Projects:
    - Costume Design
    - Lighting Design
    - Properties Design
    - Scenery Design
    - Technical Direction
  - (c) Stage Management
  - (d) Theatre for Youth Tour
  - (e) Theatre in Education
- Prerequisite: written instructor approval.

**THP 501 Performance: Solo Performance.** (8) A

Students begin to define their mission in art. Emphasis on the actor as a solo storyteller, speaking as herself or himself. Studio. Prerequisite: instructor approval.

**THP 502 Performance: Aesthetics of Theatre Art.** (8) A

Understanding and analyzing scripts and performance in order to be an effective actor/storyteller who speaks as a character. Projects focus on solo, duet performances. Studio. Prerequisite: instructor approval.

**THP 503 Performance: The Ensemble.** (8) A

The ensemble, working with a playwright, creates a play that addresses social issues through improvisation and community input. Studio. Prerequisite: instructor approval.

**THP 504 Acting: Transformation II.** (8) S

Fundamentals including combat, scansion, poetic language, acting style. Scene study, ensemble performance projects focused on Shakespeare, new scripts. Studio. Prerequisite: THP 503 or written instructor approval.

**THP 506 Scenography.** (3) N

The process of production collaboration. Taught in conjunction with THP 419. Prerequisite: theatre graduate standing or written instructor approval.

**THP 508 Multiethnic Workshop.** (3) F, S

Advanced workshop for development and presentation of works originating out of American ethnic cultures. Lecture, lab.

**THP 509 Singing for Actors.** (1) F, S

Introduction of the basics of singing technique. Breath control, resonance, articulation, exploration, and expansion of singing range. May be repeated for credit. Studio. Prerequisite: admission to M.F.A. Acting program or written instructor approval.

**THP 511 Improvisation with Youth Workshop.** (3) S

Theories and techniques of drama with various populations of youth. Emphasis on how research informs practice. Practicum included. Prerequisites: THP 411 or graduate standing and written instructor approval.

**THP 512 Puppetry Workshop.** (3) F, S

Survey of puppetry in education, puppetry as an art form in design and performance. Lab fee required. Prerequisite: graduate standing or written instructor approval.

**THP 515 Problems in Directing.** (3) S

Analysis of common directing problems. Topics include: creating the ensemble, conceptual unity, metaphor, nonliteral strategies, and organizational responsibilities of the director. Prerequisite: written instructor approval.

**THP 517 Stage Management Practicum.** (3) F

Readings and research in stage management and participation as a stage manager in a University Theatre production. Prerequisite: written instructor approval.

**THP 519 Directing: Works in Progress.** (3) F

Advanced projects in directing concentrating on a collaborative process between director, playwright, actors, and designers. Focus is primarily on new scripts or adaptations of literature. May be repeated for credit. Studio, on-site practicum. Prerequisites: graduate standing; written instructor approval.

**THP 530 Advanced Costume Design.** (3) N

Advanced studio projects in costume design for a variety of production forms. Prerequisite: written instructor approval.

**THP 540 Scene Design Applications.** (3) N

Conceptual and practical application of the design process including graphic and sculptural projects. Practical design problems investigated in laboratory. Lab fee. Prerequisite: written instructor approval.

**THP 545 Lighting Design Applications.** (3) N

Advanced studio projects in stage lighting design. Prerequisite: written instructor approval.

**THP 560 Playwright's Workshop.** (3) F, S

Practice and study of creating characters, dialogue, scenes, plays, and monologues for the stage. May be repeated for credit. Studio. Prerequisite: written instructor approval.

**THP 561 Scripts in Progress.** (3) F, S

Studio work with the instructor centered on revisions of original plays. Preparing the script for productions and rewriting while in production. May be repeated for credit. Studio. Prerequisite: THP 560 or written instructor approval.

**THP 562 Literary Management Workshop.** (3) F

Advanced literary management for the contemporary theater, including trends in new play development, festivals and productions throughout the United States. Participation in Arizona Playwriting Competition. Prerequisite: THP 560 or written instructor approval.

**THP 584 Internship.** (1–3) A

Field research and on-site training in theatre for youth, community theatre, and production techniques. Prerequisite: written instructor approval.

**THP 593 Applied Projects.** (1–12) A

Prerequisite: written instructor approval.

**THP 594 Conference and Workshop in Child Drama.** (3) A

Prerequisite: written instructor approval.

**THP 598 ST: Special Topics.** (1–4) A

Topics may be selected from the following:

- (a) Acting
  - (b) Advanced Screenwriting
  - (c) College Teaching:
    - Acting
    - Dramatic Analysis
    - Improvisation with Youth
    - Movement
    - Puppetry
    - Voice
  - (d) Directing
  - (e) Performance and Technology
  - (f) Solo and Collaborative Performance
  - (g) Solo Performance
  - (h) Stage Dialects
  - (i) Stage Management
  - (j) Theatre of the Oppressed
  - (k) Works in Progress:
    - Actor
    - Playwright.
- Lecture, studio.

**THP 611 Improvisation with Youth Seminar.** (3) A

Examination of current research, theory, and practices in drama with youth. Development and execution of research projects. Prerequisite: written instructor approval.

**THP 618 Directing Practicum.** (3) A

Practical experience in directing and producing an entire play or musical for young audiences. Prerequisite: written instructor approval.

**THP 649 Design Studio.** (3) F, S

Projects include design of scenery, costume, lighting, or sound for laboratory or mainstage productions. May be repeated for credit. Prerequisite: written instructor approval.

**THP 684 Internship.** (3–6) F, S, SS

Field research in acting, improvisation with youth, theatre for youth, puppetry, and scenography. Prerequisite: written instructor approval.

**THP 691 Seminar: Scenography.** (3) N

Examination of and research into modern concepts and practices of scenography. Prerequisite: written instructor approval.

**THP 693 Applied Project.** (1–12) F, S, SS

Final projects for M.F.A. Theatre candidates in acting, scenography, and theatre for youth. Prerequisite: written instructor approval.

**THP 783 Field Work.** (1–12) A

(a) Theatre Education

**Omnibus Graduate Courses:** See page 51 for omnibus graduate courses that may be offered.

## Theory and Composition

See "Music," page 251.

## Transportation Systems

### Interdisciplinary Certificate Program

**Mary Kihl**

*Director*

(ARCH 119) 480/965-6395

Fax 480/965-3635

### Aeronautical Management Technology (ASU East)

Professor: Gesell;

Assistant Professors: Jackson, Karp

### Civil and Environmental Engineering

Professors: Mamlouk, Matthias;

Assistant Professors: Owusu, Zhu

### Geography

Professor: Burns;

Associate Professor: Kuby

### Planning and Landscape Architecture

Professors: Kihl, Mushkatel, Pijawka;

Associate Professor: Guhathakarta

Under the auspices of the Graduate College, the interdisciplinary Certificate in Transportation Systems program is administered by the Committee on Transportation Systems. The objective of this program is to enable existing ASU graduate students and transportation professionals with advanced degrees to examine transportation-related issues from a variety of perspectives and in the context of different travel modes.

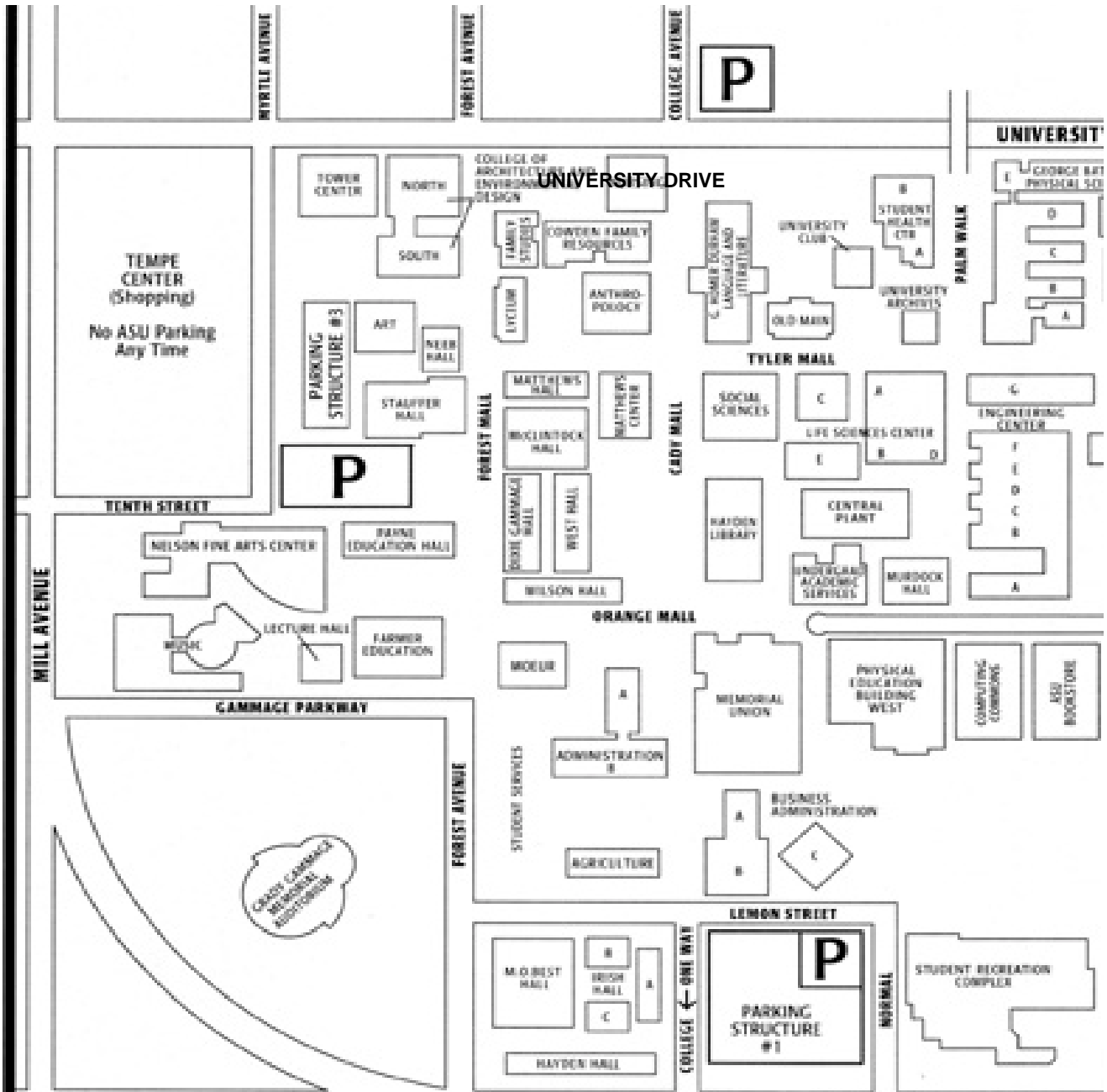
The certificate program requires a minimum of 15 semester hours of course work. To qualify for the certificate, the student must complete an interdisciplinary issues proseminar class (three semester hours), complete three elective courses (nine semester hours) from an approved list of transportation-related courses in at least two disciplines that are outside the student's degree program, and complete a capstone research paper that explores a transportation problem from a multidisciplinary perspective (three semester hours). A thesis in the area of transportation may substitute for the capstone paper.

Master's degree candidates in good standing in participating departments or current practicing professionals who already hold a graduate degree may apply for admission to the certificate program. The applications will be reviewed by the Transportation Systems Certificate Admissions and Advisory Committee, made up of representatives of participating departments. Enrollment in all classes outside the major requires permission of the instructor. For more information, contact the program director, 480/965-6395.



Professor David Pijawka discusses policy issues with Master of Environmental Planning students.

Tim Trumble photo

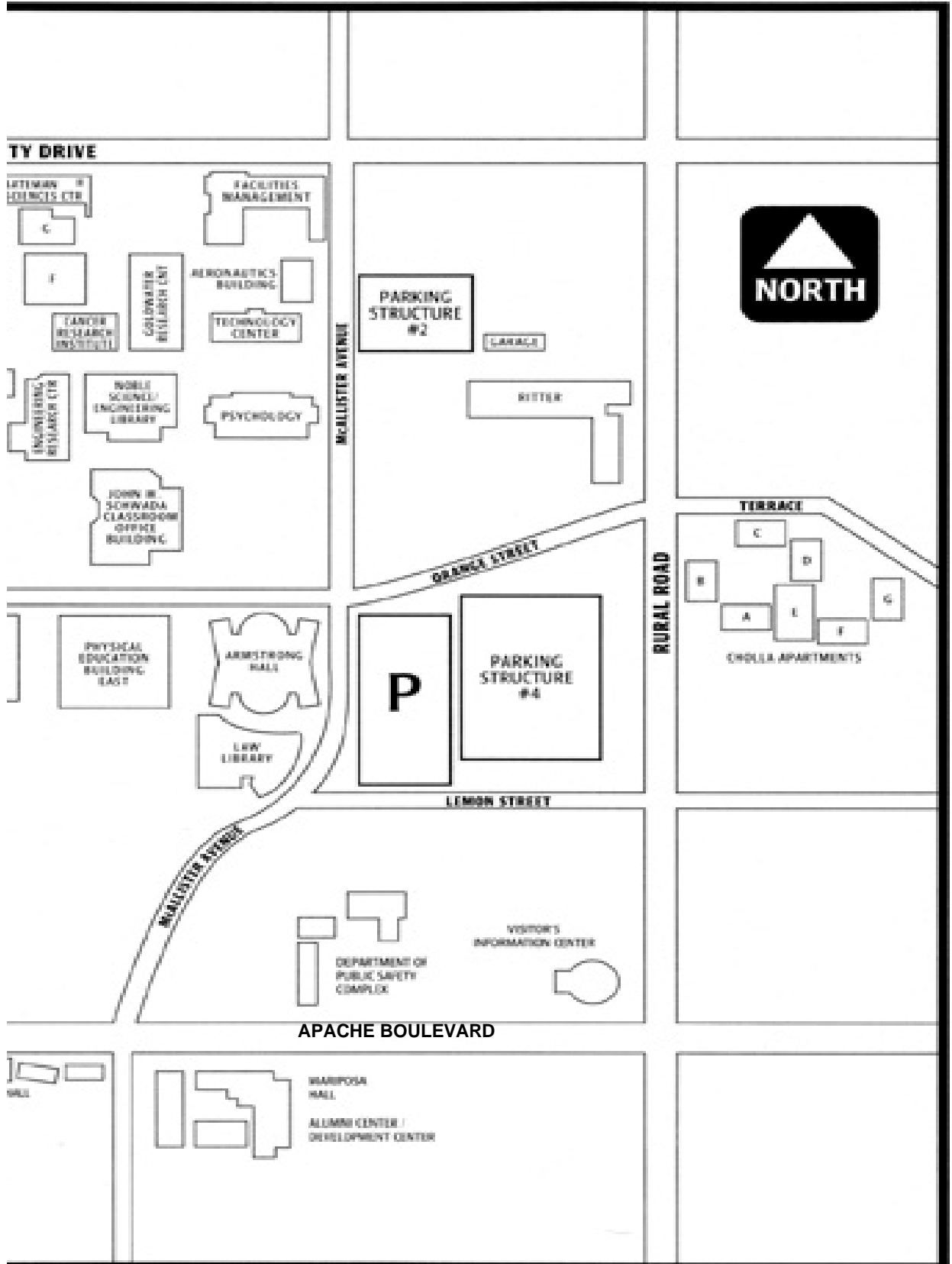


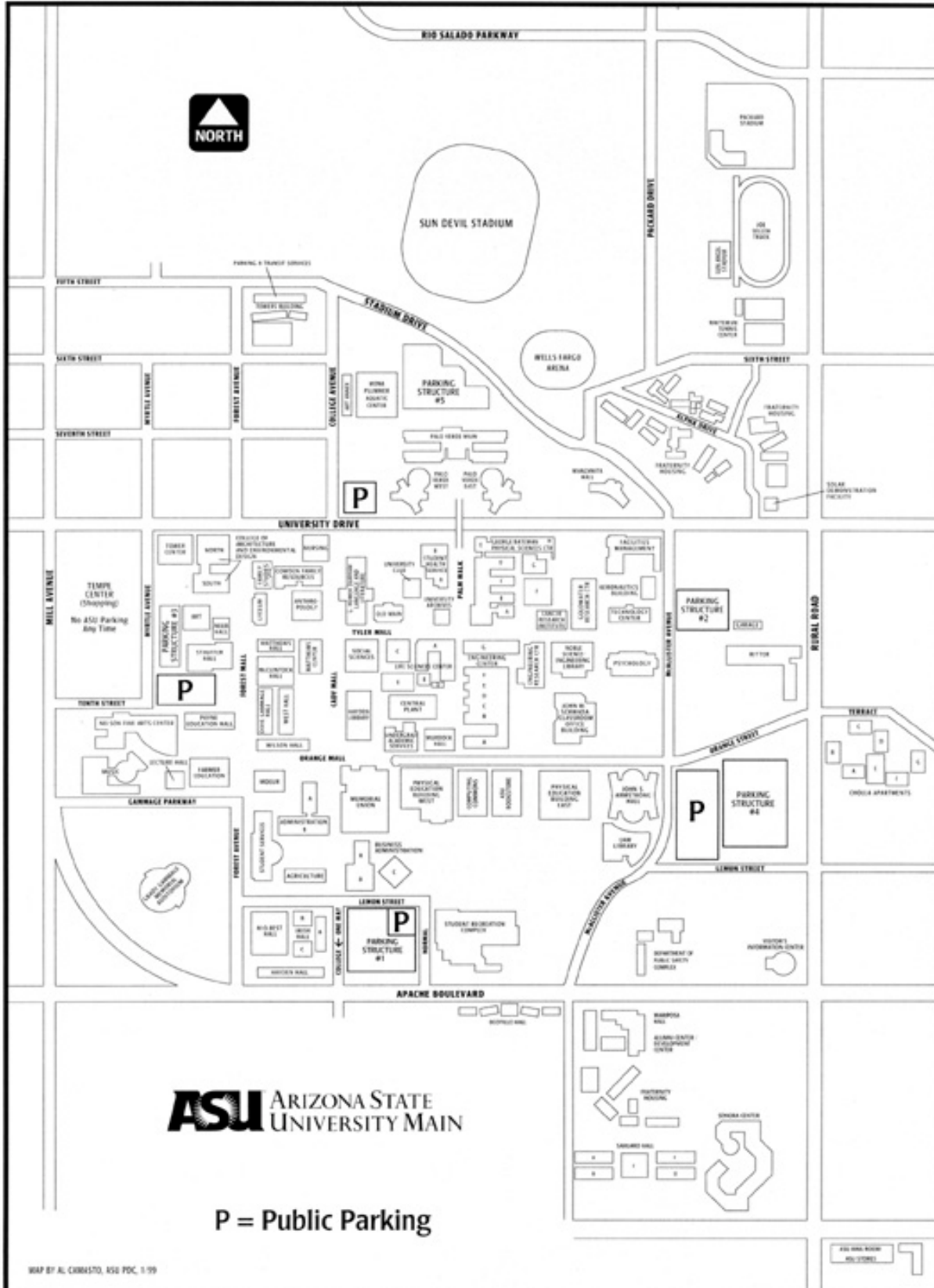
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**ASU** ARIZONA STATE UNIVERSITY MAIN

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# Academic Directory

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Effective Sept. 1, 1999, the area code is 480 for all numbers at ASU Main, ASU East,  
and Downtown Center but remains 602 for ASU West.

## **Graduate College**

Admissions Office . . . . .	965-6113
Advising Office . . . . .	965-3521
Format Office . . . . .	965-3521
General Office . . . . .	965-3521

## **College of Architecture and Environmental Design**

Architecture, School of . . . . .	965-3536
Design, School of . . . . .	965-4135
Planning and Landscape Architecture, School of . . . . .	965-7167

## **College of Business**

Accountancy and Information Management, School of . . . . .	965-3631
Business Administration, Department of . . . . .	965-3231
Economics, Department of . . . . .	965-3531
Finance, Department of . . . . .	965-3131
Health Administration and Policy, School of . . . . .	965-7778
Inquiries regarding Ph.D. in Business Administration and M.B.A. . . . .	965-3332
Management, Department of . . . . .	965-7586
Marketing, Department of . . . . .	965-3621
Supply Chain Management, Department of . . . . .	965-3231

## **College of Education**

Curriculum and Instruction, Division of . . . . .	965-1644
Educational Leadership and Policy Studies, Division of . . . . .	965-6248
Psychology in Education, Division of . . . . .	965-3384

## **College of Engineering and Applied Sciences**

Chemical, Bio, and Materials Engineering, Department of . . . . .	965-3313
Civil and Environmental Engineering, Department of . . . . .	965-3589
Computer Science and Engineering, Department of . . . . .	965-3190
Construction, Del E. Webb, School of . . . . .	965-3615
Electrical Engineering, Department of . . . . .	965-3590
Engineering, School of . . . . .	965-1726
Industrial and Management Systems Engineering, Department of . . . . .	965-3185
Mechanical and Aerospace Engineering, Department of . . . . .	965-3291

## **College of Fine Arts**

Art, School of . . . . .	965-3468
Dance, Department of . . . . .	965-5029
Music, School of . . . . .	965-3371
Theatre, Department of . . . . .	965-5359

## **College of Law**

Admissions Office . . . . .	965-1474
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## **College of Liberal Arts and Sciences**

Anthropology, Department of . . . . .	965-6213
Biology, Department of . . . . .	965-3571
Chemistry and Biochemistry, Department of . . . . .	965-4664
English, Department of . . . . .	965-3168
Exercise Science and Physical Education, Department of . . . . .	965-3591
Family Resources and Human Development, Department of . . . . .	965-6978
Geography, Department of . . . . .	965-7533
Geology, Department of . . . . .	965-5081
History, Department of . . . . .	965-5778
Humanities . . . . .	965-6747

Languages and Literatures, Department of . . . . .	.965-6281
Mathematics, Department of . . . . .	.965-3951
Microbiology, Department of . . . . .	.965-1457
Molecular and Cellular Biology . . . . .	.965-0743
Philosophy, Department of . . . . .	.965-3394
Physics and Astronomy, Department of . . . . .	.965-3561
Plant Biology, Department of . . . . .	.965-3414
Political Science, Department of . . . . .	.965-7667
Psychology, Department of . . . . .	.965-3326
Religious Studies, Department of . . . . .	.965-7145
Sociology, Department of . . . . .	.965-3546
Speech and Hearing Science, Department of . . . . .	.965-2374
Biology, Department of . . . . .	.965-3571

### **College of Nursing**

Graduate Program . . . . .	.965-3948
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### **College of Public Programs**

Communication, Department of . . . . .	.965-5096
Journalism and Telecommunication, Walter Cronkite School of . . . . .	.965-5011
Justice Studies, School of . . . . .	.965-7682
Public Affairs, School of . . . . .	.965-3926
Recreation Management and Tourism, Department of . . . . .	.965-7291
School of Social Work . . . . .	.965-2795

### **Interdisciplinary Programs**

Communication . . . . .	.965-5096
Creative Writing . . . . .	.965-7454
Curriculum and Instruction . . . . .	.965-1448
Exercise Science . . . . .	.965-7664
Gerontology . . . . .	.965-3225
Justice Studies . . . . .	.965-7071
Public Administration . . . . .	.965-4505
Science and Engineering of Materials . . . . .	.965-2460
Speech and Hearing Science . . . . .	.965-8227
Statistics . . . . .	.965-5628
Transportation Systems . . . . .	.965-6395

### **ASU East**

Aeronautical Management Technology, Department of . . . . .	.727-1775
Agribusiness and Resource Management, School of . . . . .	.727-1585
Electronics and Computer Engineering Technology, Department of . . . . .	.727-1191
Information and Management Technology, Department of . . . . .	.727-1781
Manufacturing and Aeronautical Engineering Technology, Department of . . . . .	.727-1584
Technology and Applied Sciences, College of . . . . .	.727-1874

### **ASU West**

See page 384.

# ASU Main Faculty and Academic Professionals

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The faculty and academic professionals listed are involved in undergraduate and graduate instruction and research.  
The year of first appointment follows the name. Emeriti are included.

## A

**Aannestad, Per** (1975), Associate Professor of Physics and Astronomy; B.S., University of Oslo (Norway); Ph.D., University of California, Berkeley

**Abele, Deborah** (1990), Faculty Associate of Planning and Landscape Architecture; B.A., Vassar College

**Aberle, James T.** (1989), Associate Professor of Electrical Engineering; B.S., M.S., Polytechnic Institute of New York; Ph.D., University of Massachusetts, Amherst

**Abraham, Willard** (1953), Professor Emeritus of Special Education; B.S., Illinois Institute of Technology; M.Ed., Chicago Teachers College; Ph.D., Northwestern University

**Abston, Deborah** (1990), Associate Librarian, Access Services, Hayden Reference Service; B.S., M.S.L.S., Wayne State University

**Acereda, Alberto** (1998), Assistant Professor of Latin American Literature; Licenciado, University of Barcelona (Spain); M.A., Ph.D., University of Georgia

**Acevedo, Roberto M.** (1964), Professor Emeritus of Spanish; B.A., University of California, Berkeley; M.A., Ph.D., University of Arizona

**Acharya, Raghunath** (1976), Associate Professor of Physics and Astronomy; B.Sc., M.Sc., University of Delhi (India); Ph.D., University of Rochester

**Acker, Barbara** (1991), Associate Professor of Theatre; B.F.A., University of Texas, Austin; M.A., Case Western Reserve University; Ph.D., Wayne State University

**Acker, William J.** (1970), Professor Emeritus of Geography; B.S., Purdue University; M.S., University of Kansas; M.A., Ph.D., Syracuse University

**Adams, Donna** (1983), Associate Professor of Nursing; B.S.N., University of Missouri, Columbia; M.S., Arizona State University; D.N.Sc., University of San Diego

**Adams, James B.** (1996), Professor of Materials Science and Engineering; Interim Codirector, Science and Engineering of Materials; B.S., Duke University; M.S., Ph.D., University of Wisconsin, Madison

**Adams, Karen L.** (1984), Associate Professor of English; Director, Program for Southeast Asian Studies; B.A., M.A., Ph.D., University of Michigan

**Adelman, Madelaine** (1998), Assistant Professor of Justice Studies; A.B., Ph.D., Duke University

**Adelson, Roger D.** (1974), Professor of History; B.A., George Washington University; B.Litt., University of Oxford (United Kingdom); M.A., Ph.D., Washington University

**Aerni, Wayne** (1991), Faculty Associate of Public Affairs; B.A., University of Oregon; M.P.A., D.P.A., Arizona State University

**Agadjanian, Victor** (1995), Assistant Professor of Sociology; B.A., Moscow State University; M.S., Ph.D., University of Southern California

**Aguiar, John L.** (1976), Professor Emeritus of Anthropology; B.A., University of California, Los Angeles; M.A., California State University, Los Angeles; Ph.D., University of California, San Diego

**Ahn, Seung C.** (1990), Associate Professor of Economics; B.A., Sogang University (Korea); M.A., Ph.D., Michigan State University

**Aiken, Leona S.** (1985), Professor of Psychology; B.S., Virginia Commonwealth University; M.S., Ph.D., Purdue University

**Akins, William H.** (1975), Professor Emeritus of Theatre; B.A., Duke University; M.A., Ph.D., University of Denver

**Alarcon, Ricardo O.** (1989), Associate Professor of Physics and Astronomy; B.S., M.S., University of Chile (Chile); Ph.D., Ohio University

**Alberts, Jess K.** (1989), Associate Professor of Communication; Chair, Department of Communication; B.S.Ed., M.A., Abilene Christian University; Ph.D., University of Texas, Austin

**Alcock, John** (1972), Regents' Professor of Biology; B.A., Amherst College; Ph.D., Harvard University

**Alcorn, Marianne S.** (1981), Law Librarian, Reference; B.A., University of Washington; M.L.S., University of Southern California

**Aldama, Arturo** (1996), Assistant Professor of Chicana and Chicano Studies; B.A., Evergreen State University; M.A., Ph.D., University of California, Berkeley

**Aldrick, Frank T.** (1969), Associate Professor of Geography; B.A., University of Texas, Austin; M.S., Ph.D., Oregon State University

**Alexander, Robert J.** (1975), Professor of German; B.A., Macalester College; M.A., Ph.D., University of Wisconsin, Madison

**Alford, Terry L.** (1993), Associate Professor of Materials Science and Engineering; B.S., M.S., North Carolina State University, Raleigh; Ph.D., Cornell University

**Alisky, Marvin** (1957), Professor Emeritus of Political Science; B.A., M.A., Ph.D., University of Texas, Austin

**Alee, David R.** (1991), Associate Professor of Electrical Engineering; B.S.E.E., University of Cincinnati; M.S.E.E., Ph.D., Stanford University

**Allen, Craig M.** (1991), Associate Professor of Journalism and Telecommunication; B.A., Linfield College; M.S., University of Oregon; Ph.D., Ohio University

**Allen, James P.** (1989), Associate Professor of Chemistry and Biochemistry; B.S., Saint Joseph's University; M.S., Ph.D., University of Illinois

**Allison, Maria T.** (1984), Professor of Recreation Management and Tourism; B.S., M.S., University of New Mexico; Ph.D., University of Illinois

**Allstot, David J.** (1998), Professor of Electrical Engineering; B.S.E.S., University of Portland; M.S.E.E., Oregon State University; Ph.D., University of California, Berkeley

**Alozie, Nicholas O.** (1991), Associate Professor of Public Affairs; B.A., M.P.A., Texas Southern University; M.A., Ph.D., University of Texas, Dallas

**Alpers, Rojann** (1995), Assistant Professor of Nursing; B.S.N., M.S., Arizona State University; Ph.D., University of Iowa

**Alquist, Lewis R.** (1984), Professor of Art; B.F.A., Florida Atlantic University; M.F.A., Cranbrook Academy of Art

- Altheide, David L.** (1973), Regents' Professor of Justice Studies; B.A., Central Washington State College; M.A., University of Washington; Ph.D., University of California, San Diego
- Alvarado, Ronald H.** (1974), Professor Emeritus of Biology; B.A., University of California, Riverside; M.S., Ph.D., Washington State University
- Alvarez, Robert** (1998), Instructor of Military Science; Admin NCO
- Alvarez, Robert R. Jr.** (1989), Professor of Anthropology; B.A., Northern Arizona University; M.A., San Diego State University; M.A., Ph.D., Stanford University
- Ames, James G.** (1985), Senior Research Associate, Manufacturing Institute; B.S., San Diego State University
- Amundson, Susan** (1995), Assistant Professor of Supply Chain Management; B.S., Moorhead State University; M.B.A., College of St. Thomas; Ph.D., University of Minnesota
- Anderson, Douglas A.** (1979), Cronkite Endowment Board of Trustees Professor of Journalism and Telecommunication; Director, Walter Cronkite School of Journalism and Telecommunication; B.A., Hastings College; M.S., Kearney State College; Ph.D., Southern Illinois University, Carbondale
- Anderson, Edward F.** (1993), Adjunct Professor of Plant Biology; B.A., Pomona College; M.A., Ph.D., Claremont Graduate School and Rancho Santa Ana Botanic Garden
- Anderson, Gary** (1975), Associate Professor of Reading and Library Science; B.S., M.Ed., Edinboro State College; Ph.D., University of Pittsburgh
- Anderson, James R.** (1984), Associate Research Scientist of Chemistry and Biochemistry; B.A., Williams College; Ph.D., California Institute of Technology
- Anderson, Karen** (1987), Faculty Associate of Nursing; B.S., M.S., Arizona State University
- Anderson, Marcia L.** (1986), Librarian, Collection Development; B.A., University of Michigan; M.L.S., Wayne State University
- Anderson, Melvin S.** (1967), Professor Emeritus of Finance; B.S., M.S., Oklahoma State University; Ed.D., University of Arkansas
- Anderson-Rowland, Mary R.** (1974), Associate Professor of Industrial and Management Systems Engineering; Associate Dean, Student Affairs and Special Programs; B.A., Hope College; M.S., Ph.D., University of Iowa
- Andress, Barbara L.** (1972), Professor Emeritus of Music; B.A., M.A., Arizona State University
- Angell, C. Austen** (1989), Regents' Professor of Chemistry and Biochemistry; B.S., M.S., Melbourne University (Australia); Ph.D., University of London (United Kingdom)
- Anijar, Karen Z.** (1998), Assistant Professor of Elementary Education; B.A., Florida State University; M.A., Ph.D., University of North Carolina, Greensboro
- Appleton, Nicholas R.** (1972), Professor of Educational Policy Studies; Director, Division of Curriculum and Instruction; Associate Dean for Teacher Education; B.A., San Francisco State University; M.A., California State University, Northridge; Ed.D., University of Massachusetts, Amherst
- Aranda, Luis** (1975), Associate Professor of Legal and Ethical Studies; B.M., M.Ed., University of Arizona; J.D., Arizona State University
- Arciniega, G. Miguel** (1979), Associate Professor of Counselor Education; B.S., M.A., New Mexico State University; Ph.D., University of Arizona
- Arias, M. Beatriz** (1989), Associate Professor of Multicultural Education; B.A., M.A., Occidental College; Ph.D., Stanford University
- Armbruster, Charlotte** (1997), Faculty Associate of Nursing; B.S.N., M.S., Arizona State University
- Armbruster, Dieter** (1989), Professor of Mathematics; Associate Chair, Graduate Studies; Abitur, Zeppelin Gymnasium (Germany); Diplom, Ph.D., University of Tübingen (Germany)
- Armentdt, Brad** (1989), Associate Professor of Philosophy; Chair, Department of Philosophy; B.A., Rice University; Ph.D., University of Illinois, Chicago
- Armstrong, Robert L.** (1967), Professor Emeritus of Secondary Education; B.A., State Teachers College of Iowa; M.S., University of Iowa; Ed.D., University of Arizona
- Arner, Douglas G.** (1959), Professor Emeritus of Philosophy; B.S., Creighton University; M.A., Ph.D., University of Michigan
- Arnold, William E.** (1973), Professor of Communication; Director, Gerontology Program; B.S., M.A., Northern Illinois University; Ph.D., Pennsylvania State University
- Arntzen, Charles J.** (1997), Adjunct Professor of Plant Biology; B.S., M.S., University of Minnesota; Ph.D., Purdue University
- Aronson, Jerome M.** (1966), Professor Emeritus of Plant Biology; B.A., Ph.D., University of California, Berkeley
- Arreola, Daniel** (1990), Professor of Geography; B.A., University of California, Los Angeles; M.A., California State University, Hayward; Ph.D., University of California, Los Angeles
- Arrowsmith, Ramon** (1995), Assistant Professor of Geology; B.A., Whittier College; Ph.D., Stanford University
- Arterian, Hannah** (1979), Professor of Law; Associate Dean, College of Law; B.A., Elmira College; J.D., University of Iowa
- Ashcraft, Robert F.** (1995), Assistant Professor of Recreation Management and Tourism; Director, Nonprofit Leadership and Management Program; B.A., University of Arizona; M.A., Northern Arizona University; Ph.D., Arizona State University
- Ashcroft, Edward A.** (1988), Professor of Computer Science and Engineering; B.A., Cantab (United Kingdom); Ph.D., Imperial College of London (United Kingdom)
- Ashe, Robert W.** (1955), Professor Emeritus of Education; A.B., M.A., Arizona State University; Ed.D., University of Southern California
- Ashford, Jose B.** (1984), Professor of Social Work; B.A., Loyola University, New Orleans; M.S.W., Ohio State University; Ph.D., Bowling Green State University
- Ashforth, Blake** (1996), Professor of Management; B.Comm., Ph.D., University of Toronto (Canada)
- Ashley, Richard** (1981), Associate Professor of Political Science; B.A., University of California, Santa Barbara; M.A., Ph.D., Massachusetts Institute of Technology
- Atsumi, Takayori P.** (1968), Professor of Music; B.F.A., Kunitachi Music College (Japan); M.M., New England Conservatory of Music
- Augsburg, Tanya** (1997), Lecturer, Division of Undergraduate Academic Services; B.A., New York University; M.A., Ph.D., Emory University
- Aulerich, Christopher E.** (1989), Faculty Associate, Del E. Webb School of Construction
- Ax, Leland S.** (1959), Professor Emeritus of Engineering; B.S.E., B.S.R.E., Tri-State College; M.S., Kansas State College
- Axelrod, Morris** (1972), Professor Emeritus of Sociology; B.A., Ph.D., University of Michigan
- Axford, Roger W.** (1975), Professor Emeritus of Secondary Education; B.A., Nebraska Wesleyan University; M.A., Ph.D., University of Chicago
- Azuma, Tamiko** (1998), Assistant Professor of Speech and Hearing Science; B.A., University of California, Santa Cruz; M.A., Ph.D., Arizona State University

## B

**Backhaus, Ralph A.** (1977), Professor of Plant Biology; B.S., Rutgers, The State University of New Jersey; M.S., Ph.D., University of California, Davis

- Backus, Charles E.** (1968), Professor of Electrical Engineering; Provost, Arizona State University East; B.S.M.E., Ohio University; M.S., Ph.D., University of Arizona
- Bacon, Catherine K.** (1990), Clinical Associate Professor of Speech and Hearing Science; B.A., University of California, Santa Barbara; M.A., University of Minnesota
- Bacon, Sid P.** (1988), Professor of Speech and Hearing Science; B.G.S., M.A., University of Kansas; Ph.D., University of Minnesota, Twin Cities
- Bacon, Thomas** (1993), Professor of Music; B.S., Oakland University
- Badger, William W.** (1985), Professor of Construction; Director, Del E. Webb School of Construction; B.S.M.E., Auburn University; M.S.C.E., Oklahoma State University; Ph.D., Iowa State University
- Baer, Steven M.** (1988), Associate Professor of Mathematics; B.S., M.S., Ph.D., University of Illinois
- Bagwell, Marilyn** (1972), Associate Professor of Nursing; B.S.N., University of California, Los Angeles; M.A., Arizona State University; Ph.D., Texas Woman's University
- Bahr, Donald M.** (1967), Professor of Anthropology; A.B., M.A., Ph.D., Harvard University
- Bailey, James E.** (1974), Professor of Industrial and Management Systems Engineering; B.S.I.E., M.S.I.E., Ph.D., Wayne State University
- Baker, Aaron** (1992), Assistant Professor of Interdisciplinary Humanities; B.A., Hobart College; M.A., Ph.D., Indiana University
- Baker, Brenda J.** (1998), Assistant Professor of Anthropology; B.A., Northwestern University; M.A., Ph.D., University of Massachusetts, Amherst
- Baker, Dale R.** (1989), Professor of Secondary Education; B.A., University of Oklahoma; M.A.T., Trenton State College; Ed.D., Rutgers, The State University
- Baker, Dwayne A.** (1997), Assistant Professor of Recreation Management and Tourism; B.S., University of Saskatchewan (Canada); M.S., University of Illinois; Ph.D., Texas A&M University
- Baker, Lawrence A.** (1992), Assistant Professor of Civil and Environmental Engineering; B.S., Pennsylvania State University; M.S., Utah State University; Ph.D., University of Florida
- Balanis, Constantine A.** (1983), Regents' Professor of Electrical Engineering; Director, Telecommunications Research Center; B.S.E.E., Virginia Polytechnic Institute and State University; M.E.E., University of Virginia; Ph.D., Ohio State University
- Balasubramanian, Krishnan** (1983), Professor of Chemistry and Biochemistry; M.Sc., Birla Institute of Technology Science (India); M.A., Ph.D., Johns Hopkins University
- Balcazar, Hector** (1989), Associate Professor of Family Resources and Human Development; B.S., Iberoamericana University (Mexico); M.S., Ph.D., Cornell University
- Baldini, Pier Raimondo** (1978), Professor of Italian; B.A., San Francisco State University; M.A., University of British Columbia (Canada); Ph.D., University of California, Los Angeles
- Ball, Terence** (1998), Professor of Political Science; B.A., University of California, Santa Cruz; M.A., Ph.D., University of California, Berkeley
- Ballew, Tad** (1998), Assistant Professor of Interdisciplinary Humanities; B.A., University of California, Santa Barbara; M.A., Hunter College, City University of New York
- Balling, Robert C.** (1987), Professor of Geography; Director, Climatology Laboratory; A.B., Wittenberg University; M.A., Bowling Green State University; Ph.D., University of Oklahoma
- Ballon-Aguirre, Enrique** (1992), Professor of Spanish; Bachiller en Letras, Bachiller en Derecho, University of Arequipa (Peru); Doctor en Literatura, The National University of San Marcos (Peru); Doctorat en Études Iberiques, University of Paris III (France)
- Balogh, Stephen** (1998), Lecturer of Computer Information Systems, School of Accountancy and Information Management; B.S., M.A., Ph.D., Ohio State University
- Bantz, Charles R.** (1986), Professor of Communication; Vice Provost, Office of the Senior Vice President and Provost; B.S., M.A., University of Minnesota, Twin Cities; Ph.D., Ohio State University
- Barcelo, Hélène** (1990), Associate Professor of Mathematics; Ms.C., University of Quebec (Canada); Ph.D., University of California, San Diego
- Bardrick, Richard A.** (1956), Professor Emeritus of Psychology; A.B., Ph.D., University of California, Los Angeles
- Barker, David** (1983), Professor of Theatre; B.S.E., Duquesne University; M.F.A., Rutgers, The State University
- Barkley, Margaret V.** (1963), Professor Emeritus of Family Resources and Human Development; B.S., Millikin University; M.S., Ed.D., University of Illinois
- Barlow, Richard B.** (1964), Professor Emeritus of History; B.A., M.A., Ph.D., University of Pennsylvania
- Barnard, John P.** (1991), Associate Learning Resources Specialist, Library Instruction, Systems, and Technology; B.S., State University of New York; M.Ed., Arizona State University
- Barnes, Andrew** (1996), Associate Professor of History; B.A., Wesleyan University; M.A., Ph.D., Princeton University
- Barona, Andrés** (1986), Professor of Education; B.S., M.Ed., Texas A&M University; Ph.D., University of Texas, Austin
- Barone, Thomas** (1990), Professor of Curriculum and Instruction and Educational Leadership and Policy Studies; B.A., Loyola University, New Orleans; M.A., University of New Orleans; Ed.D., Stanford University
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- Whitcotton, Stacey** (1997), Assistant Professor of Accountancy, School of Accountancy and Information Management; B.A., Texas Tech University; Master of Accountancy, Ph.D., University of Oklahoma
- Whitehouse, Richard** (1997), Lecturer of Computer Science and Engineering; B.S., Worcester State College; M.S., University of Tennessee
- Whysong, Gary L.** (1974), Associate Professor of Environmental Resources; B.S., M.S., Montana State University; Ph.D., University of Wyoming
- Wie, Bong** (1989), Professor of Engineering; B.S., Seoul National University (South Korea); M.S., Ph.D., Stanford University
- Wiesel, Avi** (1995), Assistant Professor of Construction; B.Sc.C.E., Polytechnic Institute of Timisoara (Romania); M.Sc.C.E., Ph.D., Technion-Israel Institute of Technology (Israel)
- Wiggins, Harry B.** (1987), Senior Lecturer Emeritus of Supply Chain Management; B.S., U.S. Merchant Marine Academy; B.S., University of Vermont; M.B.A., Harvard University
- Wilcox, M. Jeanne** (1990), Professor of Speech and Hearing Science; Chair, Department of Speech and Hearing Science; B.A., Kansas State; M.A., Ph.D., Memphis State University
- Wilkins, Barry J.** (1992), Research Specialist, Center for Solid-State Science; B.A., Columbia Union College; M.S., Rutgers, The State University
- Wilkinson, Christine K.** (1970), Associate Professor of Higher Education; Vice President for Student Affairs; B.A., Arizona State University; M.A., University of California, Berkeley; Ph.D., Arizona State University
- Wilkinson, Joseph W.** (1964), Professor Emeritus of Accountancy, School of Accountancy and Information Management; B.S., Carnegie Institute of Technology; M.B.A., Stanford University; D.B.A., University of Oregon
- Williams, Carole E.** (1984), Academic Associate, Division of Undergraduate Academic Services; Coordinator, Campus Match; Coordinator, Supplemental Instruction; B.A., Trinity University, San Antonio; M.A., Arizona State University
- Williams, Frank G.** (1975), Professor of Health Administration and Policy; B.S., M.A., Oregon State University; M.A., Ph.D., University of Iowa

- Williams, Jenny L.** (1967), Associate Librarian, Original Cataloging; B.A., M.L.S., Indiana University
- Williams, Peter** (1981), Professor of Chemistry and Biochemistry; B.S., Ph.D., University of London (United Kingdom)
- Williams, Philip F.C.** (1986), Associate Professor of Chinese; B.A., University of Arkansas; M.A., Ph.D., University of California, Los Angeles
- Williams, Robert C.** (1978), Professor of Anthropology; B.A., M.A., University of Cambridge (United Kingdom); B.A., M.A., Ph.D., University of Michigan
- Williams, Stanley N.** (1991), Professor of Geology; B.S., Beloit College; M.A., Ph.D., Dartmouth College
- Williamson, Madeline J.** (1976), Professor of Music; B.A., Ohio Wesleyan University; M.M., Western Michigan University; Ph.D., Arizona State University
- Willis, Wayne T.** (1989), Associate Professor of Exercise Science and Physical Education; A.B., University of California, Berkeley; M.A., San Francisco State University; Ph.D., University of California, Berkeley
- Wills, J. Robert** (1994), Professor of Theatre; Dean, College of Fine Arts; B.A., College of Wooster; M.A., University of Illinois; Ph.D., Case Western Reserve University
- Wilson, Gail Eugene** (1972), Associate Professor of Music; B.S., Ohio State University; M.M., Arizona State University
- Wilson, Gloria N.** (1961), Associate Professor Emeritus of Educational Media and Computers; B.A., Montclair State College; M.A., Ed.D., Columbia University
- Wilson, Jeffrey R.** (1985), Associate Professor of Statistics; B.A., University of the West Indies (Trinidad and Tobago); M.S., Ph.D., Iowa State University
- Wilson, Lorna A.** (1968), Instructor Emeritus of French; B.Ed., University of Saskatchewan (Canada); M.A., Arizona State University
- Wilson, Patricia M.** (1987), Associate Professor of Family Resources and Human Development; B.S., M.Ed., Iowa State University; Ph.D., Oklahoma State University
- Wilt, Glenn A. Jr.** (1963), Associate Professor of Finance; A.B., Occidental College; M.B.A., Miami University; Ph.D., University of Michigan; C.F.A.
- Windhorst, Rogier A.** (1987), Professor of Physics and Astronomy; Associate Chair, Department of Physics and Astronomy; B.Sc., M.Sc., Ph.D., University of Leiden (Netherlands)
- Winer, Laurence H.** (1983), Professor of Law; B.A., M.A., Ph.D., Boston University; J.D., Yale University
- Winkelman, Michael** (1988), Senior Lecturer of Anthropology; B.A., Rice University; Ph.D., University of California, Irvine
- Winkelman, Richard D.** (1965), Associate Professor of Economics; B.A., Southern Illinois University; M.A., Ph.D., University of Illinois
- Wiseman, Douglas E.** (1976), Professor Emeritus of Special Education; B.S., M.A., Eastern Michigan University; Ph.D., University of Illinois
- Wiseman, Greta** (1984), Faculty Associate of Nursing; B.S.N., Hamline University; M.S., Arizona State University
- Witt, Tom** (1975), Associate Professor of Design; B.A., M.A., M.F.A., University of California, Los Angeles
- Witxed, J. Timothy** (1978), Professor of Asian Languages; B.A., University of Toronto (Canada); A.M., Stanford University; D.Phil., University of Oxford (United Kingdom)
- Wolchik, Sharlene** (1980), Professor of Psychology; B.A., Vassar College; M.S., Ph.D., Rutgers, The State University
- Wolf, Donald J.** (1969), Professor Emeritus of Political Science; B.A., M.A., Gonzaga University; S.T.M., University of Santa Clara; Ph.D., Georgetown University
- Wolf, George H.** (1986), Associate Professor of Chemistry and Biochemistry; B.A., University of California, San Diego; M.S., Ph.D., University of California, Berkeley
- Wolf, W. Shapard Jr.** (1983), Associate Research Administrator, Sociology; Director, Survey Research Laboratory, Sociology; B.F.A., Florida State University; M.Ed., University of Georgia
- Wolfe, Philip M.** (1988), Professor of Industrial and Management Systems Engineering; B.S., University of Missouri; M.S.E., Ph.D., Arizona State University
- Wolftal, Diane** (1995), Assistant Professor of Art; Assistant Professor of Anthropology; B.A., M.A., City University of New York; Ph.D., Institute of Fine Arts, New York University
- Wollam, Owen A.** (1964), Professor Emeritus of French; B.A., M.A., Montana State University; Ph.D., University of Washington
- Wong, Timothy.** (1995), Professor of Chinese; Director, Center for Asian Studies; B.A., Saint Mary's College; M.A., University of Hawaii; Ph.D., Stanford University
- Wood, Byard D.** (1970), Professor Emeritus of Mechanical and Aerospace Engineering; B.S.M.E., M.S.M.E., Utah State University; Ph.D., University of Minnesota, Twin Cities
- Wood, Patricia** (1994), Law Librarian, Reference; B.A., A.M.L.S., University of Michigan
- Wood, Steven D.** (1975), Professor of Marketing; B.S., M.A., California State University, San Diego; Ph.D., University of Wisconsin, Madison
- Woodbury, Neal W.** (1987), Professor of Chemistry and Biochemistry; B.S., University of California, Davis; Ph.D., University of Washington
- Woodfill, Marvin C.** (1966), Professor of Computer Science and Engineering; B.S., M.S., Ph.D., Iowa State University
- Wooding, Robert R.** (1971), Professor Emeritus of Construction; B.S., United States Naval Academy; B.C.E., M.C.E., Rensselaer Polytechnic Institute
- Woodman, Natalie J.** (1969), Professor Emeritus of Social Work; B.A., New York University; M.S.S., Smith College
- Woodruff, Larry** (1998), Lecturer of Exercise Science and Physical Education; B.S., University of Oregon; M.S., Western Oregon University
- Woods, Roosevelt Jr.** (1965), Professor Emeritus of Art; B.S., M.A., Arizona State University
- Woodward, Mark R.** (1985), Associate Professor of Religious Studies; B.A., M.A., Ph.D., University of Illinois
- Woolf, Charles M.** (1961-63; 1964), Professor Emeritus of Biology; Dean Emeritus, College of Liberal Arts and Sciences and Graduate College; B.S., M.S., University of Utah; Ph.D., University of California, Berkeley
- Wootton, Richard T.** (1964), Professor Emeritus of Education; B.S., M.S., Ed.D., University of Utah
- Wosinski, Marek** (1995), Senior Lecturer of Psychology; B.A., M.A., Ph.D., University of Warsaw (Poland)
- Wotrung, Roxena A.** (1994), Clinical Assistant Professor of Nursing; B.S.N., M.S., Arizona State University
- Wrenn, C. Gilbert** (1965), Professor Emeritus of Counselor Education; A.B., Willamette University; M.A., Ph.D., Stanford University; LL.D., Willamette University
- Wright, Johnson Kent** (1994), Assistant Professor of Interdisciplinary Humanities; Director of Graduate Studies; B.A., Kalamazoo College; M.A., Ph.D., University of Chicago
- Wright, M. Lin** (1973), Professor Emeritus of Theatre; B.A., M.A., Ph.D., University of Minnesota, Twin Cities
- Wu, Ai-hwa** (1964), Librarian, Original Cataloging; B.A., National Taiwan University (Taiwan); M.L.S., University of Washington
- Wurzburger, Marilyn J.** (1960), Librarian; Head, Special Collections; B.A., MacMurray College

**Wyckoff, Susan** (1979), Professor of Physics and Astronomy; B.A., Mount Holyoke College; Ph.D., Case Western Reserve University

**Wyndelts, Robert W.** (1974), Professor of Accountancy; B.B.A., M.P.A., Georgia State University; Ph.D., University of Georgia; C.P.A., Arizona, Georgia

**Wytko, Joseph R.** (1975), Professor of Music; B.M.E., West Virginia University; M.M., D.M., Northwestern University

## Y

**Yabes, Ruth Ammerman** (1990), Associate Professor of Planning and Landscape Architecture; B.S. (Planning), B.A. (Economics), University of California, Davis; M.C.P., University of Pennsylvania; Ph.D., Cornell University

**Yaghi, Omar M.** (1992), Associate Professor of Chemistry and Biochemistry; B.S., State University of New York, Albany; Ph.D., University of Illinois

**Yamaguchi, Gary T.** (1989), Associate Professor of Bioengineering; A.B., Occidental College; B.S., California Institute of Technology; S.M.M.E., Massachusetts Institute of Technology; Ph.D., Stanford University

**Yamamori, Tetsumao** (1989), Adjunct Professor of Sociology; B.A., Northwest Christian College; B.D., Texas Christian University; Ph.D., Duke University

**Yancy, Margaret Lee** (1997), Faculty Associate of Nursing; B.S.N., M.S., Arizona State University

**Yao, Lun-Shin** (1981), Professor of Engineering; B.S.E., Cheng Kung University; M.S., University of Texas; Ph.D., University of California, Berkeley

**Yao, Winberta M.** (1975), Associate Librarian Emeritus, Hayden Reference Service; B.A., University of California, Berkeley; M.S., Columbia University

**Yau, Stephen S.** (1994), Professor of Computer Science and Engineering; Chair, Department of Computer Science and Engineering; B.S., National Taiwan University (Taiwan); M.S., Ph.D., University of Illinois, Urbana

**Yazdi, Navid** (1998), Assistant Professor of Electrical Engineering; B.Sc., University of Tehran (Iran); M.A.Sc., University of Windsor (Canada); Ph.D., University of Michigan, Ann Arbor

**Ye, Nong** (1998), Associate Professor of Industrial and Management Systems Engineering; B.S., Peking University (China); M.S.E., Chinese Academy of Sciences (China); Ph.D., Purdue University

**Yoshioka, Carlton F.** (1988), Professor of Recreation Management and Tourism; Chair, Department of Recreation Management and Tourism; B.A., University of California, Santa Barbara; M.A., California State University, Chico; Ph.D., University of Oregon

**Youm, Kyu Ho** (1991), Professor of Journalism and Telecommunication; B.A., Konkuk University (South Korea); M.A., Ph.D., Southern Illinois University, Carbondale

**Young, Bernard** (1988), Professor of Art; B.F.A., Temple University; M.F.A., Ph.D., Cornell University

**Young, Dennis L.** (1975), Professor of Mathematics; B.S., Saint Louis University; M.S., Ph.D., Purdue University

**Young, Hewitt H.** (1967), Professor Emeritus of Industrial and Management Systems Engineering; B.S.M.E., M.S.I.E., Case Institute of Technology; Ph.D., Arizona State University

**Young, Joseph E.** (1979), Professor Emeritus of Art; B.A., California State University at Los Angeles; M.A., University of California, Los Angeles

**Young, Josephine Peyton** (1998), Assistant Professor of Reading Education; M.A., The University of West Florida; Ph.D., The University of Georgia

**Young, Michael Cochise** (1990), Director, Bachelor of Interdisciplinary Studies Program; B.A., St. Joseph's University; M.A., Ph.D., University of Pennsylvania

**Young, Otis E. Jr.** (1963), Professor Emeritus of History; A.B., A.M., Ph.D., Indiana University

**Youngblood, Robert L.** (1973), Professor of Political Science; Chair, Department of Political Science; B.A., Willamette University; M.A., University of Hawaii, Manoa; Ph.D., University of Michigan

## Z

**Zandieh, Michelle** (1997), Assistant Professor of Mathematics; B.A., Northwestern University; M.S., Ph.D., Oregon State University

**Zatz, Marjorie S.** (1982), Professor of Justice Studies; Director, Interdisciplinary Ph.D. Program in Justice Studies; Chair, Committee on Law and the Social Sciences; B.A., University of Massachusetts, Amherst; M.A., Ph.D., Indiana University, Bloomington

**Zautra, Alex** (1976), Professor of Psychology; Director, Clinical Program in Psychology; B.A., Antioch College; M.S., Ph.D., University of Utah

**Zeitlin, Marilyn A.** (1992), Director, ASU Art Museum; A.B., M.A., Harvard University

**Zellmer, Linda R.** (1997), Assistant Librarian, Map Collection; B.S., University of Wisconsin, Oshkosh; M.A., The College of William and Mary; M.L.S., University of Wisconsin, Milwaukee

**Zhang, Yong-Hang** (1997), Associate Professor of Electrical Engineering; Nanjing Normal University (China); M.Sc., Institute of Semiconductors, Chinese Science and Technology University (China); Ph.D., Max-Planck-Institut für Festkörperforschung University of Stuttgart (Germany)

**Zhu, Anmin** (1997), Lecturer of Mathematics; B.S., Anhui University (China); M.S., Milin University (China); Ph.D., Arizona State University

**Zhu, Han** (1997), Assistant Professor of Civil and Environmental Engineering; B.S., M.S., Fudan University (China); Ph.D., Northwestern University

**Zhu, Yingxian** (1996), Lecturer of Mathematics; B.S., Anhui University (China); M.S., Dalian University of Science and Technology (China); Ph.D., Arizona State University

**Zimiles, Herbert** (1988), Professor of Educational Psychology; B.A., New York University; Ph.D., University of Rochester

**Zimmer, Carl R.** (1959), Professor Emeritus of Engineering; B.S.E.E., Cornell University; M.S.E.E., Ph.D., Syracuse University

**Zimmerman, Pamela** (1997), Lecturer of Mathematics; B.S., University of Nebraska, Omaha; M.A., Arizona State University

**Zorita, Paz Mendez-Bonito** (1993), Associate Professor of Social Work; A.S., School of Social Work of Gijón (Spain); M.S.S.A., Ph.D., Case Western Reserve University

**Zucker, Stanley H.** (1975), Professor of Special Education; B.A., State University of New York, Stony Brook; M.S., Hofstra University; Ph.D., University of Missouri, Columbia

**Zunkel, Gretchen M.** (1997), Assistant Professor of Nursing; B.S.N., University of Colorado; M.N., University of California; M.N., Ph.D., University of Washington

**Zuo, Jian-Min** (1989), Associate Research Scientist of Physics and Astronomy; B.S., Nanjing University (China); Ph.D. Arizona State University

**Zuo, Yijun** (1998), Assistant Professor of Mathematics; B.S., Zhenjiang Teachers University (China); M.S., Lanzhou University (China); M.S., Ph.D., The University of Texas, Dallas

**Zwiebel, Imre** (1979), Professor Emeritus of Engineering; B.S., University of Michigan; M.S., Ph.D., Yale University

**Zygas, K. Paul** (1984), Associate Professor of Architecture; A.B., M.Arch., Harvard University; Ph.D., Cornell University

# Regents' Professors

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The title "regents' professor" is conferred on selected members of the ASU tenured faculty who have achieved and are sustaining the highest level of distinction by their exceptional contributions to the mission of the university in research or other creative activity and in teaching or professional service.

**JOHN ALCOCK**

*Regents' Professor of Biology*

**DAVID L. ALTHEIDE**

*Regents' Professor of Justice Studies*

**C. AUSTEN ANGELL**

*Regents' Professor of Chemistry and Biochemistry*

**CONSTANTINE BALANIS**

*Regents' Professor of Electrical Engineering*

**DAVID C. BERLINER**

*Regents' Professor of Educational Leadership and Policy Studies and Psychology in Education*

**PETER R. BUSECK**

*Regents' Professor of Chemistry and Biochemistry and Geology*

**ROBERT B. CIALDINI**

*Regents' Professor of Psychology*

**JEFFREY COOK**

*Regents' Professor of Architecture*

**JOHN M. COWLEY**

*Regents' and Galvin Professor Emeritus of Physics and Astronomy*

**NORMAN DUBIE**

*Regents' Professor of English*

**NANCY H. EISENBERG**

*Regents' Professor of Psychology*

**LEROY EYRING**

*Regents' Professor Emeritus of Chemistry and Biochemistry*

**DAVID K. FERRY**

*Regents' Professor of Electrical Engineering*

**DAVID WILLIAM FOSTER**

*Regents' Professor of Spanish*

**WILLIAM L. GRAF**

*Regents' Professor of Geography*

**RONALD GREELEY**

*Regents' Professor of Geology*

**DAVID R. HICKMAN**

*Regents' Professor of Music*

**DAVID H. KAYE**

*Regents' Professor of Law*

**GARY D. KELLER**

*Regents' Professor of Spanish*

**RAYMOND W. KULHAVY**

*Regents' Professor of Psychology in Education*

**DANIEL M. LANDERS**

*Regents' Professor of Exercise Science and Physical Education*

**SHENG H. LIN**

*Regents' Professor Emeritus of Chemistry and Biochemistry*

**THERESE ANN MARKOW**

*Regents' Professor of Biology*

**JAMES W. MAYER**

*Regents' Professor of Chemical, Bio, and Materials Engineering*

**LEE MEYERSON**

*Regents' Professor Emeritus of Psychology*

**CARLETON B. MOORE**

*Regents' Professor of Chemistry and Biochemistry and Geology*

**JEFFRIE G. MURPHY**

*Regents' Professor of Philosophy and Law*

**MICHAEL O'KEEFFE**

*Regents' Professor of Chemistry and Biochemistry*

**CAIO PAGANO**

*Regents' Professor of Music*

**DENNIS J. PALUMBO**

*Regents' Professor of Justice Studies*

**GEORGE R. PETTIT**

*Regents' Professor of Chemistry and Biochemistry*

**ALBERTO ALVARO RIOS**

*Regents' Professor of English*

**NANCY FELIPE RUSSO**

*Regents' Professor of Psychology*

**JOHN C.H. SPENCE**

*Regents' Professor of Physics and Astronomy*

**MARYBETH STEARNS**

*Regents' Professor Emeritus of Physics and Astronomy*

**WILLIAM T. TROTTER**

*Regents' Professor of Mathematics*

**CHRISTY G. TURNER II**

*Regents' Professor of Anthropology*

**J. BRUCE WAGNER JR.**

*Regents' Professor Emeritus, Center for Solid-State Science and Chemistry and Biochemistry*

# Administrative Personnel

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## Arizona Board of Regents

### Ex Officio

Jane Hull, B.S., *Governor of Arizona*

Lisa Graham Keegan, B.A., M.S., *Superintendent of Public Instruction*

### Appointed

To July 1999 . . . . . Jennifer Reichelt, *Student Regent*

To January 2000 . . . . . Rudy E. Campbell, CLU  
John F. Munger, B.A., J.D.

To January 2002 . . . . . George H. Amos III, B.S.  
Judith Gignac

To January 2004 . . . . . Kay McKay  
Donald J. Ulrich, B.A.

To January 2006 . . . . . Chris Herstam, B.A., M.A.  
Jack Jewett, B.A.

### Counsel to the Board

Joel Sideman, J.D.

## President's Office

President . . . . . Lattie F. Coor

Senior Executive Assistant

to the President . . . . . Ben R. Forsyth

Executive Assistant

for University Programs . . . . . Ruth S. Jones

Advisor to the President

on American Indian Affairs . . . . . Peterson Zah

Director, Athletics . . . . . Kevin White

Director, Equal Opportunity/  
Affirmative Action . . . . . Barbara A. Mawhiney

General Counsel . . . . . Paul J. Ward

ICA Faculty Representative . . . . . Jerry L. Kingston

## ASU Main

### Academic Affairs

Senior Vice President and Provost . . . . . Milton D. Glick

Vice Provost . . . . . Charles R. Bantz

Vice Provost . . . . . Kathleen Church

Vice Provost . . . . . Walter Harris Jr.

Vice Provost for Information

Technology . . . . . William E. Lewis

Vice Provost for Research . . . . . Jonathan Fink

Assistant Vice President for Academic

Affairs . . . . . Louis Olivias

Assistant to the Senior Vice President

and Provost . . . . . Linda Van Scoy

Fiscal Operations Administrator . . . . . Lynn Carpenter

Director, Academic and Administrative

Documents . . . . . Tabb Forster

Director, Academic Articulation . . . . . Zoila Gamero de Tovar

Director, Academic Facilities . . . . . David Techau

Director, Center for Learning  
and Teaching Excellence. . . . . *To be Appointed*

Director, Fiscal Planning and Analysis . . . . . Alan Carroll

Director, Institutional Analysis . . . . . John Porter

Director, International Programs. . . . . William G. Davey

Director, Office of Research

Development . . . . . Patrick Burkhardt

Director, Strategic Planning

and Policy Analysis. . . . . Douglas Vinzant

Director, Summer Sessions . . . . . Carol Switzer

Director, Undergraduate

Academic Services . . . . . William S. Johnson

Director, University Evaluation . . . . . William S. Johnson

### College of Architecture and Environmental Design

Dean, College of Architecture and

Environmental Design. . . . . John Meunier

Associate Dean, College of Architecture

and Environmental Design . . . . . David G. Scheatzle

Associate Dean, College of Architecture

and Environmental Design . . . . . Mary Kihl

Director, Ph.D. program in Environmental

Planning in Design . . . . . Michael D. Kroelinger

Director, School of Architecture . . . . . Ron McCoy

Director, School of Design . . . . . Jacques Giard

Director, School of Planning and

Landscape Architecture. . . . . Frederick Steiner

Director, Herberger Center for

Design Excellence. . . . . Mary Kihl

Coordinator, Joint Urban Design Program . . . . . John McIntosh

Coordinator, Joint Urban Design Studio. . . . . Michael Dollin

### College of Business

Dean, College of Business . . . . . Larry E. Penley

Associate Dean, Professional Programs . . . . . Lee R. McPheters

Associate Dean, Undergraduate

Programs . . . . . Stephen K. Happel

Director, School of Accountancy

and Information Management. . . . . Philip M.J. Reckers

Chair, Department of Economics . . . . . Arthur E. Blakemore

Chair, Department of Finance . . . . . Herbert M. Kaufman

Director, School of Health

Administration and Policy . . . . . Eugene S. Schneller

Chair, Department of Management. . . . . William H. Glick

Chair, Department of Marketing. . . . . Michael P. Mokwa

Chair, Department of Supply Chain

Management . . . . . Joseph R. Carter

Director, Center for Advanced

Purchasing Studies . . . . . Phillip L. Carter

Director, Arizona Real Estate Center . . . . . Jay Q. Butler

Director, Center for Business

Research . . . . . Timothy D. Hogan

Director, Center for Services

Marketing and Management . . . . . Stephen W. Brown

Director, Bank One Economic

Outlook Center . . . . . Lee R. McPheters

Director, Joan and David Lincoln

Center for Ethics . . . . . Marianne M. Jennings

Director, L. William Seidman  
 Research Institute . . . . . Timothy D. Hogan

### College of Education

Dean and Regents' Professor,  
 College of Education . . . . . David C. Berliner  
 Associate Dean, Teacher Education . . . Nicholas R. Appleton  
 Associate Dean, Academic Programs  
 and Personnel. . . . . Gail Hackett  
 Associate Dean, Research . . . . . Gene V. Glass  
 Director, Division of Curriculum  
 and Instruction . . . . . Nicholas R. Appleton  
 Academic Program Coordinator,  
 Early Childhood Education . . . . Reynaldo A. Gomez  
 Academic Program Coordinator,  
 Educational Media and Computers . . . . Gary Bitter  
 Academic Program Coordinator,  
 Elementary Education . . . . . Carole Edelsky  
 Academic Program Coordinator,  
 Multicultural Education. . . . . Carlos Vallejo  
 Academic Program Coordinator,  
 Reading and School  
 Library Science . . . . . *To Be Appointed*  
 Academic Program Coordinator,  
 Secondary Education . . . . . Robert Gryder  
 Academic Program Coordinator,  
 Special Education . . . . . Alfonso Prieto  
 Interim Director, Division of Educational  
 Leadership and Policy Studies. . . . . Mary Lee Smith  
 Academic Program Coordinator,  
 Educational Administration and  
 Supervision . . . . . Thomas H. Metos  
 Academic Program Coordinator,  
 Education Policy Studies . . . . . Mary Lee Smith  
 Academic Program Coordinator,  
 Higher and Post-Secondary  
 Education . . . . . Howard L. Simmons  
 Director and Regents' Professor, Division  
 of Psychology in Education. . . . . Raymond Kulhavy  
 Academic Program Coordinator and  
 Training Director, Counseling  
 Psychology. . . . . Charles D. Claiborn  
 Academic Co-Program Coordinator,  
 Counselor Education . . . . . Stafford Hood  
 Academic Co-Program Coordinator,  
 Counselor Education . . . . . J. Jeffries McWhirter  
 Academic Program Leader, Learning  
 and Instructional Technology . . . . . Elsie G. Moore  
 Academic Program Leader, Lifespan  
 Developmental Psychology . . . . . Elsie G. Moore  
 Academic Program Leader,  
 Measurement, Statistics, and  
 Methodological Studies. . . . . Elsie G. Moore  
 Academic Program Coordinator and  
 Training Director, School  
 Psychology. . . . . Raymond Kulhavy  
 Director, Center for Bilingual  
 Education and Research. . . . . Josué González  
 Director, Bureau of Educational  
 Research and Services . . . . . Margaret Mangini  
 Director, Center for Indian Education . . . Octaviana Trujillo  
 Director, Counselor Training Center . . . . . Judy Homer

Director, Initial Teacher Certification  
 and Induction Programs. . . . . Billie Enz  
 Director, Professional Field Experience . . . . . Billie Enz  
 Director, Student Affairs . . . . . Richard Daniel

### College of Engineering and Applied Sciences

Dean, College of Engineering and  
 Applied Sciences . . . . . Peter E. Crouch  
 Associate Dean, Academic Affairs . . . . Daniel F. Jankowski  
 Associate Dean, Research . . . . . Gregory Raupp  
 Associate Dean, Student Affairs  
 and Special Programs . . . . Mary R. Anderson-Rowland  
 Director, Del E. Webb School of  
 Construction. . . . . William W. Badger  
 Director, School of Engineering . . . . . Daniel F. Jankowski  
 Chair, Department of Chemical, Bio,  
 and Materials Engineering. . . . . Eric J. Guilbeau  
 Chair, Department of Civil and  
 Environmental Engineering . . . . . Sandra Houston  
 Chair, Department of Computer  
 Science and Engineering . . . . . Stephen S. Yau  
 Chair, Department of Electrical  
 Engineering . . . . . Stephen M. Goodnick  
 Chair, Department of Industrial and  
 Management Systems Engineering . . . Gary L. Hogg  
 Chair, Department of Mechanical  
 and Aerospace Engineering . . . . . Don L. Boyer  
 Director, Engineering Core  
 and Special Studies . . . . . Daniel F. Jankowski  
 Director, Center for Innovation in  
 Engineering Education . . . . . Donovan L. Evans  
 Codirector, Center for Low Power  
 Electronics . . . . . Dieter Schroder  
 Director, Center for Professional  
 Development . . . . . Charles S. Elliott  
 Director, Center for Research in  
 Engineering and Applied Sciences . . . *To Be Appointed*  
 Director, Center for Solid-State  
 Electronics Research . . . . . Michael Kozicki  
 Director, Center for System Science  
 and Engineering Research . . . . . Frank Hoppensteadt  
 Codirector, Manufacturing Institute . . . . . Ampere Tseng  
 Codirector, Manufacturing Institute . . . Vicki Smith-Daniels  
 Director, Telecommunications  
 Research Center. . . . . Constantine A. Balanis

### College of Extended Education

Dean, College of Extended Education. . . . Bette F. DeGraw  
 Associate Dean . . . . . Barbara Lafford  
 Interim Director, American English  
 and Culture Program . . . . . Mark D. Rentz  
 Director, Communications and Marketing . . . Randy Bailey  
 Director, Development and Outreach . . . . Scott Sheldon  
 Director, Distance Learning  
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 Director, Academic and Professional  
 Programs . . . . . Patricia A. Feldman  
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 Director, School of Art . . . . . Julie F. Codell



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 Practitioner Certificate Program . . . . . Lynne Vigil  
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 Programs . . . . Steve Rippon  
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 Director, B.I.S. . . . . Michael Cochise Young  
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 Head, Acquisitions and  
 Bibliographic Records . . . . *To Be Appointed*  
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 Design Library . . . . Berna Neal  
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 Map Collection . . . . Rebecca Burke  
 Interim Head, Interlibrary Loan and  
 Document Delivery . . . . Ginny Sylvester  
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 and Technology (LIST) . . . . Scott Herrington  
 Head, Music Library . . . . Robert Follet  
 Head, Preservation . . . . Lois Schneberger  
 Head, Special Collections . . . . Marilyn Wurzbarger  
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Basketball—Women . . . . .	Charli Turner Thorne
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 Assistant Director . . . . . Gloria Aerni  
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 Program Coordinator . . . . . Vicki Harmon  
 Human Resources Specialist Senior . . . . . Patrick Patterson

**ASU East**

See "ASU East Administrative Personnel," page 383.

**ASU West**

See "ASU West Administrative Personnel," page 394.

# ASU East

Charles E. Backus, Ph.D.

Provost

ASU East was established in 1996 at the former Williams Air Force Base, 23 miles southeast of ASU Main. There, ASU East and its educational partners have created the Williams campus—a residential, academic community focused on meeting the needs of students and of business, industry, and the larger community. The 600-acre Williams Campus offers a small college environment, yet students have ready access to the amenities of a major metropolitan area and the resources of a major research university.

ASU East offers degree programs to prepare students for knowledge and skills needed for success in professional, civic, and personal lives in the 21st century. Eight baccalaureate degree programs, two master's degree programs, and one certificate program can now be completed at ASU East, with additional programs in the planning stages.

The College of Technology and Applied Sciences offers a master's degree and a range of bachelor's programs in high demand areas of technology, the only programs of their kind in Arizona. The unique bachelor's and master's degrees in agribusiness in the Morrison School of Agribusiness and Resource Management prepare students for careers in one of the fastest growing sectors of global business. East College offers a range of supporting courses for all ASU East programs and, in cooperation with the College of Education at ASU Main, offers the professional program in Elementary Education to help meet the demand for highly qualified teachers in the state. Additional East College programs continue to be developed.

New facilities, new programs, and new opportunities are constantly emerging at ASU East. The campus is easily accessible via major interstate routes. Please see "ASU East Campus Map" map, page 378. For the latest information, call 480/727-EAST (3278) or access the Web site at [www.east.asu.edu](http://www.east.asu.edu).

## CAMPUS AND STUDENT SERVICES

ASU East is a student-centered campus that offers many of the features of a small college in a rural area while providing access to the resources of a major research university and the amenities of a large metropolitan area. The campus includes excellent educational facilities: modern classrooms

and laboratories, a 21st-century electronic library, and state-of-the-art computer equipment. Other amenities include a dining hall, childcare services, campus union, bookstore, copy center, and free parking. A shuttle service provides transportation between ASU East and ASU Main. An additional shuttle is available for transportation from ASU Main to ASU West.

## Enrollment Services—OASIS

The OASIS provides one-stop services for admission, financial aid, business services, and registration. Conveniently located in the Academic Center Building, students find personnel ready to assist them with registration processes, tuition payment, financial assistance information, student employment, photo IDs, and parking information.

## Student Support Services

Staff provide new student advisement orientation programs, workshops, academic advising for undeclared majors, support for international and multicultural students, students with disabilities, and tutoring services and referrals. Staff also provide career advising and assessment, career planning workshops, career exploration software programs, and internship information.

## Williams Campus Housing and Residential Life

Campus housing is located in several academic villages designed to support and promote student academic success. Family resident assistants live and work in the homes and resident assistants live and work in the residence halls. There are many opportunities for students to be involved in leadership positions and residential life programs.

**Residence Halls.** Residence halls offer 160 large private rooms with amenities. Students may elect to share a room with another student if they prefer this option.

**Homes.** More than 600 homes with two to five bedrooms are located on campus. Single and married students, as well as faculty and staff living with their families, make their home at the Williams Campus. For further information, call 480/727-1700.

## ASU East Graduate Degrees, Majors, and Concentrations

Major	Degree	Administered by
Agribusiness Concentrations: agribusiness management and marketing, food quality assurance	M.S.	Morrison School of Agribusiness and Resource Management
Technology Contact the college for available concentrations.	M.S.Tech.	College of Technology and Applied Sciences



Graduate student Hana Dostalova and researchers at ASU East are developing biological solutions for cleansing contaminated soil. Tim Trumble photo

### Library Services

Strong resources and personal service define the ASU East Library. As a primarily electronic research library, it is designed to take maximum advantage of new technology. Electronic indexes, catalogs, and journals support study and research in many fields, with an emphasis on agribusiness and technology. While the library acquires materials in all formats, by intention it prefers electronic text. Thousands of periodicals are available digitally in a variety of subjects, while those that remain in print form can quickly be obtained by the library. Documents in electronic form can be delivered directly to students' desks by e-mail or fax. Most publications not available on campus may be obtained overnight. While most come from the other campuses of ASU, the library can obtain publications from anywhere in

the world. The library's Web address is [eastlib.east.asu.edu/rlib](http://eastlib.east.asu.edu/rlib).

**Computing Commons.** With more than 75 workstations, the Computing Commons at ASU East provides general computing access through the campus network to the Internet and ASU Main computer services, including e-mail and general purpose computing. The department provides specialized software and systems to meet the particular needs of the ASU East programs. In addition, IT East provides computer classrooms and audio visual material to support the campus academic programs. IT East has a staff of support personnel to aid the campus community's computing needs, including Web development.

### Williams Campus Union

The Campus Union (CU) is the center of the campus community serving students, faculty, staff, and guests. CU facilities include meeting and study rooms, a ballroom, TV lounge, coffee bar, and a game room. Programs and services such as movie nights, ice cream socials, dances, and holiday parties complement the educational mission of the Williams Campus and enhance the quality of campus life. The CU is staffed primarily by students, providing them the opportunity to develop leadership skills and a customer service orientation. For more information, call 480/727-1116 or 480/727-1098.

### Williams Campus Dining

The El Mirage Dining Hall offers all meals Monday through Friday. Students can choose either the continental breakfast or hot breakfast buffet. Lunch and dinner offer a buffet as well as menu options. For students interested in purchasing a meal plan, three meal plan options are available. Call 480/988-2903 for more information.

### Recreational Facilities and Services

The Williams Campus Fitness Center is equipped with state-of-the-art weight training and cardiovascular machines, racquetball courts, and a gymnasium. Trained exercise professionals are on hand daily to provide personal training assistance. A variety of health, fitness, and sports classes are also offered at the Fitness Center. For students who prefer outdoor sports activities, the campus has basketball and tennis courts, soccer/football fields, baseball fields, a running track, and swimming pool. For more information, call 480/988-8400.

### Student Health Services

Health services for ASU East students are provided by the Veteran's Administration Medical Center located at the Williams Campus. Services include a full range of assessment and treatment, physical examinations and immunizations, women's health care, diagnostic tests, laboratory tests/x-rays, and pharmacy. Health education and counseling, and wellness and health assessments are also available. Student registration fees cover the cost of office visits for full-time ASU East students. Part-time students pay a nominal fee. Some office procedures and laboratory tests require additional charges. Health insurance is not required to use Health Services, however, it is strongly advised for all students and is required for international students. For more information, call 480/222-6568.



The Oasis at ASU East

Dave Tevis photo

### Accreditation

The North Central Association of Colleges and Schools accreditation of ASU Main includes ASU East. In addition, ASU East programs in Aeronautical Engineering Technology, Electronics Engineering Technology, and Manufacturing Engineering Technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (TAC of ABET).

### Academic Organization and Administration

The chief operating and academic officer of ASU East is the provost. There are two colleges and one school at ASU

East administered by deans. These academic units develop and implement the teaching, research, and service programs of the institution. Additional support for the academic mission of the campus is provided by Library Services and Information Technology, each administered by a director. See "ASU East Administrative Personnel," page 383.

### Advising

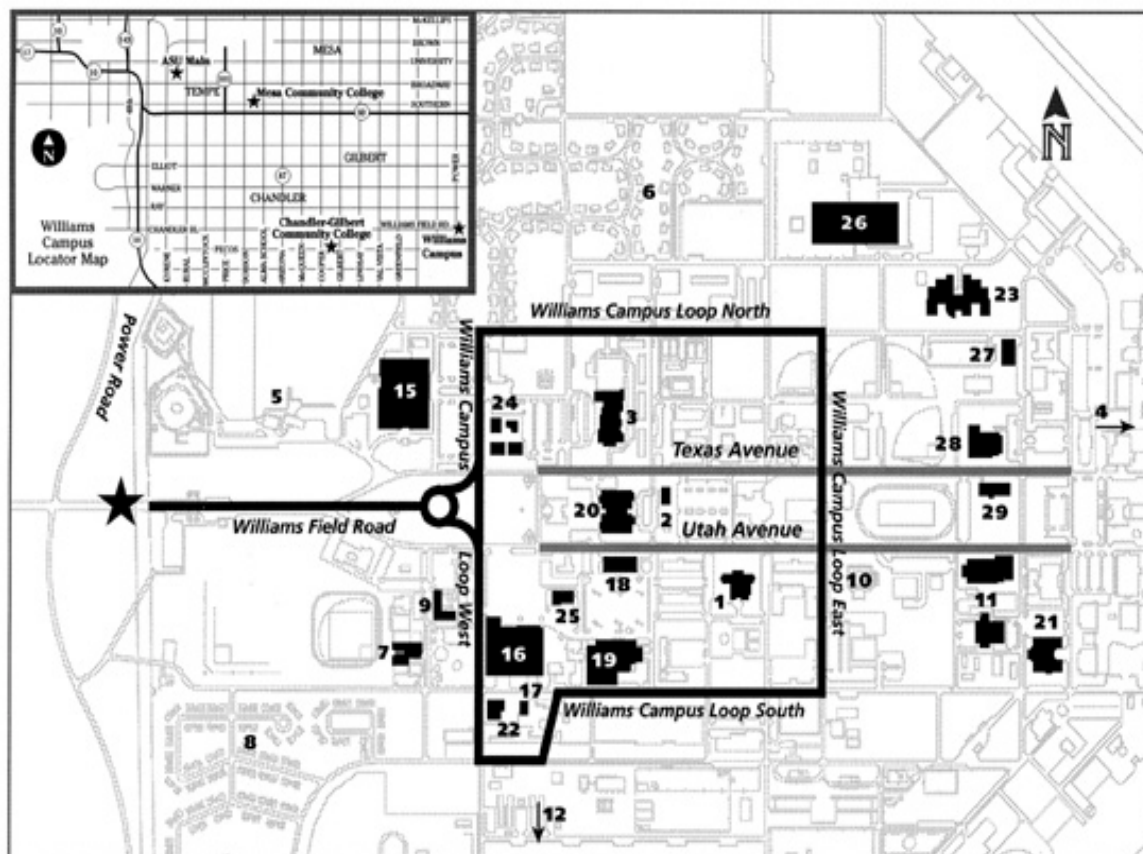
Students are encouraged to take advantage of the skill and knowledge of the advising professionals available to them in the academic units and to seek academic advising early.

For more information or to schedule an advising session, contact an academic advisor.

### Academic Advising

College or School	Location	Telephone	Days/Hours
College of Technology and Applied Sciences	CNTR 10	480/727-1252	Mon.–Fri. 8:00 A.M.–5:00 P.M. Appointments are recommended.
Morrison School of Agribusiness and Resource Management	CNTR 20	480/727-1585	Mon.–Fri. 8:00 A.M.–5:00 P.M. Appointments are recommended.





### WILLIAMS CAMPUS

- 1 - Williams Campus Dining Hall (El Mirage)
- 2 - Williams Campus Housing Office
- 3 - Williams Campus Union (CU)
- 4 - Williams Gateway Airport & Flight Line
- 5 - Toka Sticks Clubhouse & Golf Course
- 6 - North Desert Village
- 7 - Child Development Center (CDCTR)
- 8 - West Desert Village
- 9 - Administrative Services Building - Security (ADMIN)
- 10 - Swimming Pool (POOL)
- 11 - US Air Force Armstrong Laboratory Buildings
- 12 - South Desert Village

### ASU EAST

- 15 - Veteran's Administration Regional Clinic (ASU East Student Health)
- 16 - Technology Center (TECH)
- 17 - Agribusiness Food Science Lab (AGBFS)
- 18 - Auditorium (AUD)
- 19 - Future Classroom and Lab Building
- 20 - Academic Center Building (CNTR)
- 21 - Classroom Building (CLRB)
- 22 - TECH II
- 23 - Flight Simulator Building (SIM)
- 24 - Morrison School of Agribusiness and Resource Management Complex (AGB 1-4)
- 25 - Center for Agribusiness Policy Studies (CAPS)

### CHANDLER-GILBERT COMMUNITY COLLEGE AT WILLIAMS CAMPUS

- 26 - Aviation Technology Center, Embry-Riddle, and University of North Dakota (ATC)
- 27 - General Studies Building (GSB)
- 28 - Physical Education Center (PEC)
- 29 - Science Lab Building (SLB)





# ASU East Directory

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For the ASU Main “Academic Directory,” see page 315. For the “ASU West Directory,” see page 387. Effective Sept. 1, 1999, the area code is 480 for all numbers at ASU Main and ASU East, but Downtown Center and ASU West will retain the 602 area code.

## Academic Units

Agribusiness and Resource Management, Morrison School of.....	CNTR 20.....	727-1585
East College.....	CNTR 92.....	727-1515
Technology and Applied Sciences, College of.....	CNTR 10.....	727-1874
Aeronautical Management Technology, Department of.....	SIM Bldg-201.....	727-1998
Electronics and Computer Engineering Technology, Department of.....	TECH 101.....	727-1137
Information and Management Technology, Department of.....	TECH 102.....	727-1781
Manufacturing and Aeronautical Engineering Technology, Department of.....	SIM Bldg-295B.....	727-1584

## Administrative

General Information.....	CNTR Garden Level.....	727-3278
American Indian Programs.....	CNTR 92.....	727-1161
Bookstore.....	CNTR 102.....	727-1146
Campus Union.....	CU.....	727-1116
Cashiering Services.....	CNTR 81.....	727-1081
Computer Commons, ASU East.....	CNTR 150.....	727-1184
Copy Center.....	CNTR 147.....	727-1175
Educational Opportunity Center.....	CNTR Garden Level.....	727-1153
Housing, Williams Campus.....	WCHO Bldg.....	727-1700
Library Services.....	CNTR 110.....	727-1037
OASIS.....	CNTR Garden Level.....	727-3278
ASU Sun Cards		
Office of the Registrar		
Student Business Services		
Student Financial Assistance		
Undergraduate Admissions		
Williams Campus Parking Decals		
Physical Education Center, Williams Campus.....	WCFC Bldg.....	988-8400
Provost, Office of the.....	CNTR 30.....	727-1028
Student Health Services.....	Veterans Administration Clinic.....	222-6568
Campus Life Services.....	CNTR 52.....	727-1116

# ASU East Faculty and Academic Professionals

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## A

**Abuleyaman, Eltayeb S.** (1998), Associate Professor of Electronics and Computer Engineering Technology; B.S., University of Khartoum (Sudan); M.S., Oregon State University; Ph.D., University of Arizona

**Autore, Donald D.** (1959), Professor Emeritus of Technology; B.S.E., University of Michigan; M.S.E., Arizona State University

## B

**Backus, Charles E.** (1968), Professor of Electrical Engineering; Provost, ASU East; B.S.M.E., Ohio University; M.S., Ph.D., University of Arizona

**Barchilon, Marian G.** (1989), Associate Professor of Technical Communication; B.S., State University of New York, Binghamton; M.S., Northeastern University

**Barrett, Thomas W.** (1950), Professor Emeritus of Agribusiness and Resource Management; B.S., Brigham Young University; M.S., Ph.D., Cornell University

**Borrmann, David W.** (1996), Lecturer of Aeronautical Management Technology; B.S., Drexel University; M.A., Arizona State University

**Brown, Walter C.** (1966), Professor Emeritus of Technology; B.S., Northwest Missouri State University; M.Ed., Ed.D., University of Missouri, Columbia

**Brownson, Charles W.** (1980), Librarian, ASU East Library Services; Director, ASU East Library Services; B.A., South Dakota State University; M.F.A., University of Oregon; M.L.S., University of California, Berkeley

**Burdette, Walter E.** (1956), Professor Emeritus of Technology; B.S., M.S., Kansas State College of Pittsburg; Ed.D., University of Missouri, Columbia

**Burk, Karl W.** (1949), Professor Emeritus of Technology; B.A., M.A., Arizona State University; Ed.D., Bradley University

**Burkink, Tim** (1998), Assistant Professor of Agribusiness and Resource Management; B.S., M.B.A., Ph.D., University of Nebraska, Lincoln

## C

**Carlsen, Paul A.** (1978), Professor Emeritus of Technology; B.A.E., M.N.S., Ed.D., Arizona State University

**Cavalliere, William A.** (1946), Professor Emeritus of Technology; B.A., M.A., Arizona State University

**Chalquest, Richard R.** (1971), Professor Emeritus of Agribusiness and Resource Management; B.S., D.V.M., Washington State University; M.S., Ph.D., Cornell University

**Collins, Donald G.** (1989), Professor of Manufacturing and Aeronautical Engineering Technology; B.Arch., Virginia Polytechnic Institute and State University; M.S., Ph.D., University of Illinois, Urbana

**Cox, Frank E.** (1972), Professor Emeritus of Technology; B.S.M.E., Purdue University; M.S.E., Arizona State University

## D

**Daneke, Gregory A.** (1982), Professor of Information and Management Technology; B.A., M.A., Brigham Young University; Ph.D., University of California, Santa Barbara

**Dolin, Penny Ann** (1998), Lecturer of Information and Management Technology; B.A., Bard College; M.S., Arizona State University

**Duff, Jon M.** (1997), Professor of Information and Management Technology; B.S., M.S., Purdue University; Ph.D., Ohio State University

## E

**Edwards, Mark R.** (1978), Professor of Agribusiness and Resource Management; B.S.M.E., United States Naval Academy; M.B.A., D.B.A., Arizona State University

**Edwards, Marvin J.** (1959), Professor Emeritus of Technology; B.S., M.A., Arizona State University

## F

**Fordemwalt, James N.** (1987), Associate Professor of Electronics and Computer Engineering Technology; B.S., M.S., University of Arizona; Ph.D., Iowa State University of Science and Technology

## G

**Gesell, Laurence E.** (1984), Professor of Aeronautical Management Technology; B.A., Upper Iowa University; M.P.A., University of San Francisco; Ph.D., Arizona State University

**Gordon, Richard S.** (1980), Professor of Agribusiness and Resource Management; A.B., University of Rochester; M.A., Harvard University; Ph.D., Massachusetts Institute of Technology

**Grossman, Gary M.** (1994), Associate Professor of Information and Management Technology; B.A., University of the Pacific; M.S., Ph.D., Purdue University

## H

**Hefner, Stephen P.** (1973), Instructional Professional of Agribusiness and Resource Management; Academic Professional, Morrison School of Agribusiness and Resource Management; B.S., Illinois State University; M.S., Arizona State University

**Hild, Nicholas R.** (1983), Professor of Information and Management Technology; B.S.M.E., M.S.Enve., University of Iowa; Ph.D., Union Graduate School

**Hirata, Ernest T.** (1974), Associate Professor of Information and Management Technology; B.A., San Diego State College; Ed.D., Arizona State University

**Horowitz, Renee B.** (1986), Professor Emeritus of Information and Management Technology; B.A., Brooklyn College; M.A., Ph.D., University of Colorado

**Humble, Jane E.** (1989), Associate Professor of Information and Management Technology; B.S.E., M.S.E., Ph.D., Arizona State University

## J

**Jackson, Andrew E.** (1995), Assistant Professor of Aeronautical Management Technology; B.A., University of Louisville; M.B.A., Embry-Riddle Aeronautical University; Ph.D., University of Central Florida

**K**

**Kagan, Albert** (1992), Professor of Agribusiness and Environmental Resources; B.S., M.S., Ph.D., Iowa State University of Science and Technology

**Karp, Merrill R.** (1994), Assistant Professor of Aeronautical Management Technology; B.S., Arizona State University; M.A., Central Michigan University; Ph.D., Walden University

**Keith, Marlow F.** (1946), Professor Emeritus of Technology; B.A., M.A., Arizona State University

**Kelley, Donald G.** (1980), Associate Professor of Manufacturing and Aeronautical Engineering Technology; B.S., M.S., Arizona State University

**Kigin, Denis J.** (1958-65; 1967), Professor Emeritus of Technology; Dean Emeritus, Continuing Education and Summer Sessions; B.S., Mankato State University; M.S., University of Wisconsin, Stout; Ed.D., University of Missouri

**Kisielewski, Robert V.** (1978), Professor Emeritus of Technology; B.S.M.E., M.S.M.E., University of Wisconsin, Madison

**L**

**Lawler, Eugene D.** (1967), Professor Emeritus of Technology; B.S., Northern State College; M.A., Arizona State University

**Lestar, Dorothy Jo** (1996), Lecturer of Information and Management Technology; B.S., Arizona State University

**Lipari, Charles A.** (1995), Assistant Professor of Electronics and Computer Engineering Technology; B.S.E.E., M.S.E.E., University of Southwestern Louisiana; Ph.D., Louisiana State University

**Lytle, Robert G.** (1972), Professor Emeritus of Agribusiness and Resource Management; B.S., Western Kentucky University; M.S., Arizona State University

**M**

**Macia, Narciso F.** (1990), Associate Professor of Electronics and Computer Engineering Technology; B.S., M.S., University of Texas, Arlington; Ph.D., Arizona State University

**Maddy, Kenneth H.** (1980), Professor Emeritus of Agribusiness and Resource Management; B.S., Pennsylvania State University; M.S., University of Wisconsin, Madison; Ph.D., Pennsylvania State University

**Maisel, James E.** (1985), Professor Emeritus of Electronics and Computer Engineering Technology; B.Eng.Sci., B.E.E., Fenn College; M.S.E.E., Ohio State University

**Manfredo, Mark R.** (1999), Assistant Professor of Agribusiness and Resource Management; B.S., California State University, Fresno; M.S., New Mexico State University; Ph.D., University of Illinois, Urbana

**Marquardt, Raymond A.** (1997), Professor of Agribusiness and Resource Management; Dean, Morrison School of Agribusiness and Resource Management; B.S., M.S., Colorado State University; Ph.D., Michigan State University

**Matson, John H.** (1978), Associate Professor of Information and Management Technology; B.S., M.S., Illinois State University

**Matthews, James B.** (1989), Professor Emeritus of Aeronautical Technology; B.S., Rose-Hulman Institute of Technology; M.S., Massachusetts Institute of Technology; Ph.D., University of Arizona

**McBrien, Edward F.** (1986), Professor Emeritus of Electronic/Computer Technology; B.S.E.E., Fenn College; M.S.E.E., Cleveland State University

**McCurry, William K.** (1995), Associate Professor of Aeronautical Management Technology; Chair, Department of Aeronautical Management Technology; B.S., Purdue University; M.S., Troy State University; Ph.D., University of Kansas

**McHenry, Albert L.** (1978), Professor of Technology; Dean, College of Technology and Applied Sciences; B.S., Southern University and A & M College; M.S., Ph.D., Arizona State University

**Miller, Victor J.** (1958), Professor Emeritus of Agribusiness and Resource Management; B.S., M.S., Ph.D., University of Illinois

**Minter, Marshall R. Jr.** (1965), Professor Emeritus of Technology; B.S.M.E., Purdue University; M.S.M.E., University of Arizona

**Moody, E. Grant** (1951), Professor Emeritus of Agribusiness and Resource Management; B.S., University of Arizona; M.S., Kansas State University; Ph.D., Purdue University

**Munukutla, Lakshmi V.** (1987), Professor of Technology; Associate Dean, College of Technology and Applied Sciences; B.S., M.S., Andhra University (India); Ph.D., Ohio University

**N**

**Nowlin, Robert W.** (1990), Professor of Electronics and Computer Engineering Technology; Chair, Department of Electronics and Computer Engineering Technology; B.S.E.E., University of Washington; M.S.E.E., San Diego State University; Ph.D.E.E., Texas Tech University

**O**

**O'Brien, Marc H.** (1997), Lecturer of Aeronautical Management Technology; B.A., Boston University; M.S., Indiana State University

**Okonkwo, Charles U.** (1994), Lecturer of Manufacturing and Aeronautical Engineering Technology; B.S., M.S., Iowa State University; Ph.D., University of Florida

**Olson, Larry W.** (1995), Associate Professor of Information and Management Technology; B.S., Baylor University; Ph.D., University of Pennsylvania

**P**

**Palmgren, Dale E.** (1984), Associate Professor of Manufacturing and Aeronautical Engineering Technology; Interim Chair, Department of Manufacturing and Aeronautical Engineering Technology; Assistant Dean, College of Technology and Applied Sciences; B.S., M.S., Ph.D., University of Wisconsin, Madison

**Pardini, Louis J.** (1967), Professor Emeritus of Technology; B.A., A.M., Idaho State University; Ed.D., University of Northern Colorado

**Patterson, Paul M.** (1995), Assistant Professor of Agribusiness; B.S., Auburn University; M.S., Ph.D., Purdue University

**Pearce, Martha V.** (1977), Professor Emeritus of Technology; B.S., Columbia University; M.S., Boston University; Ed.D., Arizona State University

**Pearson, Michael W.** (1998), Assistant Professor of Aeronautical Management Technology; B.A., University of Houston; M.B.A., J.D., Arizona State University

**Peterson, Edward R.** (1977), Assistant Professor of Electronics and Computer Engineering Technology; B.S.E.E., Fairleigh Dickinson University; M.S.E.E., Arizona State University

**Prust, Zenas A.** (1959), Professor Emeritus of Technology; B.S., University of Wisconsin, Stout; M.A., University of Minnesota, Twin Cities; Ed.D., University of Northern Colorado

## R

**Raccach, Moshe** (1980), Associate Professor of Agribusiness and Resource Management; B.Sc., M.Sc., The Hebrew University (Israel); Ph.D., Cornell University

**Rajadas, John N.** (1996), Assistant Professor of Manufacturing and Aeronautical Engineering Technology; B.Tech., Indian Institute of Technology (India); M.S., Ph.D., Georgia Institute of Technology

**Rasmussen, Robert D.** (1949), Professor Emeritus of Agribusiness and Resource Management; B.S., Iowa State University; M.S., Washington State University

**Reed, William H.** (1968), Associate Professor Emeritus of Manufacturing and Aeronautical Engineering Technology; B.S., University of Oklahoma; M.S., Arizona State University

**Richards, Timothy J.** (1994), Assistant Professor of Agribusiness and Resource Management; B.Comm., University of British Columbia; M.A., Ph.D., Stanford University

**Richardson, Grant L.** (1953), Professor Emeritus of Agribusiness and Resource Management; B.S., M.S., University of Arizona; Ph.D., Oregon State University

**Robinson, Daniel O.** (1950), Professor Emeritus of Agribusiness and Resource Management; A.B., Brigham Young University; M.S., University of Arizona; Ph.D., Ohio State University

**Roe, Keith B.** (1979), Professor Emeritus of Technology; B.S., Wisconsin State College; M.A., University of Michigan

**Rogers, Bradley B.** (1984), Associate Professor of Manufacturing and Aeronautical Engineering Technology; B.S., M.S., Montana State University; Ph.D., Arizona State University

**Rook, Fern H.** (1969), Professor Emeritus of Technology; B.A., University of Colorado; M.A., Arizona State University

**Roper, Devon J.** (1966), Professor Emeritus of Aeronautical Technology; B.S., Utah State University; M.S., Arizona State University

## S

**Salmirs, Seymour** (1981), Professor Emeritus of Technology; B.A.E., M.S.A.E., Georgia Institute of Technology

**Schildgen, Thomas E.** (1981), Professor of Information and Management Technology; Chair, Department of Information and Management Technology; B.S., M.S., Illinois State University; Ed.D., Northern Arizona University

**Schmidt, Peter A.** (1978), Associate Professor of Manufacturing and Aeronautical Engineering Technology; B.S., Northern Illinois University; M.A., Ed.D., Arizona State University

**Schmitz, Troy G.** (1998), Assistant Professor of Agribusiness and Resource Management; B.S., University of Saskatchewan (Canada); M.S., Ph.D., University of California, Berkeley

**Schoen, Robert A.** (1966), Professor Emeritus of Technology; B.S., M.S., Arizona State University

**Schwalm, David E.** (1986), Associate Professor of English; Dean of East College, Vice Provost ASUE; B.A., Carlton College; M.S., Ph.D., University of Chicago

**Seperich, George J.** (1976), Professor of Agribusiness and Resource Management; Associate Dean, Morrison School of Agribusiness and Resource Management; B.S., Loyola University, Chicago; M.S., Ph.D., Michigan State University; Ph.D., University of Illinois, Urbana

**Sheller, Don** (1986), Professor Emeritus of Manufacturing Technology; B.M.E., Ohio State University; M.S., Arizona State University

**Stanton, Julie V.** (1996), Assistant Professor of Agribusiness; B.A., Georgetown University; Ph.D., University of Maryland, College Park

**Stiles, Philip G.** (1969), Professor Emeritus of Agribusiness and Resource Management; B.S., University of Arkansas; M.S., University of Kentucky; Ph.D., Michigan State University

**Sundararajan, Rajeswari** (1996), Assistant Professor of Electronics and Computer Engineering Technology; B.S., University of Madras (India); M.S., Indian Institute of Science (India); Ph.D., Arizona State University

## T

**Taysom, Elvin D.** (1953), Professor Emeritus of Agribusiness and Resource Management; B.S., University of Idaho; M.S., Utah State University; Ph.D., Washington State University

**Thomason, Leslie L.** (1969), Professor Emeritus of Technology; A.B., M.A., Ed.D., University of Oklahoma

**Thor, Eric P.** (1990), Professor of Agribusiness and Environmental Resources; Director, Center for Agribusiness Policy Studies; B.S., M.S., Ph.D., University of California, Berkeley

**Turney, Mary Ann** (1999), Associate Professor of Aeronautical Management Technology; B.A., LeMoyne College; M.A., Hofstra University; Ed.D., Nova Southeastern University

## W

**Watkins, Thomas B.** (1972), Professor Emeritus of Technology; B.S., University of Wyoming; M.S., Arizona State University

**Welty, Ellen L.** (1996), Reference/Instruction Librarian, ASU East Library Services; B.A., University of Wyoming; M.L.S., University of Arizona

**Wilcox, Sidney W.** (1955), Professor Emeritus of Engineering; B.A., Bethany-Peniel College; M.A., University of Oklahoma

**Wilson, Daniel** (1978), Senior Lecturer of Information and Management Technology; B.S., Drexel University; M.S.E., Ph.D., Arizona State University

**Wood, Billy G.** (1977), Associate Professor of Electronics and Computer Engineering Technology; A.B., University of California; B.S., Eastern Illinois University; M.S., University of Arizona

## Z

**Zeng, Guoliang** (1991), Associate Professor of Electronics and Computer Engineering Technology; B.S., Chengdu Telecommunication Institute (China); M.S., University of California, San Diego; M.N.S., Ph.D., Arizona State University

# ASU East Administrative Personnel

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## Academic Administration

Provost .....	Charles E. Backus
Vice Provost, Academic Programs and Dean, East College .....	David E. Schwalm
Dean, College of Technology and Applied Sciences .....	Albert L. McHenry
Associate Dean, College of Technology and Applied Sciences .....	Lakshmi V. Munukutla
Assistant Dean, College of Technology and Applied Sciences .....	Dale E. Palmgren
Chair, Department of Aeronautical Management Technology .....	William K. McCurry
Chair, Department of Electronics and Computer Engineering Technology .....	Robert W. Nowlin
Chair, Department of Information and Management Technology .....	Thomas E. Schildgen
Interim Chair, Department of Manufacturing and Aeronautical Engineering Technology .....	Dale E. Palmgren
Project Director, International Projects Institute .....	Gary M. Grossman
Dean, Morrison School of Agribusiness and Resource Management .....	Raymond A. Marquardt
Associate Dean, Morrison School of Agribusiness and Resource Management .....	George J. Seperich
Director, Academic Services .....	C. Vinette Cowart
Director, Administrative Services .....	Terry C. Isaacson
Director, American Indian Programs .....	Phillip J. Huebner
Director, Budget and Planning .....	Sheila A. Ainlay
Director, Campus Life Services .....	Gary L. Kleemann
Director, Center for Agribusiness Policy Studies .....	Eric P. Thor
Director, Development .....	Judith L. Heasley
Director, Information Technology .....	Kati L. Weingartner
Interim Director, Institutional Advancement .....	C. Vinette Cowart
Director, Library Services .....	Charles W. Brownson
Director, Research and Sponsored Projects .....	Jean N. Humphries
Director, Student Affairs .....	Larry Kruse

# ASU West

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**Elaine P. Maimon, Ph.D.**

Vice President and Provost

ASU West currently offers four master's degree programs plus specialized programs leading to professional certificates. Degree programs are offered through four academic units:

1. College of Arts and Sciences
2. College of Education
3. College of Human Services
4. School of Management

Established in 1984 as a nonresidential campus, ASU West serves the diverse needs of approximately 5,000 working adults, returning students, and continuing students, many of whom balance academic demands with work and family. Students enjoy a small college atmosphere on a conveniently located, full-service neighborhood campus, while having access to the resources of a Research I, PAC-10 university.

Academic programs, classes, and support services (including child care) are innovative and provide students with a high quality education. Classes are offered in the day and evening, as well as on weekends, through television (cable), on the Internet, and at off-campus locations.

The ASU West campus occupies more than 300 acres and is easily accessed via the interstate routes of I-10 and I-17. Facilities are state-of-the-art and consist of seven major buildings (600,000 square feet) surrounded by a beautifully landscaped, natural environment.

## Accreditation

ASU West is accredited by the Commission on Institutions of Higher Education of the North Central Association of Colleges and Schools. Professional programs in various academic areas are also accredited by the following agencies.

All Business and Accountancy degree programs in the School of Management are accredited by the American Assembly of Collegiate Schools of Business (AACSB), the official accrediting agency in the field of business administration.

## Academic Organization and Administration

As chief operating and academic officer of ASU West, the vice president and provost for ASU West provides executive leadership for the continuing development and management of the campus and reports directly to the president of Arizona State University. The vice president and provost is aided in the administration of the campus by vice provosts, deans, directors, department chairs, faculty, and other officers. There are four schools and colleges at ASU West administered by deans. These academic units develop and implement the teaching, research, and service programs of the institution, aided by the ASU West Library, Division of Collaborative Programs, and other services.

## Degree and Certificate Programs

ASU West offers degree and certificate programs as shown in the "ASU West Graduate Degrees and Majors," page 385.

ASU West also offers postbaccalaureate programs for teacher certification in Elementary Education and Secondary Education.

At the graduate or postbaccalaureate level, three certificates are available: The Certificate in Gerontology, administered by the College of Human Services; and the Postbaccalaureate Certificate in Accountancy, administered by the School of Management

## Admission

Students applying for admission to an ASU West degree or certificate program must complete an application and have transcripts sent directly to the following addresses:

Degree program and readmission applicants: call 602/543-4567 or write

GRADUATE STUDIES  
ARIZONA STATE UNIVERSITY WEST  
PO BOX 37100  
PHOENIX AZ 85069-7100

Nondegree and certificate program applicants: call 602/543-8123 or write

ADMISSIONS AND RECORDS  
ARIZONA STATE UNIVERSITY WEST  
PO BOX 37100  
PHOENIX AZ 85069-7100

## Campus Facilities and Services

The campus of ASU West is located between 43rd and 51st Avenues on West Thunderbird Road in Phoenix. Immediately west of the campus is the city of Glendale. The core campus was completed in March 1991 and includes the following facilities: the Fletcher Library, Sands Classroom Building, Classroom Laboratory/Computer Building, Faculty and Administration Building, Kiva Lecture Hall, and University Center Building.

**Fletcher Library.** With a seating capacity of 900 and space for 300,000 volumes, the 106,000-square-foot facility is a state-of-the-art information access center designed to take full advantage of electronic technology.

**Sands Classroom Building.** Containing 38 rooms for classes and seminars, the building provides an intimate atmosphere in which to exchange ideas.

**Kiva Lecture Hall.** The Kiva seats 200 and serves as an auditorium for a variety of programs, faculty lectures, and public forums.

## ASU West Graduate Degrees and Majors

Major	Degree	Administered by
Business Administration	M.B.A.	School of Management
Educational Administration and Supervision	M.Ed.	College of Education
Elementary Education	M.Ed.	College of Education
Concentrations: bilingual education, educational media and computers, ESL education, reading		
Secondary Education	M.Ed.	College of Education
Concentration: educational media and computers		
Special Education	M.Ed.	College of Education
Concentration: infants and young children		

**Classroom Laboratory/Computer Building.** This building contains science laboratories; studios for art, dance, and music; computer classrooms; and an astronomy platform located on the roof.

**Faculty and Administration Building.** Most faculty and administrative offices are located in this building. Classrooms are located in the basement of the east wing.

**University Center.** This facility houses admissions and records, an array of student assistance programs, health services, a preschool, and student activities. Other building facilities include food service, a bookstore, cashier and fee payment services, student lounges, an art gallery, a wellness/fitness facility, a black box theater, meeting rooms, a branch office of the Arizona State Savings and Credit Union, and a divisible, multipurpose auditorium.

**Library Services.** The Fletcher Library collection includes 310,000 volumes, 1.4 million microforms, and more than 3,000 serial titles. Additionally, students have access to the 3 million-volume collection on the main campus, which is provided through the ASU Library Online System and a document delivery service.

The library is open seven days a week. Library staff members are on duty when the library is open to provide instruction in using the online catalog, the full-text databases, and other library resources. For library hours, call 602/543-8500. For information and reference services, call 602/543-8501.

**Computing Facilities and Services.** Information Technology at ASU West offers a full range of computing facilities for use by students, faculty, and staff through a combination of local microcomputer facilities and a pervasive high-speed communications network that provides access to server computer facilities located at ASU Main and to the Internet. Students may access ASU servers from home through their Internet service provider connections.

Technopolis, a student computing access center located on the lower level of Fletcher Library, contains networked IBM-compatible and Macintosh microcomputers, and high-quality peripherals such as laser printers and scanners. Software needed by ASU West students is provided on Technopolis computers and servers. Information and help for computer users, computer accounts services, adaptive technology for students with disabilities, and manuals for equipment and software are available at the center.

ASU West also has several classrooms and a multimedia presentation facility that facilitate the use of computers and

audiovisual equipment during instruction. They are located in the Classroom Laboratory/Computer Classroom Building.

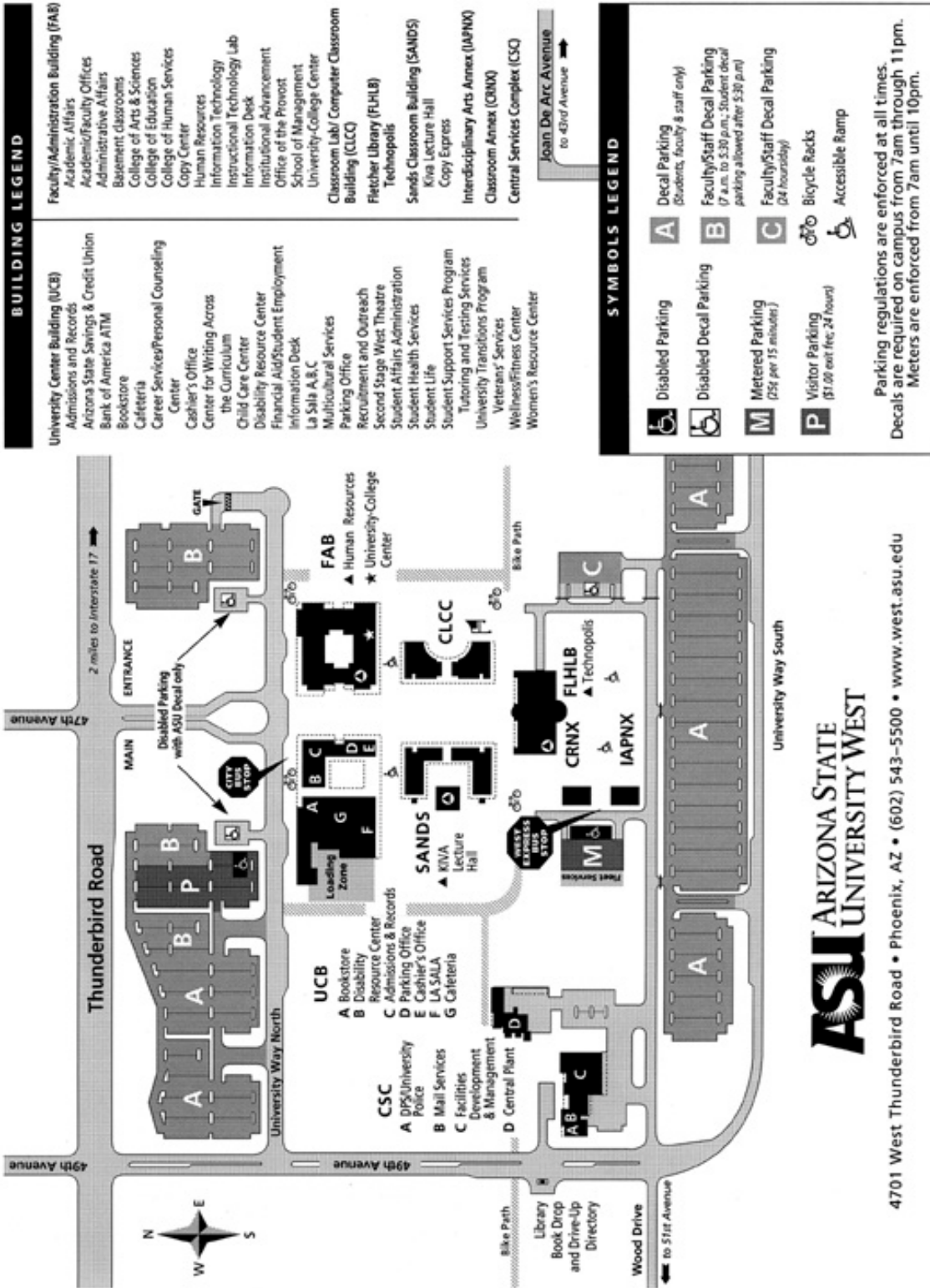
## Student Affairs

Student Affairs is responsible for the delivery of a variety of services and developmental programs in support of students' extracurricular needs and educational pursuits. Special attention is given to the recruitment and retention of a culturally diverse student population. Student Affairs' stated purpose is to identify and respond to the support and student development needs of ASU West's diverse student population for the purpose of enhancing each student's social, cultural, personal, intellectual, and professional growth. The offices of Student Affairs are located in the University Center Building and currently offer programs for

1. admissions information and services,
2. career services and personal counseling,
3. disability support services,
4. financial aid,
5. learning enrichment/tutorial,
6. multicultural student services,
7. registration services,
8. student employment,
9. student health services,
10. student life, and
11. veterans services.

For more information, visit the University Center Building, e-mail [westreg@asuvm.inre.asu.edu](mailto:westreg@asuvm.inre.asu.edu), call 602/543-8122, or write

STUDENT AFFAIRS  
ARIZONA STATE UNIVERSITY WEST  
PO BOX 37100  
PHOENIX AZ 85069-7100



4701 West Thunderbird Road • Phoenix, AZ • (602) 543-5500 • www.west.asu.edu





# ASU West Directory

For the ASU Main "Academic Directory," see page 315. For the "ASU East Directory," see page 379. Effective Sept. 1, 1999, the area code is 480 for all numbers at ASU Main, ASU East, and Downtown Center but remains 602 for ASU West.

## Academic Units (Administrative and Faculty Offices)

Arts and Sciences, College of .....	FAB N200L-3 .....	543-6000
American Studies, Department of .....	FAB N220B .....	543-6090
Ethnic Studies Program .....	CLCC 208A .....	543-6034
Integrative Studies, Department of .....	FAB N279 .....	543-6003
Interdisciplinary Arts and Performance, Department of .....	FAB N230F .....	543-6057
Life Sciences, Department of .....	CLCC 210B .....	543-6059
Social and Behavioral Sciences, Department of .....	FAB N250 .....	543-6058
Women's Studies Program .....	FAB S115A .....	543-3300
Collaborative Programs, Division of .....	FAB S144 .....	543-4600
Bachelor of Applied Science Program .....	FAB S144 .....	543-4BAS
Research Consulting Center .....	FAB S131 .....	543-3410
University-College Center .....	FAB S150 .....	543-4222
University Honors College .....	FAB S151 .....	543-4503
Writing Across the Curriculum, Center for .....	UCB 202 .....	543-6151
Education, College of .....	FAB S200L-1 .....	543-6300
Human Services, College of .....	FAB N290 .....	543-6600
Administration of Justice, Department of .....	FAB S270D .....	543-6607
Communication Studies, Department of .....	FAB S270-1 .....	543-6606
Gerontology Program .....	FAB S290-2 .....	543-6642
Nursing (ASU Main Program) .....	FAB S116-1 .....	543-6605
Recreation and Tourism Management, Department of .....	FAB S277 .....	543-6603
Social Work, Department of .....	FAB S270F .....	543-6602
Library, Fletcher .....	FLHLB .....	543-8501
Circulation and Renewal .....		543-8520
Hours .....		543-8500
Information and Reference Services .....		543-8501
Management, School of .....	FAB N101 .....	543-6200
Accountancy Program .....	FAB S178 .....	543-6275
Master of Business Administration Program .....	FAB N151 .....	543-6201
Undergraduate Global Business Program .....	FAB N101 .....	543-6200

## Others

Admissions and Records (Registration Services/Student Records) .....	UCB 120 .....	543-8123
Associated Students of ASU West .....	UCB 226 .....	543-8186
Bookstore .....	UCB 140 .....	543-6800
Career Services and Personal Counseling Center .....	UCB 320 .....	543-8124
Disability Resource Center .....	UCB 130 .....	543-8145
TDD .....		543-4327
Financial Aid Services .....	UCB 120 .....	543-8178
Graduate Studies .....	FAB S301 .....	543-4567
Information Desk .....	FAB Lobby .....	543-5500
Multicultural Services .....	UCB 221 .....	543-8148
Parking Services (Decals, Appeals) .....	UCB 105 .....	543-7275
Residency Classification .....	UCB 120 .....	543-8123
Student Academic Support Services .....	UCB 220 .....	543-8157
Student Employment .....	UCB 120 .....	543-8178
Student Health Services .....	UCB 170 .....	543-8019
Student Life .....	UCB 220 .....	543-8200
Student Support Services Program .....	UCB 201 .....	543-8121
Tutoring and Testing Services .....	UCB 201 .....	543-8136
Veterans Services .....	UCB 120 .....	543-8123
Vice President/Provost .....	FAB N303 .....	543-7000
Vice Provost, Academic Affairs .....	FAB N301 .....	543-4500
Women's Resource Center .....	UCB 323 .....	543-3421

# ASU West Faculty and Academic Professionals

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## A

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**Alvarez, Celia** (1992), Assistant Professor of Women's Studies; B.A., Hampshire College; M.S., Ph.D., University of Pennsylvania

**Andereck, Kathleen L.** (1993), Associate Professor of Recreation and Tourism Management; B.S., University of Wisconsin, Stevens Point; M.S., Texas A & M University; Ph.D., Clemson University

**Anders, Gary C.** (1989), Professor of Economics; Director, Institute for International Business; B.S., West Texas State University; M.A., Ph.D., University of Notre Dame

**Anderson, Karen E.** (1996), Assistant Librarian; B.A., Saint Olaf College; M.L.S., San Jose State University

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**Atwater, Leanne E.** (1993), Associate Professor of Management; Director, Faculty Development, School of Management; B.A., M.A., San Diego State University; Ph.D., Claremont Graduate School

**Ávalos, Manuel** (1990), Associate Professor of Political Science; B.A., M.A., University of Arizona; Ph.D., University of New Mexico

## B

**Baldwin, Bruce A.** (1989), Professor of Accountancy; B.A., M.B.A., Michigan State University; Ph.D., Arizona State University

**Beckett, E. Carol** (1996), Assistant Professor of Bilingual Education; B.A., M.Ed., Ed.D., Arizona State University

**Bellizzi, Joseph A.** (1988), Professor of Marketing; B.S., M.A., Ph.D., University of Nebraska, Lincoln

**Berman, Tressa** (1995), Assistant Professor of Anthropology; B.A., San Francisco State University; M.A., University of Colorado, Boulder; Ph.D., University of California, Los Angeles

**Bernat, Frances P.** (1993), Associate Professor of Administration of Justice; B.S., State University of New York College at Buffalo; M.A., J.D., State University of New York at Buffalo; Ph.D., Washington State University

**Bettis, Carr** (1991), Associate Professor of Accountancy; B.B.A., University of Guam; Ph.D., Indiana University, Bloomington

**Brawley, E. Allan** (1992), Professor of Social Work; Interim Director, Division of Collaborative Programs; Special Advisor to the Provost; Certificate of Social Work, University of Strathclyde (United Kingdom); D.S.W., University of Pennsylvania

**Bredbenner, Candice D.** (1990), Associate Professor of American History; B.A., Russell Sage College; M.A., Ph.D., University of Virginia

**Broadus, Dorothy C.** (1990), Associate Professor of English; Chair, Department of American Studies; B.A., Eastern Kentucky University; M.Ed., Ph.D., University of Louisville

**Bryn, Sandra L.** (1994), Assistant Professor of Curriculum and Instruction; B.S., Minot State College; M.A., Ed.D., Northern Arizona University

**Burleson, Mary H.** (1997), Assistant Professor of Psychology; B.A., M.S., New Mexico State University; Ph.D., Arizona State University

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## C

**Cardelle-Elawar, Maria** (1987), Associate Professor of Educational Psychology; B.A., Universidad Experimental Libertador (Venezuela); M.S., University of Southern California; Ph.D., Stanford University

**Cárdenas, Lupe** (1986), Associate Professor of Spanish; B.A., M.A., Ph.D., Arizona State University

**Carey, James** (1998), Lecturer, School of Management; B.S., M.B.A., Ph.D., Arizona State University

**Carey, Jane M.** (1988), Associate Professor of Management Information Systems; B.S., M.B.A., Eastern Illinois University; Ph.D., University of Mississippi

**Carlile, Barbara J.** (1993), Lecturer; Coordinator, Field Placement for Education; B.A., Immaculate Heart College; M.Ed., Arizona State University; Ed.D., Northern Arizona University

**Carter, Wendy** (1997), Assistant Professor of Sociology; B.A., Stanford University; M.S., Carnegie Mellon University; M.S., Ph.D., University of Wisconsin, Madison

**Cerveris, Michael E.** (1990), Professor of Music; Chair, Department of Interdisciplinary Arts and Performance; B.S., The Juilliard School; M.A., Catholic University; D.M.A., West Virginia University

**Chaffin, Nancy** (1994), Assistant Librarian; B.A., M.L.S., University of Arizona

**Chang, Stanley Y.** (1992), Associate Professor of Accountancy; B.B.A., National Taiwan University (Taiwan); M.A., University of Missouri; Ph.D., Texas Tech University

**Chisholm, Inés M.** (1991), Associate Professor of Bilingual Education; B.A., M.Ed., University of Puerto Rico; Ph.D., University of Florida

**Christie, Alice A.** (1995), Assistant Professor of Technology and Education; B.A., Denison University; M.Ed., Boston University; Ph.D., Arizona State University

**Cleland, Jo Ann V.** (1991), Assistant Professor of Reading/Language Arts; B.A., Saint Olaf College; M.A., Ed.D., Northern Arizona University

**Coles, Jerilyn W.** (1994), Assistant Professor of Management; B.S., Brigham Young University; Ph.D., University of Utah

**Collins, Kathleen** (1997), Assistant Librarian; B.A., University of Maine; M.L.I.S., Dalhousie University (Canada)

**Collins-Chobanian, Shari C.** (1994), Assistant Professor of Philosophy; B.A., Colorado State University; M.A., Ph.D., Washington University

**Comprone, Joseph J.** (1992), Professor of English and American Studies; B.A., Springfield College; M.A., Ph.D., University of Massachusetts, Amherst

**Corrigan, John A.** (1992), Associate Professor of Religion; B.A., University of Dayton; M.A., Miami University; Ph.D., University of Chicago

**Costantino, James** (1998), Lecturer of Accountancy, B.S., M.Acc., Arizona State University; M.A., University of Southern California

**Craig, Timothy P.** (1990), Associate Professor of Ecology; B.S., Kansas State University; M.S., Ph.D., Northern Arizona University

**Cuádriz, Gloria H.** (1994), Assistant Professor of American Studies; B.A., University of California, Santa Cruz; M.A., Ph.D., University of California, Berkeley

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## D

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**Delgado, Fernando** (1994), Assistant Professor of Communication Studies; B.A., San Jose State University; M.A., Ph.D., University of Iowa

**Di Mare, Lesley** (1992), Associate Professor of Communication Studies; Chair, Department of Communication Studies; B.A., California State University, Chico; M.A., California State University, Hayward; Ph.D., Indiana University, Bloomington

**Dix, Clarence L.** (1979), Senior Lecturer of Social Work; B.S., Buena Vista College; M.S.W., University of Chicago

**Dixon, Kevin A.** (1995), Associate Research Scientist of Life Sciences; B.S., Brock University (Canada); M.S., University of Oklahoma; M.S., Ph.D., University of Chicago

**Duncan, William A.** (1991), Associate Professor of Accountancy; B.S., Portland State University; Ph.D., University of Texas, Austin

## E

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## F

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**Farrelly, Deg** (1991), Associate Librarian; B.A., Illinois State University; M.L.S., Rutgers, The State University

**Fedock, Patricia** (1993), Assistant Professor of Science Education; B.A., M.A., Ph.D., Arizona State University

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**Fields, Jill S.** (1998), Visiting Assistant Professor of American Studies; B.A., University of California, Santa Cruz; M.A., Ph.D., University of Southern California

**Firat, A. Fuat** (1990), Professor of Marketing; Licencié en Economie, Istanbul University (Turkey); Ph.D., Northwestern University

**Flint, G. David** (1998), Lecturer, School of Management; B.A., Grand Canyon University; M.I.M., American Graduate School of International Management; Ph.D., Texas A & M University

## G

**Gallegos, Bee** (1984), Associate Librarian; B.S., University of North Alabama; M.L.S., George Peabody College for Teachers

**Garcia, Mildred** (1997), Associate Professor of Social and Behavioral Sciences; Associate Vice Provost; Associate Director, Hispanic Research Center; B.S., Bernard M. Baruch College; M.A., New York University; M.A., Ed.D., Columbia University, Teachers College

**Garrett, Judith N.** (1996), Assistant Professor of Early Childhood Education/Special Education; B.S., State University of New York, Fredonia; M.A., University of Tennessee, Knoxville; Ph.D., George Mason University

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**Georges-Abeyie, Daniel** (1992), Professor of Administration of Justice; B.A., Hope College; M.A., University of Connecticut; Ph.D., Syracuse University

**Gilkeson, John S.** (1991), Associate Professor of History; A.B., Amherst College; M.A., University of Oklahoma; Ph.D., Brown University

**Gitelson, Richard** (1994), Associate Professor of Recreation and Tourism Management; Chair, Department of Recreation and Tourism Management; B.A., M.A.T., M.S., University of North Carolina, Chapel Hill; Ph.D., Texas A & M University

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**Gopalakrishnan, Mohan** (1998), Associate Professor of Operations Production Management; B.E., College of Engineering (India); M.S., Ph.D., University of Alabama, Tuscaloosa

**Graves, Joseph L.** (1994), Associate Professor of Evolutionary Biology; Coordinator, Ethnic Studies Program; A.B., Oberlin College; Ph.D., Wayne State University

**Greenhut, John G.** (1989), Associate Professor of Finance and Economics; B.A., Ph.D., Texas A & M University

**Griffin, Marie** (1997), Assistant Professor of Administration of Justice; B.S., Santa Clara University; Ph.D., University of Arizona

**Grober, Matthew S.** (1995), Associate Professor of Endocrinology; B.S., California State, Long Beach; Ph.D., University of California, Los Angeles

**Gruber, Diane** (1995), Lecturer of Communication Studies; B.A., Rutgers, The State University; M.A., Purdue University

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## H

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**Hay, Victoria** (1993), Senior Lecturer of Writing; B.A., University of Arizona; M.A., Ph.D., Arizona State University

**Hayden, Mary** (1998), Lecturer, School of Management; B.A., M.B.A., Arizona State University

**Hayne, Stephen C.** (1994), Assistant Professor of Management Information Systems; B.Com., University of Alberta; Ph.D., University of Arizona

**Hernández, Anthony C.R.** (1992), Associate Professor of Psychology; B.A., University of California, Riverside; M.A., Ph.D., University of California, Los Angeles

**Hess, Robert K.** (1990), Associate Professor of Measurement and Evaluation; B.A., M.Ed., University of Georgia; Ph.D., University of South Carolina

**Howard, Elizabeth C.** (1994), Assistant Professor of Curriculum and Instruction; B.A., University of Texas, Austin; M.A.T., New Mexico State University; Ph.D., University of Texas, Austin

**Hughes, Kimberly** (1994), Assistant Professor of Genetics; B.A., Rice University; M.S., Ph.D., University of Chicago

**Hultsman, John T.** (1990), Professor of Recreation and Tourism Management; B.G.S., University of Kansas; M.S., University of Missouri; Re.D., Indiana University, Bloomington

**Hultsman, Wendy Z.** (1990), Associate Professor of Recreation and Tourism Management; B.S.E., State University of New York, Cortland; M.S., Indiana University, Bloomington; Ph.D., Pennsylvania State University

**Hutt, Roger W.** (1975), Associate Professor of Management; Director, Undergraduate Global Business Programs, School of Management; B.S., M.B.A., Ohio State University; Ph.D., Michigan State University

**Hyman, Batya** (1995), Assistant Professor of Social Work; B.A., Barnard College; M.S.W., Boston University; Ph.D., Brandeis University

**Hyndman, Jennifer** (1997), Assistant Professor of Geography; B.A., University of Alberta (Canada); M.A., Lancaster University (United Kingdom)

## I

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**Isbell, Dennis** (1991), Associate Librarian; B.S., M.A., Northern Arizona University; M.L.S., University of Arizona

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## J

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**Jones, Robert W.** (1994), Associate Professor of Collaborative Programs; Director, Center for Writing Across the Curriculum; B.S., M.A., Middle Tennessee State University; Ph.D., Miami University

## K

**Kammerlocher, Lisa** (1988), Associate Librarian; B.S., M.L.S., University of Oklahoma

**Kang, Eun** (1998), Visiting Assistant Professor of Finance; B.LAWS, Sungkyunkwan University (Korea); M.B.A., University of Michigan; Ph.D., Wharton School, University of Pennsylvania

**Kassing, Jeffrey** (1998), Visiting Assistant Professor of Communication Studies; B.A., William Jewell College; M.A., Murray State University; Ph.D., Kent State University

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**Kelley, Michael F.** (1990), Associate Professor of Early Childhood Education; B.S., M.S., Arizona State University; Ed.D., University of Georgia

**Kirby, Andrew** (1995), Professor of Social and Behavioral Sciences and Geography; Chair, Department of Social and Behavioral Sciences; B.A., Ph.D., University of Newcastle (United Kingdom)

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**Knopf, Richard C.** (1986), Professor of Recreation and Tourism Management; B.S., M.S., Ph.D., University of Michigan

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## L

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**Lentz, Daniel** (1991), Associate Professor of Music Theory and Composition; B.A., Saint Vincent College; M.F.A., Ohio University, Athens

**Lerman, Richard** (1995), Associate Professor of Media Arts; B.A., M.F.A., Brandeis University

**Levy, Emanuel** (1990), Professor of Sociology; B.A., M.A., Tel Aviv University (Israel); M.Ph., Ph.D., Columbia University

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## M

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**Medville, Karen K.** (1995), Assistant Research Scientist in Life Sciences; B.A., Colorado College; M.S., Colorado State University

**Mengesha, Astair Gebre Mariam** (1991), Associate Professor of Women's Studies; Chair, Women's Studies Program; B.A., Purdue University; M.A., Michigan State University; Ph.D., Iowa State University

**Mezner, Martin** (1994), Assistant Professor of International Business; B.A., B.S., Bryan College; M.S., University of Texas, Dallas; Ph.D., University of South Carolina

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**Miller, Paul A.** (1988), Associate Professor of Psychology; B.S., Saint Vincent College; M.S., North Carolina State University, Raleigh; M.A., Ph.D., University of Texas, Austin

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**Mueller, Carol M.** (1988), Associate Professor of Sociology; B.A., University of California, Berkeley; M.A., Rutgers, The State University; Ph.D., Cornell University

**Muller, Barbara J.** (1991), Senior Lecturer of Accountancy; B.S., M.B.A., Arizona State University

**Myers, Marilyn** (1987), Associate Librarian; Director, Library Information and Resources; B.A., Kansas State University; M.S., University of Illinois; M.A., Kansas State University

## N

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**Nadir, P. Aneesah** (1994), Lecturer of Social Work; B.S.W., Adelphi University; M.S.W., Arizona State University

**Nahavandi, Afsaneh** (1989), Professor of Management; B.A., University of Denver; M.A., Ph.D., University of Utah

**Náñez, José E. Sr.** (1988), Associate Professor of Psychology; B.A., M.A., California State University; Ph.D., University of Minnesota, Twin Cities

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**Nilan, Kathleen M.** (1994), Assistant Professor of European Studies; B.A., Yale University; M.A., Sarah Lawrence College; M.A., M.Phil., Ph.D., Yale University

**Noronha, Gregory M.** (1995), Assistant Professor of Finance; B.S.E., University of Michigan; M.B.A., Ph.D., Virginia Polytechnic Institute and State University

**Nucci, Christine** (1998), Assistant Professor of Early Childhood Education; B.A., Hunter College, City University of New York; M.S., Brooklyn College, City University of New York; Ph.D., City University of New York

## O

**Olson, Christine M.** (1996), Lecturer of Psychology; Coordinator of Internships, Integrative Studies; B.A., Bethany College; M.S., Kansas State University; Ph.D., Arizona State University

## P

**Painter, Suzanne R.** (1995), Assistant Professor of Educational Administration; B.S., Eastern Oregon State College; M.Ed., Ph.D., University of Oregon

**Pambuccian, Victor V.** (1994), Assistant Professor of Mathematics; Baccalaureat, German Lyceum (Romania); M.S., University of Bucharest (Romania); Ph.D., University of Michigan

**Pecuch-Herrero, Marta** (1994), Assistant Professor of Mathematics; M.S., Ph.D., University of Chicago

**Perry, Eleanor A.** (1996), Assistant Professor of Educational Administration; B.A., Douglas College; M.Ed., Rutgers, The State University; Ph.D., University of Oregon

**Portillo, Gregory R.** (1995), Assistant Professor of Political Science; B.A., California State University, Hayward; M.A., University of California, Los Angeles; Ph.D., University of California, Berkeley

**Pough, F. Harvey** (1993), Professor of Systems Ecology; Chair, Department of Life Sciences; B.A., Amherst College; M.A., Ph.D., University of California, Los Angeles

**Pulido, Alberto L.** (1993), Assistant Professor of American Studies; B.A., University of California, San Diego; M.A., Ph.D., University of Notre Dame

## R

**Ragle, Gael L.** (1988), Lecturer of Educational Psychology; B.S.Ed., M.A.Ed., Northern Arizona University; Ed.D., Arizona State University

**Ramsey, Ramsey Eric** (1994), Assistant Professor of Communication Studies; B.A., Rutgers, The State University; M.A., Ph.D., Purdue University

**Reese, Ruth** (1988), Lecturer of Educational Psychology; B.S., University of Wisconsin, Madison; M.S., Ph.D., University of Wisconsin, Milwaukee

**Ridley, Dale Scott** (1990), Associate Professor of Educational Psychology; B.S., New Mexico State University; M.A., Ph.D., University of Texas, Austin

**Rillero, Peter** (1994), Assistant Professor of Science Education; B.A., State University of New York, Buffalo; M.A., Columbia University; Ph.D., Ohio State University

**Rochford, Linda** (1998), Associate Professor of Marketing; B.S., M.B.A., Ph.D., University of Minnesota

**Rodriguez, Christina** (1997), Assistant Professor of Clinical Psychology; B.S., University of Miami; Ph.D., University of Florida

**Rodriguez, Nancy** (1998), Assistant Professor of Administration of Justice; B.S., University of Miami; M.S., Ph.D., University of Florida

**Ryan, Joseph M.** (1995), Professor of Education and Collaborative Programs; Director, Research Consulting Center; A.B., M.Ed., Boston College; Ph.D., University of Chicago

## S

**Sabatini, Arthur J.** (1991), Assistant Professor of Performance Studies; B.A., M.A., Ohio University; Ph.D., New York University

**Saffo, Mary Beth** (1994), Professor of Physiology; B.A., University of California, Santa Cruz; Ph.D., Stanford University

**Scheiner, Samuel M.** (1994), Associate Professor of Biometry; B.A., M.S., Ph.D., University of Chicago

**Schmidtke, Paul C.** (1998), Lecturer of Integrative Studies; B.S., Rose-Hulman Institute of Technology; Ph.D., Ohio State University

**Schuett, Gordon W.** (1995), Assistant Professor of Integrative Biology; B.A., University of Toledo; M.S., Central Michigan University; Ph.D., University of Wyoming

**Searle, Mark S.** (1995), Professor of Recreation and Tourism Management; Dean, College of Human Services; B.A., University of Winnipeg (Canada); M.S., University of North Dakota; Ph.D., University of Maryland

**Sen, Nilanjan** (1992), Associate Professor of Finance; B.A., Jadavpur University (India); M.A., Ph.D., Virginia Polytechnic Institute

**Shirreffs, Janet H.** (1977), Professor of Recreation and Tourism Management; Director, Gerontology Program; B.S., Ithaca College; M.S., Syracuse University; Ph.D., Texas Woman's University

**Shultz, Clifford J.** (1992), Associate Professor of Marketing; B.A., DePauw University; M.A., Ph.D., Columbia University

**Siegel, Donald** (1994), Associate Professor of Economics; B.A., Columbia College; M.Phil., Ph.D., Columbia University

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Liaison, Nursing (ASU Main Program).....	Lasca Beck
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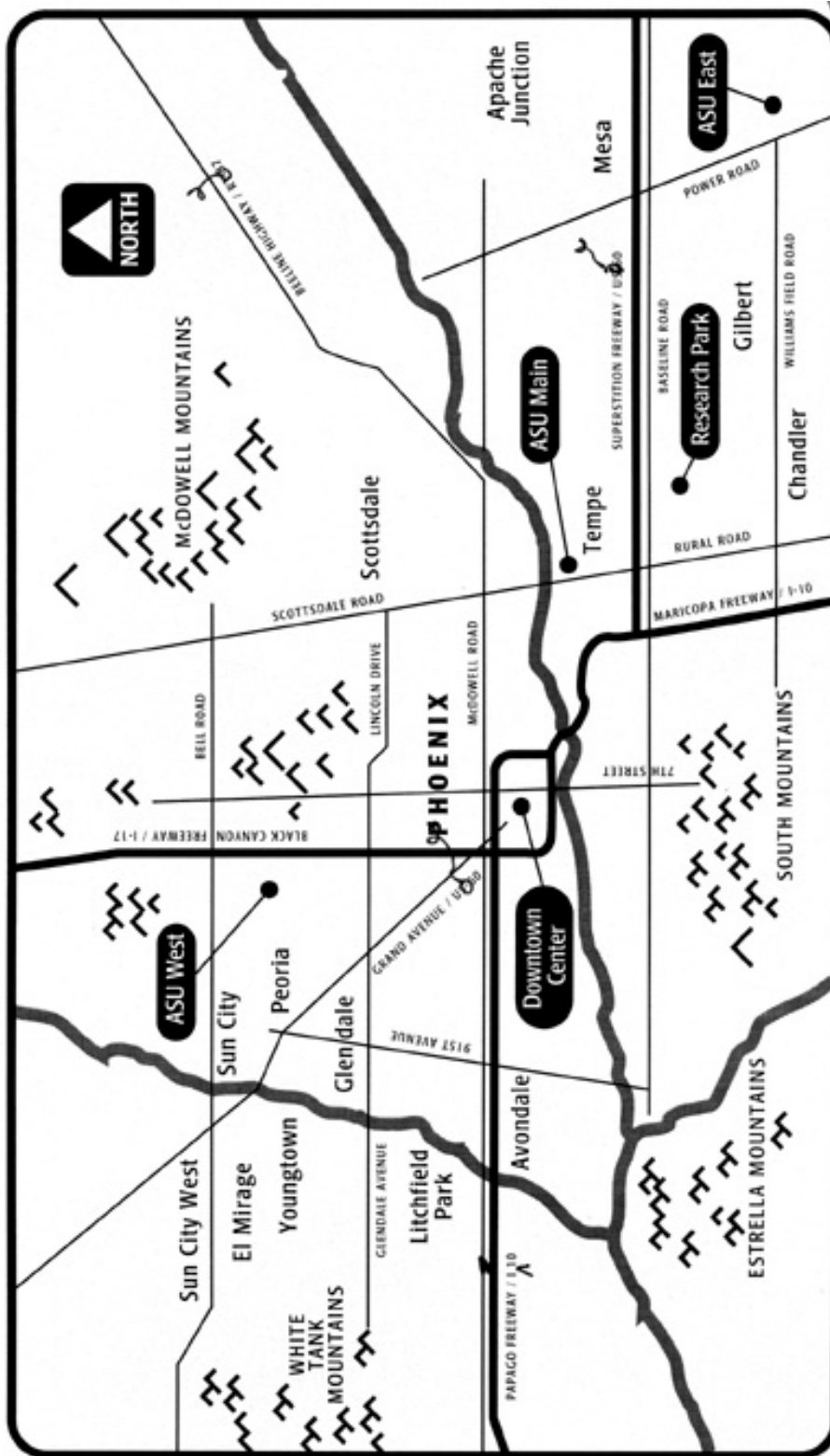
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# ASU VICINITY MAP



MAP BY AL CAMASTO, ASU PDC . 2/99

# Building Abbreviations

ADM A	Administration A-Wing	LAWLB	John J. Ross-William C. Blakley Law Library
ADM B	Administration B-Wing	LIB	Charles T. Hayden Library
AED	College of Architecture and Environmental Design/North	LL	G. Homer Durham Language and Literature Building
AG	Agriculture Building	LSA	Life Sciences A-Wing
AGB1-4	ASUE Agribusiness Quads 1-4 <sup>1</sup>	LSC	Life Sciences C-Wing
AGBFS	ASUE Agribusiness Food Science Lab <sup>1</sup>	LSE	Life Sciences E-Wing
ANTH (Wings A-C)	Anthropology Building	LYC	Lyceum Theatre
AQUAT (Wings A and B)	Mona Plummer Aquatics Center	MAIN	Old Main
ARCH	College of Architecture and Environmental Design/South	MCENT	A.J. Matthews Center
ARCV	University Archives	MCL	James H. McClintock Hall
ART	Art Building	MHALL	Carrie Matthews Hall
ARWH	Art Warehouse	MOEUR	B.B. Moeur Administration
ASUDC	Downtown Center	MTCHL	Mitchell School (Tempe)
BA	Business Administration Building	MU	Memorial Union
BAC	Business Administration C-Wing	MUR	John Murdock Lecture Hall
BKSTR	ASU Bookstore	MUSIC	Music Building
CERA (Wings A and B)	Ceramics Annex	NEEB	L.S. Neeb Hall
CFS	Center for Family Studies	NOBLE	Daniel E. Noble Science and Engineering Library
CHAPL	Danforth Chapel	NUR	Nursing Building
CLCC	Classroom Laboratory/ Computer Classroom Building <sup>2</sup>	PBS	Packard Baseball Stadium
CLRB	ASUE Classroom Building <sup>1</sup>	PEBE	Physical Education Building East
CMPIN	Campus Inn	PEBW	Physical Education Building West
CNTR	ASUE Academic Center Building <sup>1</sup>	PPS	Facilities Management
COMM	Center for Agribusiness Policy Studies <sup>1</sup>	PRNT	ASUE Academic/Business Services Complex <sup>1</sup>
COWDN	Cowden Family Resources Building	PS (Wings A-G)	George M. Bateman Physical Sciences Center
CP	Central Plant	PSH	Physical Science H-Wing
CPCOM	Computing Commons Building	PSY	Psychology Building
CRI	Cancer Research Institute	RITT (Wings A and B)	Ritter Building <sup>2</sup>
CRNX	Classroom Annex <sup>2</sup>	SANDS	Sands Classroom Building <sup>2</sup>
CSB	Community Services Building	SCOB (Wings A and B)	John W. Schwada Classroom Office Building
CSC	Central Services Complex <sup>2</sup>	SDF	Solar Demonstration Facility
CUB	Williams Campus Union Building <sup>1</sup>	SHS (Wings A and B)	Student Health Service
ECA	Engineering Center A-Wing	SIM	ASUE Flight Simulator Building <sup>1</sup>
ECB	Engineering Center B-Wing	SOLAR	Photovoltaics Testing Laboratory <sup>1</sup>
ECC	Engineering Center C-Wing	SRC	Student Recreation Complex
ECD	Engineering Center D-Wing	SS	Social Sciences Building
ECE	Engineering Center E-Wing	SSV	Student Services Building
ECF	Engineering Center F-Wing	STAD	Sun Devil Stadium
ECG	Engineering Center G-Wing	STAUF (Wings A and B)	Charles Stauffer Communication Arts Building
ECANX	Engineering Center Annex	TC	Technology Center
ED	Hiram B. Farmer Education Building	TCB	Aeronautics Building
EDB	Ira D. Payne Education Hall	TCC	Technology Center Annex
EDC	Education Lecture Hall	TECH	ASUE Technology Center <sup>1</sup>
ENGR	Engineering Research Center	TECH2	ASUE Technology Center Annex <sup>1</sup>
FAB	Faculty and Administration Building <sup>2</sup>	THWH	Theatre Warehouse
FAC	Nelson Fine Arts Center	TOWER (Wings A and B)	University Tower Center
FIELD	University Field Lab	TRACK	Joe Selleh Track
FLHLB	Fletcher Library <sup>2</sup>	UAC	Wells Fargo Arena
GGMA	Grady Gammage Memorial Auditorium	UASB	Undergraduate Academic Services Building
GHALL	Dixie Gammage Hall	UCB	University Center Building <sup>2</sup>
GWC	Barry M. Goldwater Center for Science and Engineering Research	UCLUB	University Club
IAPNX	Interdisciplinary Arts and Performance Annex <sup>2</sup>	VISIT	ASU Visitor's Information Center
ICA	Intercollegiate Athletics	WFLD	ASU West Alternate Locations <sup>2</sup>
IRISH	Frederick M. Irish Hall	WH	Warehouse
LAW	John S. Armstrong Hall	WHALL	West Hall
		WILSN	George W. Wilson Hall
		WTC	Whiteman Tennis Center

<sup>1</sup> Located at ASU East.

<sup>2</sup> Located at ASU West.

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