Dance

Master's Program

herbergercollege.asu.edu/dance

480/965-5029

PEBE 107A

Claudia Murphey, Chair

Professors: Kaplan, Keuter, Ludwig, Murphey

Associate Professors: Jackson, Matt, Mooney

Assistant Professors: Fitzgerald, Lindholm Lane, Parrish, Rolnick, Tsukayama, Vissicaro

Associate Research Professional: Mitchell

Lecturer: Tongret

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, education and science and somatics of dance; and to begin charting future directions through technology, media opportunities, and community partnerships.

Admission. All students must apply to the M.F.A. program in Dance through the Graduate College. A bachelor's degree with a major in Dance or its equivalent is required. Applicants must submit an application form, fee, transcripts, and other materials to the Graduate College Admissions office. An application packet and list of guidelines are available online at www.asu.edu/graduate/admissions. They may also be obtained from Graduate Admissions by calling 480/965-6113 or by sending e-mail to gradadmiss@asu.edu. The GRE examination is not required for admission into this program. The TOEFL exam is required for international students.

Three letters of reference, a current résumé, and a statement of intent must be filed with the Department of Dance to assess the qualifications of each candidate. In addition to submitting this material, the candidate must participate in a technique audition in modern dance and ballet and present a self-choreographed solo dance work approximately five minutes in length. The technique audition and solo work may be submitted on videotape (VHS format, Standard Play [SP] speed) or CD-ROM (Macintosh format); however, auditioning in person is preferred. Each candidate must also submit a videotape of a group work choreographed by the applicant within the last three years and/or a portfolio of relevant work in a chosen area(s) of expertise. Applicants for admission also participate in an interview with the faculty.

Program of Study. A total of 60 semester hours of graduate credit is required, including

1. 30 to 37 semester hours in foundational studio/theory course work (in the areas of technique and movement arts, choreography and art-making practices, interactive arts, education and community partnerships, theory, and professional preparation);
2. eight hours of individual M.F.A. project (choreography, performance, or other approved project);
3. 15 to 30 semester hours of electives in chosen area(s) of study.

In consultation with the graduate directors, the graduate policy committee, 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. The M.F.A. project serves as the capstone experience in the graduate dance curriculum. 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, or projects designed to incorporate technology or other approved research components. The department welcomes projects in the areas of dance science and somatics, multimedia, community education and professional outreach, theory, and history whose approaches are interdisciplinary in nature. Required supporting documentation of the project may be written and bound, realized on 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.

DANCE HISTORY (DAH)

DAH 501 Philosophy of Dance. (3)
once a year
Analyzes traditional and contemporary theories of dance with regard to issues of expression, form, and meaning.

DAH 502 Cultural Concepts of Dance. (3)
once a year
Examines the close connection between culture, dance, and movement through writings in cultural theory, dance ethnology, and philosophy.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

DANCE (DAN)

DAN 500 Research Methods. (1–12)
selected semesters

DAN 510 Dance Stagecraft and Production. (1–3)
fall and spring
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 its equivalent).

DAN 521 Sound Lab. (2)
fall
Audio mixing for analog/digital recording and editing. Lecture, lab. Prerequisite: instructor approval.

DAN 522 Sound Design. (2)
spring
Focus on digital recording/editing of audio compositions for choreographic and video projects. Lecture, lab. Pre- or corequisite: DAN 423 or 521.

DAN 523 Dance, Computers, and Multimedia. (3)
fall and spring
Introduces desktop multimedia as it relates to dance creation, production, education, and research. Lecture, lab.

DAN 534 Technique and Theory of Modern Dance. (3)
fall and spring
Preparation in the performance and comprehension of professional-level modern dance for first-year graduate students. 6 hours weekly. May be repeated for credit. Prerequisite: placement audition.

DAN 535 Technique and Theory of Ballet. (2)
fall and spring
Graduate study of ballet technique. May be repeated for credit. Studio. Prerequisite: placement audition.

DAN 540 Advanced Problems in Dance Kinesiology. (3)
fall
Principles of kinesiology applied to the torso and shoulders. Focus on identifying muscular imbalances, pathomechanics, and analysis of dance conditioning practices. Lecture, lab.

DAN 542 Ideokinesis. (2)
fall
Theoretical examination of ideokinetic methods of facilitating postural change and movement efficiency.

DAN 545 Laban Movement Analysis. (3)
spring
Theory and practice of Laban movement analysis and Bartenieff fundamentals through movement integration, observation, critical research, notation, and analysis. Lecture, studio.

DAN 550 Graduate Dance Pedagogy: Modern. (3)
spring
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)
fall
Advanced analysis of teaching techniques for ballet. Prerequisite: instructor approval.

DAN 564 Solo and Group Choreography I. (3)
fall
Original choreography created for solo and group performance. Studio. Prerequisites: DAN 364 and 365 (or their equivalents).

DAN 565 Solo and Group Choreography II. (3)
spring
Continuation of DAN 564. Studio. Prerequisite: DAN 564.

DAN 571 Dance Theatre. (1–3)
fall and spring
Performance in specially choreographed dance productions. May be repeated for credit. Prerequisite: instructor approval.

DAN 580 Performance Studies Practicum. (1–3)
spring
Focus on developing rehearsal skills and achieving performance excellence through the preparation of three completed works. Studio, lab.

DAN 591 Seminar. (1–3)
fall and spring
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)
fall and spring
Preparation in the performance and comprehension of professional-level modern dance for second-year graduate students. 6 hours weekly. May be repeated for credit. Prerequisite: placement audition.

DAN 640 Paradigms for the Analysis of Dance Technique. (3)
spring
Motor learning, cognitive science, motor development, dance medicine, and somatics paradigms applied to the practice of dance technique. Prerequisite: DAN 500 or instructor approval.

DAN 664 Choreography Workshop. (1–3)
fall
Choreographic study in a seminar context with faculty and guest artists. May be repeated for credit. Studio. Prerequisites: DAN 564, 565.

DAN 671 Dance Arizona Repertory Theatre. (3–4)
fall and spring
Preprofessional modern dance company, emphasizing outreach and performance. Opportunity to work with guest artists and community schools and organizations. Lecture, studio. Prerequisite: instructor approval.

DAN 693 M.F.A. Project. (1–8)
fall, spring, summer
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 Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Design

Master's Program

www.asu.edu/caed/design/designHome.html

480/965-4135

AED 154

Jacques R. Giard, Director

Professors: Brandt, Giard, Kroelinger

Associate Professors: Bernardi, Cutler, Johnson, McDermott, Patel, Ratner, Sanft, Witt

Assistant Professors: Boradkar, Herring, McCoy, Rothstein, Thibeau Catsis, Weed

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. Course offerings focus on such areas as facilities planning and management, human factors, and methodology, theory and criticism.

The faculty in the school also participate in offering the Ph.D. in Environmental Design and Planning program. See "Environmental Design and Planning," page 202, for information on this interdisciplinary, college-wide Ph.D. degree program.

MASTER OF SCIENCE IN DESIGN

The Master of Science in Design (M.S.D.) degree with a major in Design has three concentrations: graphic design, industrial design, and interior design.

Graphic Design Concentration

The graphic design concentration is for individuals interested in advanced studies in visual language; history; theory; criticism; and methodology, design processes, and technology. This program develops an understanding of contemporary graphic design issues through specialized research and design skills. It also prepares the graduate student for a career in graphic design education.

Industrial Design Concentration

This concentration is for individuals interested in advanced studies in human factors, history, theory, criticism and methodology, design processes, and technology. This program develops an understanding of contemporary industrial design issues through specialized research and design skills. It also prepares the graduate student for a career in industrial design education.

Interior Design Concentration

The interior design concentration is for individuals interested in advanced studies in facilities planning and management, or history, theory, criticism and methodology. This program develops an understanding of contemporary interior design issues through specialized research and design skills. It also prepares the graduate student for a career in interior design education.

Program Goals

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 for students who have a baccalaureate degree in Graphic Design, Industrial Design, Interior Design, or a related design discipline;
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 graduates to contribute to the literature of design through articles, essays, and books, or to participate in conferences related to their concentrations.

There are three areas of study.

Areas of Study

Design Methodology, Theory, and Criticism in Design. This area of study is available to majors with backgrounds in art, architecture, design history, graphic design, industrial design, interior design, sociology, environmental psychology, or research methods. Students choosing this area of study may focus on methodology, theory, or criticism, or they may choose to combine any or all of these three. Courses in this area of study address: selected design methodologies that stimulate creativity; methodologies for critical analysis; methodologies that lead to development of or application of theories and philosophies; the historical origins of theories and philosophies that form the basis of contemporary design; the implication of theory in design knowledge and its discourse; strategies for recognizing and interpreting emerging design issues and trends; the evolution of the literature of design criticism; definition of design criticism; the qualifications of design critics' application of theories or philosophies in making judgments; and qualities constituting effective critical writing. Applications include design research, design education, design marketing and production decision, and design criticism.

Facilities Planning and Management in Design. This area of study focuses on the coordination of the work place, equipment, and visual (graphic) environment 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/product interface. The human/product interface focus applies systems (such as interactive design) and environments (such as museum and exhibition design). Special emphasis is placed on the relationship between human and test performance factors. Emphases include qualities of function; methods of forming organizational relationships; factors of environmental control systems (acoustics and illumination, wayfinding, etc.); and human factors in graphic, product, and interior design. Subject matter also includes the design of equipment, machines, and spaces; ergonometrics and forms of ergonomic documentation; and analysis of relationships between spaces, objects, and people as simulated through computer animation, imaging, and traditional modeling techniques.

Program of Study. This program of study applies to the areas of study described in the preceding text. 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 study	12
Approved electives outside the school	9
Approved research methods courses	6
Thesis or Applied Project	6
Total	36

Admission Requirements. Applicants must hold a baccalaureate degree in Graphic Design, Industrial Design, Inte-

rior Design, or a related design discipline to participate in this degree program. When applying for admission, applicants must declare one of three concentrations: graphic design, industrial design, or interior design. Additionally, all areas of study must be identified from the following: design methodology, theory, and criticism; facility planning and management; or human factors in design. Admission to the M.S.D. program is selective and is done 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. Submit materials to

SCHOOL OF DESIGN
COLLEGE OF ARCHITECTURE AND
ENVIRONMENTAL DESIGN
ARIZONA STATE UNIVERSITY
PO BOX 872105
TEMPE, AZ 85287-2105

1. A 3.0 or above baccalaureate GPA is required for application.
2. Minimum TOEFL score of 550 on paper-based test or 213 on computer-based test is required of international students whose native language is not English.
3. A statement of intent (maximum 600 words), which must include the following points:
   a. Specify intended concentration: graphic design, industrial design, interior design.
   b. Specify area of study: facilities planning and management; human factors in design; design methodology, theory, and criticism.
   c. Discuss proposed research topic. What will be the research focus? Why is this research important to the applicant, the design community, and the general population?
   d. Specify proposed mentor for intended research. Faculty biographies can be found on the Web site at www.asu.edu/caed/design/designHOME.html.
   e. Discuss personal academic background and professional experience that has prepared the applicant for or will support proposed research topic.
4. Three letters of recommendation from persons who are qualified to comment on the applicant's potential in the selected concentration.
5. 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 (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 or the SPEAK test administered by the American English and Culture Program at ASU); and
6. An 8.5" x 11" portfolio documenting papers and imaginative projects that support the intended concentration and that demonstrate drawing, rendering, and modeling skills.

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 of Design by January 15 for fall semester.

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.

Foreign Language Requirements. None.

Practicum. All students in the program must enroll in a three-hour teaching practicum (DSC 580) that focuses on the problems and issues surrounding studio, lecture, and seminar instruction. Emphasis is on the techniques of criticism and individual and group studio teaching.

Thesis or Applied Project. For students choosing the thesis option, six semester hours of DSC 599 Thesis apply toward the thesis. Guidelines in the *Format Manual* must be followed. For students choosing the applied project option, six hours of DSC 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.

Web Addresses

Information about the program in Design, and the College of Architecture and Environmental Design in general, may be found on the Web site at www.asu.edu/caed/design/designHome.html. E-mail inquiries or requests should be sent to designmsd@asu.edu.

RESOURCES

Faculty

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, material culture studies, exhibit design, furniture design, environmental design, facilities planning and management, methodology, theory and criticism, creative thinking, design evaluation, and wayfinding.

Facilities

The College of Architecture and Environmental Design maintains a high-bay research facility, a lighting laboratory, ethnographic studies 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 500 Research Methods. (1–12)
selected semesters
Fee.

DSC 520 Contemporary Design Issues. (3)
fall
Projected applications in design production, planning, and decision-making processes. Lecture, seminar. Prerequisites: INT 310 and 311 (or their equivalents).

DSC 524 Illumination and Acoustics. (3)
selected semesters
Research and laboratory investigation of advanced illumination and acoustics issues of facility design. Emphasizes human factors and performance aspects. Prerequisites: INT 457 and 458 (or their equivalents).

DSC 525 Design Methodologies. (3)
fall
Practical exercises and studies in problem-solving strategies; problem definition and supporting theory for the designer. Lecture, seminar, lab. Fee. Prerequisite: senior or graduate standing.

DSC 527 Modern Design Theory. (3)
spring
Aesthetic, political, economic, and social theories that have shaped modern design; theory as the basis for design philosophies. Lecture, seminar. Prerequisite: DSC 525 (or its equivalent).

DSC 529 Design Criticism. (3)
fall
Critical methods applied to design as material culture and human expression; evaluation of achievement versus intention. Lecture, seminar. Prerequisite: DSC 527 (or its equivalent).

DSC 544 Human Factors Systems and Documentation. (3)
fall
Advanced topics associated with theory and methods of human factors in design. Individual projects stressing problem organization, evaluation, and documentation. Lecture, seminar, lab. Prerequisite: DSC 344 (or its equivalent).

DSC 552 Computer Simulation in Design. (3)
selected semesters
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)
selected semesters
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)
selected semesters
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)
spring
Background and development of design education theories. Concepts of studio teaching methods. Comprehensive student project development and evaluation methods. Prerequisite: graduate standing.

DSC 592 Research. (1–12)
selected semesters

DSC 593 Applied Project. (1–12)
selected semesters
Fee.

DSC 598 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Facilities Planning II

Fee.

DSC 599 Thesis. (1–12)
selected semesters
Fee.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Economics

Master's and Doctoral Programs

www.cob.asu.edu/ecn/programs.cfm
480/965-3531
BAC 659

Arthur E. Blakemore, Chair

Professors: Blakemore, Boyes, Brada, Burdick, Burgess, Deserpa, Faith, Gooding, Happel, Hoffman, Hogan, Kingston, Low, Manelli, Mayer, McDowell, McPheters, Melvin, Méndez, Ormiston, Rogerson, Santos, Schlee, Zhou

Associate Professors: Ahn, Cogley, Datta, Reffett, Reiser, 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 131), the program leading to the M.S. in Statistics (see "Master of Science," page 327) and the program leading to the Ph.D. degree in Business Administration (see "Master of Business Administration," page 131). 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 84. 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, 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 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. program in Economics is designed to give students a broad understanding of critical analysis of business problems and the quantitative skills necessary for their analysis. Graduates of the program will have distinctive capabilities in quantitative skills and business data analysis applied to markets and firm behavior, customer behavior, business strategies and processes, and global impacts on business.

Program of Study. See "Master's Degrees," page 93, 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 nonthesis 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 96, for general requirements. In addition to completing 60 semester hours of credit beyond the bachelor's degree (30 semester hours beyond the master's degree) and 24 semester 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 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.

ECONOMICS (ECN)

ECN 436 International Trade Theory. (3)
fall and spring
Comparative-advantage doctrine, including practices under varying commercial policy approaches. Economic impact of international disequilibrium. Prerequisite: ECN 314 or instructor approval.

ECN 438 International Monetary Economics. (3)
fall and spring
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.

ECN 441 Public Finance. (3)
once a year
Public goods, externalities, voting models, public expenditures, taxation, and budget formation with emphasis on the federal government. Prerequisite: ECN 314 or instructor approval.

ECN 453 Government and Business. (3)
once a year
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)
once a year
Elements of regression analysis: estimation, hypothesis tests, prediction. Emphasizes use of econometric results in assessment of economic theories. Prerequisite: instructor approval.

ECN 485 Mathematical Economics. (3)
once a year
Integrates economic analysis and mathematical methods into a comprehensive body of knowledge within contemporary economic theory. Prerequisite: instructor approval.

ECN 498 Pro-Seminar. (3)
selected semesters
Topics chosen from current area of interest. Prerequisites: both ECN 313 and 314 or only instructor approval.

ECN 502 Managerial Economics. (3)
fall and spring
Applies microeconomic analysis to managerial decision making in areas of demand, production, cost, and pricing. Evaluates competitive strategies. Prerequisite: M.B.A. degree program student.

ECN 503 Global Economics for Managers. (3)
fall and spring
Macroeconomic analysis of issues related to economic growth, inflation, interest rates behavior, unemployment, exchange rate determination, and global competitiveness. Prerequisite: M.B.A. degree program student.

ECN 504 History of Economic Thought. (3)
once a year
Historical development of economic theory. Emphasizes the development of economic analysis from preclassical economics through Keynes. Prerequisite: ECN 510 or instructor approval.

ECN 509 Macroeconomic Theory and Applications. (3)
fall
Theory of income, output, employment, and price level. Influence on business and economic environment. Prerequisites: both ECN 111 and calculus or only instructor approval.

ECN 510 Microeconomic Theory and Applications. (3)
fall
Applies economic theory to production, consumer demand, exchange, and pricing in a market economy. Prerequisites: both ECN 112 and calculus or only instructor approval.

ECN 511 Macroeconomic Analysis I. (3)
fall
Current theories of output, employment, inflation, and asset prices as well as major aggregates. Introduces dynamic optimization techniques. Prerequisites: both ECN 313 and calculus or only instructor approval.

ECN 512 Microeconomic Analysis I. (3)
fall
Theory of production, consumer demand, resource use, and pricing in a market economy. Prerequisites: both ECN 314 and calculus or only instructor approval.

ECN 513 Macroeconomic Analysis II. (3)
spring
Focuses on growth theory, dynamic general equilibrium models, monetary theory, open-economy issues. Prerequisite: ECN 511 or instructor approval.

ECN 514 Microeconomic Analysis II. (3)
spring
General equilibrium, welfare economics, production, and capital theory. Prerequisite: ECN 512 or instructor approval.

ECN 515 Advanced Macroeconomic Analysis. (3)
fall
Focuses 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)
fall
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)
fall
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)
spring
Development of basic theoretical models for analyzing labor market issues. Prerequisite: ECN 510 or instructor approval.

ECN 522 Labor Economics II. (3)
selected semesters
Extensions/criticisms of labor market theories. Applications to a variety of policy issues. Prerequisite: ECN 521.

ECN 525 Econometrics I. (3)
spring
Problems in the formulation of econometric models. Emphasizes estimation, hypothesis testing, and forecast of general linear models. Prerequisite: 6 hours in statistics or instructor approval.

ECN 526 Econometrics II. (3)
fall
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)
spring
Generalized method of moment estimation, estimation with censored and truncated samples, nonlinear models, panel-data models, econo-

metrics of nonstationarities. Prerequisite: ECN 526 or instructor approval.

ECN 536 International Trade Theory. (3)
spring
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: both ECN 509 and 510 or only instructor approval.

ECN 538 International Monetary Theory and Policy. (3)
fall
Foreign exchange market, balance of payments, and international financial institutions and arrangements; theory and applications. Prerequisites: both ECN 509 and 510 or only instructor approval.

ECN 541 Public Economics. (3)
fall
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)
spring
Analyzes 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)
fall
Economic problems, issues, and policy decisions facing the developing nations of the world. Prerequisites: both ECN 509 and 510 or only instructor approval.

ECN 584 Economics Internship. (1–3)
summer
Academic credit for professional work organized through the Internship Program. Prerequisites: both ECN 510 and 511 or only instructor approval.

ECN 585 Mathematics for Economists. (3)
fall
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)
fall, spring, summer
Presentations by outside speakers, department faculty, and graduate students of work in progress. Prerequisite: instructor approval.

ECN 593 Applied Projects. (3)
fall
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)
fall
Workshops offered include: economic analysis, microeconomic analysis, macroeconomics.

ECN 598 Special Topics. (3)
selected semesters
Advanced topics in economics. Consult the *Schedule of Classes* for offerings. Prerequisite: instructor approval.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

QUANTITATIVE BUSINESS ANALYSIS (QBA)
Department of Economics

QBA 410 Applied Business Forecasting. (3)
spring
Applies forecasting techniques in business and institutional environments. Prerequisite: QBA 221.

QBA 421 Applied Quality Analysis II. (3)
fall, spring, summer
Applies statistical tools employed in quality analysis. Topics include experimental design, customer surveys, and process control and capability. Prerequisite: QBA 221.

QBA 502 Managerial Decision Analysis. (3)
fall and spring
Fundamentals of quantitative analysis to aid management decision making under uncertainty. Prerequisites: MAT 210; computer literacy; graduate degree program student.

QBA 525 Applied Regression Models. (3)
once a year
Simple linear regression, multiple regression, indicator variables, and logistic regression. Emphasizes business and economic applications. Prerequisite: MAT 210.

QBA 527 Categorical Data Analysis. (3)
once a year
Discrete data analysis in business research. Multidimensional contingency tables and other discrete models. Prerequisite: QBA 525.

QBA 530 Experimental Design. (3)
once a year
Experimental designs used in business research. Balanced and unbalanced factorial designs, repeated measures designs, and multivariate analysis of variance. Prerequisite: QBA 525 (or its equivalent).

QBA 535 Multivariate Methods. (3)
once a year
Advanced statistical methods used in business research. Multivariate analysis of association and interdependence. Prerequisite: QBA 525.

QBA 540 Forecasting. (3)
selected semesters
Foundation of statistical forecasts and forecast intervals; applies classical and computer-assisted forecasting methods to business forecasting problems. Prerequisites: MAT 210; QBA 502.

QBA 593 Applied Project. (1–12)
selected semesters

QBA 599 Thesis. (1–12)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Education

Master's and Doctoral Programs

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 Psychology, Educational Technology, Higher and Postsecondary Education, and Special Education. Concentrations within the M.Ed. in Curriculum and Instruction include bilingual education, early childhood education, elementary education, English as a second language, Indian education, language and literacy, mathematics education, professional studies, science education, secondary education, and social studies education. Within Special Education, M.Ed. areas of concentration are education of the gifted, the mildly disabled, the multicultural exceptional, and severely/multiply disabled 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 a written comprehensive examination or applied project. 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 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, 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 "Courses," page 183 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 Reentry. 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 reentry and, following approval of the reentry 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 reentry are considered along with all other new applications to the degree program.

Reentry 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 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 reexamination. A reexamination may be administered no sooner than three months and no later than one year from the date of the original examination. Only one reexamination 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)
fall, spring, summer
Overview of educational inquiry from controlled, quantitative to qualitative, naturalistic. Emphasizes locating and critically interpreting published research.

COE 502 Introduction to Data Analysis. (3)
fall, spring, summer
Descriptive statistics, visual approaches, estimation, and inferential methods for univariate and bivariate educational research problems. Experience using statistical software. Cross-listed as EDP 502. Credit is allowed for only COE 502 or EDP 502.

COE 503 Introduction to Qualitative Research. (3)
fall, spring, summer
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)
fall, spring, summer
Introduces 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)
fall, spring, summer
Political, social, historical, and philosophical analyses of American education at all levels. Examines primary sources, legal findings, and case studies.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Educational Administration and Supervision

Master's and Doctoral Programs

coe.asu.edu/elps
480/965-6357
ED 120

Kay Hunnicutt, Coordinator, D.E.L.T.A. Doctorate
M. Scott Norton, Coordinator, ASU Main
Donna Macey, Coordinator, Internships

Professors: González, Norton, Valverde, Webb

Associate Professors: Danzig, Hunnicutt, Peña

Clinical Professor: Dyer

Clinical Associate Professor: Macey

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 185. See also "Doctor of Philosophy," page 96, 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 semester 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. Preapproval by an advisor is required. The core courses are COE 501, 502, 503, 504, and 505. A set of research courses is required for the Ed.D. degree.

MASTER OF EDUCATION

See "Master of Education," page 181, for information on the Master of Education degree.

DOCTOR OF EDUCATION

See "Doctor of Education," page 182, for information on the Doctor of Education degree.

RESEARCH ACTIVITY

Current faculty research activities include legal issues in educational administration, school violence prevention, sexual harassment, school administration policies, including human resource policy, and urban education policy.

EDUCATIONAL ADMINISTRATION AND SUPERVISION (EDA)

EDA 501 Competency/Performance in Educational Administration. (3)
fall and summer
Nature of educational administration and the concept of competency as it applies to educational administration.

EDA 510 Introduction to Organization and Administration of American Public Schools. (3)
fall and spring
Explores organizational structure and administration of public education 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)
spring
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 525 Human Relations and Societal Factors in Education. (3)
selected semesters
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)
fall, spring, summer
Administering curriculum improvement, in-service education, evaluating, and improving teaching competence; administrative instructional responsibilities.

EDA 544 Public School Finance. (3)
fall
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)
selected semesters
Administrative factors of primary importance in developing community involvement in public schools. Emphasizes theory and skill of school system and individual communication.

EDA 555 Educational Facility Planning. (3)
selected semesters
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)
fall, spring, summer
Purchasing, budgeting, accounting, payroll management, auditing, financial reporting, insurance, and administration of nonteaching personnel and services.

EDA 573 Human Resources Administration. (3)
spring
Organization for human resources services; development of policy to govern the human resources function and its related processes.

EDA 576 The School Principalship. (3)
fall
Problem and laboratory approaches used to provide application of administrative activities of elementary and secondary schools. Prerequisites: EDA 501, 526.

EDA 611 Educational Policy and the Law. (3)
summer in odd years
Emphasizes policy analysis and application of federal and state law to policy evaluation and development in public schools. Lecture, case studies. Prerequisite: EDA 511 or HED 649. Corequisite: admission to doctoral program in education.

EDA 624 Organizational Development and Management of Schools. (3)
spring
Current organizational patterns for public schools. Emphasizes the organizations, human, and social dimensions on organizations. Lecture, discussion, projects.

EDA 634 Instructional Leadership. (3)
selected semesters
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 645 Leadership Development for Education Leaders. (3)
spring
Principles, theories, attributes, and skills related to individual leadership development. Lecture, online computer modules. Also offered as a Web-only course. Prerequisite: admission to doctoral program in education or instructor approval.

EDA 675 Politics of Education. (3)
spring
Uses social science theory and research to consider the political context of educational policy making. Prerequisite: COE 505.

EDA 676 The School Superintendency. (3)
spring
Critical examination of the school superintendency and the primary functions of this educational position. Includes duties, responsibilities, activities, and problems of the school superintendent. Examines the unique leadership role of the school superintendent. Prerequisite: instructor approval.

EDA 677 Foundations of Educational Reform Movements. (3)
fall
Historical and contemporary survey of curricular reform movements in the United States with emphasis on equity and social justice issues. Cross-listed as SPF 677. Credit is allowed for only EDA 677 or SPF 677. Prerequisite: admission to doctoral program in education or instructor approval.

EDA 679 Administration of Special Programs in Education. (1–3)
selected semesters
For personnel administering special educational services; responsibilities of superintendents, principals, supervisors, and directors for special education, student personnel, audiovisual, library science, and others.

EDA 685 Global Education. (3–6)
spring
Global perspectives on education in contemporary society with emphasis on social, political and economic factors that affect access and equity. Lecture, travel. Cross-listed as SPF 680. Credit is allowed for only EDA 680 or SPF 680. Prerequisite: admission to doctoral program in education or instructor approval.

EDA 711 Administrative Leadership. (3)
fall
Emphasizes research in leadership; application of research findings to administrative and supervisory functions in educational endeavors. Prerequisites: EDA 624; 30 semester hours in educational administration; admission to doctoral program in education.

EDA 722 Administration of Instructional Improvement. (3)
spring
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 in education.

EDA 723 Diversity in Education for School Leaders. (3)
spring
Discusses current issues and leadership strategies for meeting the needs of diverse student populations combating inequity and inequality in education. Lecture, field experience. Prerequisite: admission to doctoral program in education or instructor approvals.

EDA 733 Administrative Management. (3)
spring
Recent research relating to school management. School finance, law, buildings, transportation, food services, and supply management. Pre-

requisites: EDA 544, 571; 30 semester hours in educational administration; admission to doctoral program in education.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Educational Administration and Supervision

Master's Degree

ASU West also offers a Master of Educational Administration and Supervision (M.Ed.) degree. For more information about the ASU West program, see the *ASU West Catalog*, call 602/543-4567, or access www.west.asu.edu on the Web.

Educational Leadership and Policy Studies

Doctoral Program

coe.asu.edu/elps

480/965-6357

ED 134C

Terrence G. Wiley and Gary Hanson, Academic Program Coordinators

Regents' Professor: Berliner

Professors: Appleton, Barone, Fenske, Glass, González, Hanson, Molnar, Norton, Smith, Tobin, Turner, Valverde, Webb, Wiley

Associate Professors: Danzig, Hunnicutt, Margolis, Peña

Assistant Professors: Moses, Powers

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 96, 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. Application materials are available from the division and are submitted to the division (ED 120). 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. In selecting applicants, the program looks for background and career aspirations consistent with program goals and willingness to devote primary attention to courses and experiences on campus.

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 (six hours). In addition, they take Evaluation Theory (three hours). In the second year, students enroll for Theoretical Issues in Policy Studies (three hours). Other required courses in this category are Foundations of American Education, Politics of Education, Policy Issues in Learning and Instruction, Theory of Educational Organization, and Social and Historical (three hours each). To understand the economic and financial aspects of educational policy, students take one of the following three courses (three hours each): Higher Education Finance and Budgeting, Political Economy, or Public School Finance.

Advanced Research Methods. Students must complete a minimum of nine semester hours of research methods plus

Introduction to Qualitative Research. Advanced Quantitative Research is required of all students and presumes an introductory course in statistics has been taken successfully. If not, COE 502 must be taken for no credit. 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. The speciality areas are policy analysis, economics, finance, K–12 education, social and philosophical foundations, and research and evaluation methodology.

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 by 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 committee, 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

Current research activities include issues on the relationship between poverty and educational achievement, the efficacy of educational policies for diverse groups, including educational language policies.

COURSES

For courses, see "Educational Administration and Supervision (EDA)," page 184, "Higher and Postsecondary Education (HED)," page 229, and "Social and Philosophical Foundations (SPF)," page 314.

Educational Psychology

Master's and Doctoral Programs

coe.asu.edu/psyched

480/965-3384

EDB 302

Edward A. Nelsen, Academic Program Leader

Regents' Professors: Berliner, Kulhavy

Professors: Barona, Blanchard, Glass, Green, Krus, Nelsen, Santos de Barona, Strom, Zimilies

Associate Professors: Behrens, Moore, Stafford

Assistant Professors: Brem, Ladd, Nakagawa, Thompson

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 Educational Psychology. In the Ph.D. program, concentrations are available in learning; lifespan developmental psychology; measurement, methodological studies, and statistics; 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.Ed. program is intended for persons who wish to further prepare themselves as classroom teachers or for other positions related to instruction. A written evaluation is required as the culminating experience for the degree. Students completing this program are not expected to continue for a Ph.D. degree in Educational Psychology at ASU. For more information, access the program Web site at seamonkey.ed.asu.edu/~gail/division/divintro.htm.

See "Master of Education," page 181, for more information on the Master of Education degree.

MASTER OF ARTS

The M.A. degree program requires 30 semester hours of graduate course work, which includes a thesis. The M.A. program leads to the Ph.D. and offers areas of study in learning; lifespan developmental psychology; and measurement, methodological studies, and statistics. All applicants must submit scores on the GRE. These M.A. areas of Edu-

cational Psychology have deadlines of October 15 and February 15 for receiving all application materials, including test scores, to be considered for admission for the following semester. These M.A. programs require written comprehensive examinations. Additional information on these degree programs may be obtained from the Division of Psychology in Education and from the program Web site, coe.asu.edu/psyched.

See "Master's Degrees," page 93, for general requirements.

DOCTOR OF PHILOSOPHY

The Ph.D. degree in Educational Psychology offers areas of study in learning; lifespan developmental psychology; measurement, methodological studies, and statistics; and school psychology. Complete descriptions of each area are available from the Division of Psychology in Education and from the program Web site, coe.asu.edu/psyched. The school psychology concentration is accredited by the American Psychological Association and approved by 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. The same information is available at the program Web site, coe.asu.edu/psyched.

See "Doctor of Philosophy," page 96, for general information on the Ph.D. degree.

RESEARCH ACTIVITY

Research in learning includes teacher education, argumentation and discourse, reading, spatial cognition, and neuropsychological development in early childhood. Research in lifespan development includes studies of preschool and family literacy programs, social and moral development, peer relations, and intergenerational relationships. Research in methodology includes quantitative and qualitative methodology, personnel and program evaluation, and the use of computers for instruction and testing.

School psychology research involves assessment of cognitive and academic skills, classroom processes, interventions with high-risk children and youth, informed consent, substance abuse prevention, and assessment of minority individuals, as well as ethnic and gender issues.

EDUCATIONAL PSYCHOLOGY (EDP)

EDP 502 Introduction to Data Analysis. (3)
fall, spring, summer
Descriptive statistics, visual approaches, estimation, and inferential methods for univariate and bivariate educational research problems. Experience using statistical software. Cross-listed as COE 502. Credit is allowed for only COE 502 or EDP 502.

EDP 503 Introduction to Qualitative Research. (3)
fall, spring, summer
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)
fall, spring, summer
Introduces 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)
fall, spring, summer
Theoretical and empirical foundations of learning in the classroom milieu. Critical exposure to research and method in instructional psychology.

EDP 513 Child Development. (3)
fall, spring, summer
Examines problems and achievements experienced by children growing up in a technological society. Emphasizes discovering the child's perspective.

EDP 514 Psychology of the Adolescent. (3)
fall, spring, summer
Cognitive, physical, and social development of adolescents in contemporary society. Impact of family, school, and workplace on adolescent development. Prerequisite: EDP 310 or PGS 101 (or its equivalent).

EDP 530 Theoretical Issues and Research in Human Development. (3)
fall
Psychological theories, research, and methods relevant to human development, emphasizing the relations between early development and later performance.

EDP 535 Applied Behavior Analysis. (3)
fall
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)
fall
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)
fall and spring
Classical and cognitive theories of learning, plus recent orientations. Illustrative experimental and rational foundations; implications for educational practice.

EDP 542 Research Methods in the Learning Sciences. (3)
spring
Students read, design, and carry out original research in the learning sciences. Lecture, discussion. Prerequisites: EDP 540; instructor approval.

EDP 544 Psychology of Reading. (3)
fall
Alternate analyses of the reading process; designs and procedures for investigating instructional and noninstructional variables related to reading achievement.

EDP 545 Higher-Order Processes in the Learning Sciences. (3)
spring
Examines original research on induction, deduction, analogy and transfer, knowledge representation, and other issues in learning. Discussion. Prerequisite: EDP 540 or instructor approval.

EDP 550 Introduction to Measurement in Education. (3)
fall and spring
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 Multiple Regression and Correlation Methods. (3)
fall, spring, summer
Educational applications of regression techniques. Quantitative and qualitative predictors, curvilinear trends, and interactions. Emphasizes analyzing data and interpreting results. Lecture, lab. Prerequisite: EDP 502 or instructor approval.

EDP 554 Analysis-of-Variance Methods. (3)
fall, spring, summer
Educational applications of ANOVA techniques. Between- and within-subjects designs, multiple comparisons. Emphasizes using statistical software and interpreting results. Lecture, lab. Prerequisites: EDP 502, 552.

EDP 556 Data Processing Techniques in Measurement and Research. (3)
once a year
Use of statistical packages for data analysis. Emphasizes 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)
fall and spring
Issues in administration and interpretation of individual intelligence tests. Theoretical basis, ethical considerations, and diagnostic use of test results. Fee. Prerequisite: admission to a program in professional psychology or instructor approval.

EDP 561 Lab in Psychological Assessment. (3)
spring
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: Ethics, Theory, and Practice. (3)
fall
Provides information regarding the ethics, history, and theory of current school psychology practice.

EDP 563 Interventions in School Psychology. (3)
fall
Examines case-based consultation and consultation research relevant to school psychology practice. Field experience. Prerequisite: school psychology program or instructor approval.

EDP 564 Academic Interventions. (3)
spring
Skills-building course emphasizing academic interventions and outcome-based educational decisions. Prerequisite: EDP 535.

EDP 566 Diagnosis of Learning Difficulties. (3)
spring
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 their equivalents); instructor approval.

EDP 567 School Psychological Services to Minority Students. (3)
spring
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)
fall
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 its equivalent).

EDP 651 Methods and Practices of Qualitative Research. (3)
spring
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 for Data Analysis. (3)
fall
Educational applications of multivariate methods, including MANOVA, discriminant analysis, and exploratory factor analysis. Emphasizes analyzing data and reporting results. Lecture, lab. Prerequisite: EDP 554 or instructor approval.

EDP 654 Structural Equation Modeling in Educational Research. (3)
spring
Educational applications of confirmatory factor analysis, path analysis, and full latent variable models. Experience in conducting analyses and reporting results. Lecture, lab. Prerequisite: EDP 652 or instructor approval.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Educational Technology

Master's and Doctoral Programs

coe.asu.edu/psyched
480/965-3384
EDB 302

Thomas Brush, Academic Program Leader

Professors: Bitter, Klein, Sullivan

Associate Professors: Brush, Savenye

Assistant Professor: Julian

Clinical Assistant Professor: Igoe

The faculty in the Division of Psychology in Education offer graduate programs leading to the Master of Education (M.Ed.) and Doctor of Philosophy (Ph.D.) degrees in Educational Technology. The focus of these programs is on design, development, and evaluation of instructional systems and on educational technology applications to support learning. The doctoral program emphasizes research using educational technology in applied settings.

The graduate programs leading to a degree in Educational 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; educational technologists in universities, community colleges, and schools; or as training managers in corporate settings. Potential employment opportunities for master's degree graduates include positions as educational technologists in schools, community colleges, and universities; or as training specialists in corporate settings.

Applicants for admission to the Ph.D. degree program in Educational 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. All application materials should be received at least three months prior to the semester in which the applicant wishes to begin study.

MASTER OF EDUCATION

The M.Ed. degree in Educational Technology requires the completion of a minimum of 30 semester hours beyond a bachelor's degree. Eighteen semester hours of prescribed

course work is required for all students in the Master of Educational Technology program. In addition, students select a minimum of 12 semester hours from a variety of specialty areas such as instructional design technology, media development, technology integration, and distance education. For a complete description of the M.Ed. program in Educational Technology, access the Web site at coe.asu.edu/psyched. For more information, see "Master of Education," page 181, for general requirements.

DOCTOR OF PHILOSOPHY

The Ph.D. degree in Educational Technology requires a minimum of 84 semester hours beyond the bachelor's degree. At least 54 of these hours must be taken at ASU. Each Ph.D. student in Educational Technology is required to complete 54 to 60 semester hours of prescribed course work and a minimum of 24 semester hours of elective courses. In addition, each Ph.D. student in Educational Technology must satisfy a publication requirement prior to beginning work on their dissertation. For a complete description of the Ph.D. in Educational Technology, access the Web site at coe.asu.edu/psyched. For more information, see "Doctor of Philosophy," page 96.

RESEARCH ACTIVITY

Research activity includes design, development, and evaluation of instructional environments and educational technology applications, emerging technologies, and instructional effectiveness. Students participate in research activities and course work that lead to conference participation and journal publication.

EDUCATIONAL TECHNOLOGY (EDT)

EDT 455 Authoring Tools. (3)
fall, spring, summer
Use of current authoring tools to design and deliver computer-based instructional materials.

EDT 501 Foundations and Issues in Educational Technology. (3)
fall and spring
Introduction to educational technology. Examines accomplishments and issues in the field.

EDT 502 Design and Development of Instruction. (3)
fall and spring
Design, development, and formative evaluation of objectives-based instructional materials.

EDT 503 Instructional Media Design. (3)
fall and spring
Uses media selection, design, and production principles to prepare design specifications for solutions to instructional messages and products. Pre- or corequisite: EDT 502.

EDT 504 Development of Computer-Based Instruction. (3)
fall and spring
Systematic design, development, and formative evaluation of computer-based instruction. Prerequisites: EDT 455 (or instructor approval), 502.

EDT 505 Multimedia Presentation Technologies. (3)
fall
Explores the design of multimedia presentations and the utilization of tools and resources to effectively deliver those presentations. Lecture, lab.

EDT 506 Educational Evaluation. (3)
spring
Procedures for evaluating educational programs, training systems, and new-technology applications. Prerequisite: EDT 502.

EDT 511 Technology Applications in Education. (3)
fall and summer
Integration and evaluation of emerging technologies into K–12 and adult teaching and learning. Online and lecture.

EDT 520 Educational Technology and Training. (3)
spring
Applications of educational technology to training and human performance systems in business, industry, and government; emphasizing trends and project management. Lecture, lab. Prerequisites: EDT 501, 502.

EDT 523 Distance Education Theory and Practice. (3)
fall
Explores development of distance learning principles by examining national and international systems and applications. Online and lecture.

EDT 525 Web Resources for Educators. (3)
spring
Explores Web-based and distance learning applications for educators. Online and lecture.

EDT 527 Instructional Video Production. (3)
spring
Design and production of instructional video. Lecture, lab. Prerequisite: EDT 503 or instructor approval.

EDT 528 Development of Web-Based Instruction. (3)
fall
Design and development of online instruction using advanced technologies. Prerequisite: EDT 502.

EDT 531 Hypermedia. (3)
fall
Design, development, and evaluation of open-ended, nonlinear computer-based tools and applications. Lecture, lab. Prerequisites: EDT 455 (or instructor approval), 502.

EDT 701 Research in Educational Technology. (3)
spring
Review and analysis of research studies in educational technology. Methodology for designing, conducting, and reporting educational technology research. Prerequisites: EDT 501, 502; instructor approval.

EDT 702 Research in Technology-Based Education. (3)
fall
Critical exposure to theories, research, and methods in technology-based education.

EDT 703 Research in Distance Education. (3)
spring
Seminar with emphasis on research in telecommunications and distance education.

EDT 704 Emerging Technologies in Education. (3)
spring
Examines the role and impact of emerging technologies in education.

EDT 780 Advanced Instructional Development. (3)
spring
Conducting and documenting selected instructional development activities. Prerequisites: EDT 502; instructor approval.

EDT 792 Advanced Educational Technology Research. (3)
fall and spring
Design and execution of educational technology research on selected topics. Prerequisites: EDT 701; instructor approval.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Electrical Engineering

Master's and Doctoral Programs

www.eas.asu.edu/~eee

480/965-3590

ENGRC 555

Joseph C. Palais, Director of Graduate Studies

Regents' Professors: Balanis, Ferry, Heydt

Professors: Backus, Crouch, El-Ghazaly, Goodnick, Gorur, Higgins, Hoppensteadt, Hui, Karady, Kiaei, Kozicki, Lai, Palais, Pan, Roedel, Schroder, Shen, Si, Spanias, Tao, Thornton, Y. Zhang

Associate Professors: Aberle, Allee, Bird, Chakrabarti, Cochran, Diaz, El-Sharawy, Greeneich, Grondin, Holbert, Karam, Kim, Morrell, Rodriguez, Skromme, Tsakalis, Tylavsky

Assistant Professors: Ayyanar, Duman, Joo, Papandreou-Suppappola, Reisslein, Tepedelenlioglu, Vasileska, Yazdi, J. Zhang

The faculty in the Department of Electrical Engineering offer graduate programs leading to the M.S., the Master of Science in Engineering (M.S.E.), and the Ph.D. degrees in Electrical Engineering.

The faculty also participate in offering the tri-university Master of Engineering program and the interdisciplinary program leading to the Ph.D. degree in the Science and Engineering of Materials. See "Science and Engineering of Materials," page 312, for program description.

Admission. See "Admission to the Graduate College," page 84. 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 final 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 for further information on programs, faculty, financial aid, and for admission and statement of purpose forms.

Internship. An internship program is available to full-time, on-campus, graduate students. Students spend a semester or a summer session at an engineering company. Up to three semester hours of credit are allowed under courses EEE 584, 684, or 784.

MASTER OF SCIENCE

See "Master's Degrees," page 93, for general information.

MASTER OF ENGINEERING

The Master of Engineering requires 30 semester hours of course work. It is a practice-oriented degree. Included in the 30 semester hours are three hours of applied mathematics and three hours of engineering management. Up to six semester hours of credit can be obtained for a practice-oriented project. A final examination is also required. Courses may be taken at any of Arizona's three state universities. Courses are offered by distance delivery whenever practical. For more information access the Web site at Tri-Univ.engr.arizona.edu.

MASTER OF SCIENCE IN ENGINEERING

See "Master of Science in Engineering," page 196, for information on the M.S.E. degree.

A final written comprehensive exam is required for Option two in this program. Most master's degree students are admitted to the M.S.E. program, Option two. Those who are offered financial support or who are outstanding students showing research potential are admitted to the M.S. program. A tentative program of study must be filed during the first semester enrolled for classes.

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 96, for general requirements.

Program of Study. The official program of study must be filed no later than the semester before all degree requirements are met.

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 specialities. Significant research activity exists in coherent optics, communications, control systems, electromagnetics, power systems, signal processing, and solid-state electronics, reflecting the continuing strong interest and cooperation of local industry in these disciplines. Engineering education, low-power electronics, power systems, solid-state electronics, telecommunications, and system science and engineering have been selected for support as part of a program establishing excellence centers 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.

Antennas, Microwaves, Computational Electromagnetics, and Radar. Antennas: antenna analysis, design, and measurements; electromagnetic wave radiation, propagation, scattering, smart antennas and penetration; patch antennas; antenna broadbanding techniques. Microwaves: microwave circuits, devices, and systems; microwave, millimeter wave, and optical integrated circuits and transmission lines; 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; High Intensity Radiated Fields (HIRF). Radar: wideband radar techniques, radar cross section, radar multipath, and tracking.

Communications. Communication theory. Information theory. Modulation. Coding: source coding, channel coding, turbo codes, coding for digital storage systems. Wireless communications: coding for wireless systems, channel equalization, multiple access and diversity systems, synchronization for OFDM systems, spread spectrum systems, power control, CDMA, TDMA, FDMA, and SDMA. Communication networks: switching, wireless networks, network performance analysis, ad hoc networks, quality of service, protocols, integrated services, wireless multimedia networking, video traffic characterization, optical networking.

Control systems. Nonlinear systems analysis and control; adaptive control; robust control; sampled-data and real-time digital control, virtual instrumentation; neural networks; system identification and model validation; control of distributed parameter systems; robust multivariable control system design; control of systems with multiple hard nonlinearities; modeling, simulation, and graphical visualization of dynamical systems. Applications to aerospace systems, robotics and autonomous vehicles, semiconductor processes, manufacturing systems, and power systems.

Lasers and Coherent Optics. Fiber optics: communications, active and passive components, and networks.

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.

Signal Processing. Digital signal processing (DSP) algorithms; signal processing architectures; DSP chips; detection and estimation; statistical decision theory; sensor management; spectral estimation; array signal processing; sampling theory; wavelet analysis; time-frequency representations; sonar and radar applications; signal processing in communication systems; image processing and compression; speech coding and recognition; multimedia signal processing; audio coding algorithms; adaptive signal processing; adaptive noise cancellation.

Solid-State Electronics. Semiconductor crystal growth: epitaxial, and thin films. Processing: oxidation, diffusion, 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, lasers, microwave devices, and integrated optical circuits. Characterization: electrical, optical, physical, and chemical measurements, SEM, STM/AFM, Auger surface analysis, low temperature magneto-transport. Modeling: three-dimensional modeling of heterostructures and Si-based MOSFETs, bipolar transistor modeling, charge carrier ballistics, ensemble Monte Carlo simulations of particle transport in devices and in optically probed material characterization, quantum device modeling, quantum transport, theory of optical processes and effects. Circuit design: analog and mixed signal design, A/D converters, rf communication circuits, integrated microsystems and sensors, low-power electronics, VLSI design and novel architectures.

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)
fall
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)
fall and spring
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)
fall and spring
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. (4)
spring
Analysis, design, and applications of modern analog circuits using integrated bipolar and field effect transistor technologies. Lecture, lab. Prerequisite: ECE 334.

EEE 434 Quantum Mechanics for Engineers. (3)
fall
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)
spring
Introduces basic CMOS processing and fabrication tools. Covers the fundamentals of thermal oxidation, CVD, implantation, diffusion, and process integration. Internet lecture, internet or on-campus lab. Fee. Pre- or corequisite: EEE 436.

EEE 436 Fundamentals of Solid-State Devices. (3)
fall and spring
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)
selected semesters
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)
fall
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)
spring
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.

EEE 443 Antennas for Wireless Communications. (3)
spring
Fundamental parameters; radiation integrals; wireless systems; wire, loop, and microstrip antennas; antenna arrays; smart antennas; ground effects; multipath. Prerequisite: EEE 340.

EEE 445 Microwaves. (4)
fall
Waveguides; circuit theory for waveguiding systems; microwave devices, systems, and energy sources; striplines and microstrips; impedance matching transformers; measurements. Lecture, lab. Prerequisite: EEE 340.

EEE 448 Fiber Optics. (4)
fall
Principles of fiber-optic communications. Lecture, lab. Prerequisites: EEE 303, 340.

EEE 455 Communication Systems. (4)
fall and spring
Signal analysis techniques applied to the operation of electrical communication systems. Introduction to and overview of modern digital and analog communications. Lecture, lab. Prerequisite: EEE 350.

EEE 459 Communication Networks. (3)
spring
Fundamentals of communication networks. Study of Seven-Layer OSI model. Focus on functionality and performance of protocols used in communication networks. Prerequisite: EEE 350.

EEE 460 Nuclear Concepts for the 21st Century. (3)
spring
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)
fall
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 201, 340 (or PHY 241).

EEE 470 Electric Power Devices. (3)
fall
Analyzes 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)
spring
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)
fall
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)
fall and spring
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)
fall
Discrete and continuous systems in state space form controllability, stability, and pole placement. Observability and observers. Pre- or corequisite: EEE 480.

EEE 506 Digital Spectral Analysis. (3)
spring
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)
fall
Processing and representation of multidimensional signals. Design of systems for processing multidimensional data. Introduces image and array processing issues. Prerequisite: EEE 407 or instructor approval.

EEE 508 Digital Image Processing and Compression. (3)
spring
Fundamentals of digital image perception, representation, processing, and compression. Emphasizes image coding techniques. Signals include still pictures and motion video. Prerequisites: EEE 350 and 407 (or their equivalents).

EEE 511 Artificial Neural Computation Systems. (3)
selected semesters
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 517 Hardware Design Languages. (3)
fall and spring
Introduces hardware design languages. Modeling concepts for specification, simulation, and synthesis. Cross-listed as CSE 517. Credit is allowed for only CSE 517 or EEE 517. Prerequisite: CSE 423 or EEE 425 or instructor approval.

EEE 523 Advanced Analog Integrated Circuits. (3)
fall
Analysis and design of analog integrated circuits: analog circuit blocks, reference circuits, operational-amplifier circuits, feedback, and nonlinear circuits. Prerequisite: EEE 433 (or its equivalent).

EEE 524 Communication Transceiver Circuits Design. (3)
selected semesters
Communication transceivers and radio frequency system design; fundamentals of transceivers circuits; RF, IF, mixers, filters, frequency synthesizers, receivers, CAD tools, and lab work on IC design stations. Lecture, lab. Prerequisites: EEE 433 and 455 (or their equivalents). Pre- or corequisite: EEE 523.

EEE 525 VLSI Design. (3)
fall and spring
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)
fall
Special-purpose architectures for signal processing. Design of array processor systems at the system level and processor level. High-level synthesis. Prerequisites: both CSE 330 and EEE 407 or only instructor approval.

EEE 527 Analog to Digital Converters. (3)
fall
Detailed introduction to the design of Nyquist rate, CMOS analog to digital converters. Prerequisite: EEE 523.

EEE 530 Advanced Silicon Processing. (3)
spring
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)
fall
Transport and recombination theory, pn and Schottky barrier diodes, bipolar and junction field-effect transistors, and MOS capacitors and transistors. Prerequisite: EEE 436 (or its equivalent).

EEE 532 Semiconductor Device Theory II. (3)
spring
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)
fall
Process simulation concepts, oxidation, ion implantation, diffusion, device simulation concepts, pn junctions, MOS devices, bipolar transistors. Prerequisite: EEE 436 (or its equivalent).

EEE 534 Semiconductor Transport. (3)
spring
Carrier transport in semiconductors. Hall effect, high electric field, Boltzmann equation, correlation functions, and carrier-carrier interactions. Prerequisites: EEE 434, 436 (or 531).

EEE 535 Electron Transport in Nanostructures. (3)
spring
Nanostructure physics and applications. Two-dimensional electron systems, quantum wires and dots, ballistic transport, quantum interference, and single-electron tunneling. Prerequisites: EEE 434, 436.

EEE 536 Semiconductor Characterization. (3)
spring
Measurement techniques for semiconductor materials and devices. Electrical, optical, physical, and chemical characterization methods. Prerequisite: EEE 436 (or its equivalent).

EEE 537 Semiconductor Optoelectronics I. (3)
fall
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)
selected semesters
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)
fall
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)
selected semesters
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 its equivalent).

EEE 543 Antenna Analysis and Design. (3)
fall
Impedances, broadband antennas, frequency independent antennas, miniaturization, aperture antennas, horns, reflectors, lens antennas, and continuous sources design techniques. Prerequisite: EEE 443 (or its equivalent).

EEE 544 High-Resolution Radar. (3)
selected semesters
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 their equivalents).

EEE 545 Microwave Circuit Design. (3)
spring
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)
selected semesters
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)
spring
Applies 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)
selected semesters
Diffraction, lenses, optical processing, holography, electro-optics, and lasers. Prerequisite: EEE 440 (or its equivalent).

EEE 549 Lasers. (3)
selected semesters
Theory and design of gas, solid, and semiconductor lasers. Prerequisite: EEE 448 or instructor approval.

EEE 550 Transform Theory and Applications. (3)
selected semesters
Introduces 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 Theory. (3)
selected semesters
Entropy and mutual information, source and channel coding theorems, applications for communication and signal processing. Prerequisite: EEE 554.

EEE 552 Digital Communications. (3)
spring
Complex signal theory, digital modulation, optimal coherent and incoherent receivers, channel codes, coded modulation, Viterbi algorithm. Prerequisite: EEE 554.

EEE 553 Coding and Cryptography. (3)
selected semesters
Introduces algebra, block and convolutional codes, decoding algorithms, turbo codes, coded modulation, private and public key cryptography. Prerequisite: EEE 554.

EEE 554 Random Signal Theory. (3)
fall
Applies statistical techniques to the representation and analysis of electrical signals and to communications systems analysis. Prerequisite: EEE 350 or instructor approval.

EEE 555 Modeling and Performance Analysis. (3)
selected semesters
Modeling and performance analysis of stochastic systems and processes such as network traffic queueing systems and communication channels. Prerequisite: EEE 554.

EEE 556 Detection and Estimation Theory. (3)
selected semesters
Combines 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 Wireless Communications. (3)
fall
Cellular systems, path loss, multipath fading channels, modulation and signaling for wireless, diversity, equalization coding, spread spectrum, TDMA/FDMA/CDMA. Prerequisite: EEE 552.

EEE 571 Power System Transients. (3)
spring
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. Introduces computer analysis of transients. Prerequisite: EEE 471.

EEE 572 Advanced Power Electronics. (3)
fall
Analyzes 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)
spring
Sinusoidal waveshape maintenance; study of momentary events, power system harmonics, instrumentation, filters, power conditioners, and other power quality enhancement methods. Prerequisite: EEE 360 (or its equivalent).

EEE 574 Computer Solution of Power Systems. (3)
selected semesters
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)
fall
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)
spring
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)
selected semesters
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)
selected semesters
Controllability, observability, and realization theory for multivariable continuous time systems. Stabilization and asymptotic state estimation. Disturbance decoupling, noninteracting control. Prerequisite: EEE 482.

EEE 584 Internship. (3)
fall, spring, summer
Work performed in an industrial setting that provides practical experience and adds value to the classroom and research learning processes.

EEE 585 Digital Control Systems. (3)
selected semesters
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)
selected semesters
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)
selected semesters
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)
selected semesters
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 its equivalent).

EEE 606 Adaptive Signal Processing. (3)
fall
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)
spring
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)
fall
Principles of heterojunctions and quantum well structures, band lineups, optical, and electrical properties. Introduces heterojunction devices. Prerequisites: EEE 436, 531.

EEE 632 Heterojunction Devices. (3)
selected semesters
Applies heterostructures, quantum wells, and superlattice to modulation-doped FETs, heterostructure bipolar transistors, lasers, detectors, and modulators. Prerequisites: EEE 434, 631 (or 537).

EEE 641 Advanced Electromagnetic Field Theory. (3)
selected semesters
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 its equivalent).

EEE 643 Advanced Topics in Electromagnetic Radiation. (3)
spring
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)
fall
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 684 Internship. (1–2)
fall, spring, summer
Work performed in an industrial setting that provides practical experience and adds value to the classroom and research learning processes.

EEE 686 Adaptive Control. (3)
selected semesters
Main topics covered: adaptive identification, convergence, parametric models, performance and robustness properties of adaptive controllers, persistence of excitation, and stability. Prerequisites: both EEE 582 and 586 or only instructor approval.

EEE 731 Advanced MOS Devices. (3)
spring
Threshold voltage, subthreshold current, scaling, small geometry effects, hot electrons, and alternative structures. Prerequisite: EEE 531.

EEE 770 Advanced Topics in Power Systems. (3)
selected semesters
Power system problems of current interest, approached at an advanced technical level, for mature students. Prerequisites: EEE 577 and 579 (or their equivalents); instructor approval.

EEE 784 Internship. (3)
fall, spring, summer
Work performed in an industrial setting that provides practical experience and adds value to the classroom and research learning processes.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Elementary Education

Postbaccalaureate Program (ASU East)

The ASU East education courses below have been created as part of the postbaccalaureate program in Elementary Education. The postbaccalaureate program combines 400- and 500-level courses to fulfill the course work requirements leading to K–8 state certification. For information about the program, call the ASU East Education Office at 480/727-1103.

ELEMENTARY EDUCATION (EDC)

EDC 560 Principles of Instructional Technology. (3)
fall, spring, summer
Examines effective practices related to instructional technologies, including classroom delivery, student engagement, and evaluation of resources. Prerequisite: approval of ASU East Education Office.

EDC 565 Research-Based Phonics for the K–8 Classroom. (3)
fall, spring, summer
Current research in phonics instruction, including systematic and analytic approaches, and their application to classroom practice. Interactive forum. Prerequisites: EDC 465 (or its equivalent); approval of ASU East Education Office.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Elementary Education

Master's Program (ASU West)

ASU West offers a Master of Education (M.Ed.) degree in Elementary Education. For information, see the *ASU West Catalog*, call 602/543-4567, or access www.west.asu.edu on the Web.

Engineering

Master's Programs

MASTER OF ENGINEERING—M.E.

Arizona's three state universities—Arizona State University, Northern Arizona University, and the University of Arizona—are cooperating in offering a tri-university degree program: the Master of Engineering (M.E.).

The M.E. program is 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 Web delivered courses may incur a special course fee.

For more information, see the M.E. Web site at triuniv.engr.arizona.edu. Students enrolled in the program are able to take advantage of course offerings at any of the three universities. These offerings reflect the diversity of strengths across the state.

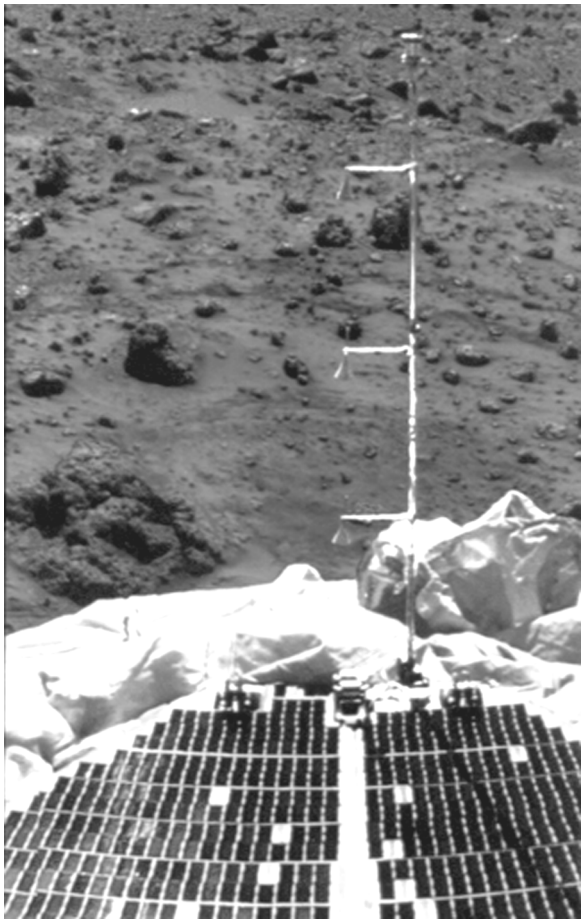
The M.E. program offers the practicing engineer the opportunity to design, in conjunction with an advisory committee, a program of study that can reflect the increasingly interdisciplinary nature of engineering practice.

Admission. For application materials, students may visit the program's Web site at triuniv.engr.arizona.edu, contact the College of Engineering and Applied Sciences at 480/965-1726, or address e-mail to 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 postbaccalaureate 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 must satisfy admission requirements, in addition to those specified above.

Individuals not meeting the requirements for regular admission may be recommended for provisional admission or deferred admission status at the discretion of the M.E. Admission Committee. Upon completion of recommended course work, provisional and/or deferred admission status students will be elevated to regular status. Refer to the M.E. Web site for program admission details.

Individuals wanting to take courses offered in the M.E. program while not seeking a degree, are encouraged to obtain nondegree admission status through the Graduate School.



The vertical stand holding wind-measuring instruments developed at ASU was a vital part of the Mars Pathfinder lander mission in 1997.

Photo courtesy of NASA

Program of Study. Graduate College requirements of the home institution must be followed. All programs of study require the completion of at least 30 semester hours of graduate credit. Each program of study requires three semester hours of course work in each of the following subject areas: engineering management/business and applied engineering mathematics.

All students are expected to take at least 10 semester hours from their home institution. During the first month of the semester in which the 10th semester hour is taken, the M.E. student should prepare a program of study. Once the program of study has been approved by the student's advisory committee, it should be forwarded for approval by the campus director of the home institution. See the M.E. Web site for detailed information regarding the program of study.

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.

Capstone Event. An appropriate capstone event is defined and managed by the student's advisory committee. A capstone event could include, but is not limited to, the following: a written and/or oral defense of an applied project; a final examination that captures the essence of the master's degree focus and represents a major portion of the student's course work; or an overview presentation incorporating knowledge gained from the program with integration and reflection of learning as applied to the job. The student's advisory committee has the authority to determine the format of the capstone event.

Time Limit. The time limit for completing the M.E. 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 one requires a thesis and is designed primarily for full-time students. Option two 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 (AECP) 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 one are required to write a thesis.

Final Examinations. A final oral examination in defense of the thesis is required for students who choose Option one. A final comprehensive examination is required for students in Option two. Examination format and times should be obtained from the academic unit.

COURSES

For courses, refer to the catalog section for the major.

Engineering Science

Master's and Doctoral Programs

The faculty of the School of Engineering offer graduate programs leading to the M.S., the M.S.E., and the Ph.D. degrees in Engineering Science. Faculty offer programs of a special and interdisciplinary nature. An area of study is also available in materials science and engineering. Contact the Department of Chemical and Materials Engineering.

See "Master's Degrees," page 93, and "Doctor of Philosophy," page 96, for information.

Graduate Record Examination. A student whose undergraduate degree program is not ABET accredited must submit 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 and Materials Engineering. Courses offered carry the MSE prefix and are listed on page 257.

For more information call 480/965-3313, send e-mail to cmerec@asu.edu, or visit 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: growth, processing and characterization of electronic materials; electroceramics; deformation behavior of materials at different length scales; computational materials science; and nanoscience and nanotechnology. Some of the research projects that are currently being pursued are: growth of group III nitrides by organometallic vapor phase epitaxy and molecular beam epitaxy and their fabrication into high frequency, high power, and high temperature devices; fabrication of spintronic devices for very high frequency applications; synthesis of high k dielectric films by organometallic vapor phase epitaxy and correlation of properties with microstructures; process-induced defects in implantation and annealing of GaN; creep and thermal fatigue behaviors of lead-free solder balls used in electronic packaging; modeling of the evolution of thin film microstructures; and synthesis and characterization of quantum dots.

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 496 Professional Seminar. (0)
fall and spring
Topics of interest to students in the engineering special and interdisciplinary studies.

ASE 582 Linear Algebra in Engineering. (3)
fall
Development and solution of systems of linear algebraic equations. Applications from mechanical, structural, and electrical fields of engineering. Prerequisite: MAT 242 (or its equivalent).

ASE 586 Partial Differential Equations in Engineering. (3)
spring
Development and solution of partial differential equations in engineering. Applications in solid mechanics, vibrations, and heat transfer. Prerequisites: MAT 242, 274.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

English

Master's and Doctoral Programs

www.asu.edu/clas/english/gradstudies/enggrad.htm

480/965-3168

LL 542

Regents' Professors: Dubie, Ríos

Professors: Adams, Bender, Bjork, Boyer, Brack, Brink, Candelaria, Carlson, Crowley, Donelson, Gutierrez, Helms, Kehl, Lester, Lightfoot, Major, A. Nilsen, D. Nilsen, Rhodes, Richard, Roen, Sands, Sensibar, Tobin

Associate Professors: Bates, Bivona, Castle, Chancy, Corse, DeLamotte, M. Goggin, Goldberg, Horan, Lussier, Mahoney, McNally, Miller, Nelson, Perry, Pritchard, Ramage, Savard, Schwalm, Tohe, van Gelderen, Voaden

Assistant Professors: Blasingame, Fox, Fuse, P. Goggin, Harris, Johnson, Milun, Webb Peterson

Senior Lecturers: Cook, Cooper, Duerden, Dugan, Dwyer, Heenan, Norton, Sudol, Wheeler

Lecturers: Binkely, Duttagupta, Stancliff, Ray

Academic Professionals: Glau, McNeil

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 181.

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 164.

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 semester hours being taken in the Department of Languages and Literatures. Included in the 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, LIN 511 Phonetics and Phonology, LIN 514 Syntax, one LIN 591 Seminar, or their equivalents chosen in consultation with the advisor, and LIN 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 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 semester hour core, a six semester hour thesis, and 12 elective hours that must include six semester hours of ENG 591 Seminar and may include nine semester hours of appropriate graduate courses outside the English department.

Foreign Language Requirements. A reading knowledge of French, German, Spanish, or another natural 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 "Teaching English as a Second Language," page 328.

DOCTOR OF PHILOSOPHY

See "Doctor of Philosophy," page 96, for general requirements.

Admission Requirements. Applicants for the Ph.D. degree in English must 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. At least 60 semester hours of graduate courses (exclusive of dissertation) beyond the bachelor's degree constitute the formal course preparation. Specifically required are three semester 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 semester 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 at least 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 semester hours taken outside the department may be counted toward the degree.

Rhetoric/Composition and Linguistics. A minimum of 60 semester hours of graduate courses (exclusive of dissertation) beyond the bachelor's degree constitutes the formal course preparation. Specifically required are three semester hours of language (for example, ENG 507 Old English, ENG 508 Old English Literature, ENG 509 Middle English, LIN 505 American English, LIN 548 Studies in English Language); six semester 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 semester 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 97.) 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

Research in English and its various subdisciplines fall into three broad areas of inquiry:

1. historical/textual studies;
2. comparative/interdisciplinary studies; and
3. pedagogical/theoretical studies.

The first category (historical/textual Studies) concerns the production, preparation, and publication of texts and explores the historical context of publication. Work in this area encompasses the writing of the creative writing faculty as well as the historical/material criticism of rhetoricians, linguists, and literary historians.

Research in the second category (comparative/interdisciplinary Studies) analyzes the dynamic play of language across cultures and disciplines and seeks to establish critical difference and similitude as the vehicle for comprehending the function of language and texts in a broadened context that includes all literatures and disciplines.

The third category (pedagogical/theoretical Studies) involves the theory and practice of those subdisciplines currently defining "English Studies." A concern for operative theories and efficacious practices involves every component of the department, encouraging the exploration of how language and literature interact in the subdisciplines and within wider spheres of cultural authority. For more information about faculty publications and specializations, access the Web site at www.asu.edu/clas/english/who/facspecial.html.

ENGLISH (ENG)

ENG Note 1. Completion of the First-Year Composition requirement (ENG 101 and 102 [or 105] or ENG 107 and 108 with a grade of "C" or higher) is a prerequisite for all English courses above the 100 level.

ENG Note 2. A term paper or equivalent out-of-class written work is required in all upper-division (300- and 400-level) ENG courses.

ENG Note 3. English majors and minors are expected to have completed ENG 200 before taking 400-level literature courses.

ENG 400 History of Literary Criticism. (3)
selected semesters
Major critics and critical traditions in the Western world. See ENG Notes 1, 2. Prerequisite: 6 hours in literature or instructor approval.

ENG 401 Topics in Critical Theory. (3)
selected semesters
Major critical schools of recent decades—postcolonialist, psychoanalytic, deconstructionist, feminist, new historicist. May be repeated for credit when topics vary. Lecture, discussion. See ENG Notes 1, 2. Prerequisite: 6 hours in literature or instructor approval.

ENG 409 Advanced Screenwriting. (3)
selected semesters
Applies the principles taught in a complete feature-length screenplay. See ENG Notes 1, 2. Prerequisite: instructor approval.

ENG 411 Advanced Creative Writing. (3)
fall and spring
Poetry, fiction, and drama for experienced writers, emphasizing individual style. Each genre may be taken once. See ENG Notes 1, 2. Prerequisite: ENG 310 or instructor approval.

ENG 412 Creative Nonfiction. (3)
selected semesters
Lectures, discussion, and criticism concerning techniques of writing creative nonfiction for publication. See ENG Notes 1, 2. Prerequisite: ENG 310 or 411 or instructor approval.

ENG 413 History of the English Language. (3)
once a year
Development of English from the earliest times to the modern period. See ENG Notes 1, 2. Prerequisite: junior standing or instructor approval.

ENG 415 Topics in Medieval Literature and Culture. (3)
selected semesters
Interdisciplinary approach to medieval literature, emphasizing cultural and historical context. May be repeated for credit when topics vary. See ENG Notes 1, 2, 3. Prerequisite: ENG 221 or instructor approval.

ENG 416 Chaucer in Middle English. (3)
once a year
Yearly alternate between Chaucer's *The Canterbury Tales* and *Troilus and Criseyde*. May be repeated for credit when topics vary. See ENG Notes 1, 2, 3. Prerequisite: ENG 221 or instructor approval.

ENG 418 Renaissance Literature. (3)
once a year
Selected topics, authors, contexts, and themes in Renaissance literature. See ENG Notes 1, 2, 3. Prerequisite: ENG 221 or instructor approval.

ENG 419 English Literature in the Early 17th Century. (3)
once a year
Topics, authors, and themes in English literature, 1603–1660. See ENG Notes 1, 2, 3. Prerequisite: ENG 221 or instructor approval.

ENG 423 Renaissance Drama. (3)
spring
Topics, authors, and themes in the drama of the Tudor and early Stuart periods. See ENG Notes 1, 2, 3. Prerequisite: ENG 221 or instructor approval.

ENG 424 Milton. (3)
once a year
Selected prose and poetry, emphasizing *Paradise Lost, Paradise Regained,* and *Samson Agonistes.* See ENG Notes 1, 2, 3. Prerequisite: ENG 221 or instructor approval.

ENG 425 Studies in Romanticism. (3)
fall
Romanticism in continental, British, and American literature and culture. May be repeated for credit when topics vary. Lecture, discussion. See ENG Notes 1, 2, 3. Prerequisite: ENG 222 or 241 or instructor approval.

ENG 427 Studies in 18th-Century Literature and Culture. (3)
selected semesters
Literary, social, and cultural issues of the period studied in an interdisciplinary format. May be repeated for credit when topics vary. See ENG Notes 1, 2, 3. Prerequisite: ENG 221 or 222 or instructor approval.

ENG 429 Studies in European Literature and Culture. (3)
selected semesters
Literary, cultural, and historical issues. May be repeated for credit when topics vary. Lecture, discussion. See ENG Notes 1, 2, 3.

ENG 430 Studies in Victorian Literature and Culture. (3)
once a year
Literary, social, and cultural issues of the period studied in an interdisciplinary format. May be repeated for credit when topics vary. See ENG Notes 1, 2, 3. Prerequisite: ENG 222 or instructor approval.

ENG 434 Studies in the Literature and Culture of the Americas. (3)
selected semesters
Literature and culture of North America, South America, and the Caribbean. May be repeated for credit when topics vary. Lecture, discussion. See ENG Notes 1, 2, 3. Prerequisite: ENG 241 or 242 or instructor approval.

ENG 436 Studies in Anglophone Literature and Culture. (3)
selected semesters
Literary, social, and cultural issues of English-speaking former colonial territories. May be repeated for credit when topics vary. Lecture, discussion. See ENG Notes 1, 2, 3. Prerequisite: ENG 222 or 242 or instructor approval.

ENG 440 Studies in American Literature and Culture. (3)
once a year
Various genres in their literary, political, theoretical, and historical contexts. May be repeated for credit when topics vary. See ENG Notes 1, 2, 3. Prerequisite: ENG 241 or 242 or instructor approval.

ENG 442 Studies in 20th-Century British and Irish Literature and Culture. (3)
once a year
Major literary genres (novel, poetry, and drama) in their cultural and historical contexts. May be repeated for credit when topics vary. See ENG Notes 1, 2, 3. Prerequisite: ENG 222 or instructor approval.

ENG 444 Studies in American Romanticism. (3)
once a year
Fiction, poetry, and essays of such nineteenth-century authors as Hawthorne, Emerson, Melville, Thoreau, Fuller, Whitman, and Dickinson. See ENG Notes 1, 2, 3. Prerequisite: ENG 241 or instructor approval.

ENG 445 Studies in American Realism. (3)
once a year
Writers and influences that shaped the development of literary realism. May be repeated for credit when topics vary. See ENG Notes 1, 2, 3. Prerequisite: ENG 242 or instructor approval.

ENG 446 Studies in Modernism. (3)
selected semesters
Cultural, historical, and literary problems in American and European modernism. May be repeated for credit when topics vary. Lecture, discussion. See ENG Notes 1, 2, 3. Prerequisite: ENG 222 or 242 or instructor approval.

ENG 448 Studies in Irish Literature and Culture. (3)
selected semesters
Themes and problems pertaining to Irish literature, film, and social and cultural history. May be repeated for credit when topics vary. Lecture, discussion. See ENG Notes 1, 2, 3. Prerequisite: ENG 222 or 242 or instructor approval.

ENG 452 Studies in the Novel. (3)
selected semesters
May be repeated for credit when topics vary. See ENG Notes 1, 2, 3. Prerequisite: ENG 221 or 222 or 241 or 242 or instructor approval.

ENG 453 Studies in the American Novel. (3)
fall and spring
Poetics and politics of the novel, 18th through 21st centuries. May be repeated for credit when topics vary. See ENG Notes 1, 2, 3. Prerequisite: ENG 241 or 242 or instructor approval.

ENG 455 Forms of Verse: Theory and Practice. (3)
selected semesters
Types, history, analysis of traditional poetic forms and contemporary adaptations. Writing of poetry in forms such as sonnet, villanelle, sestina. See ENG Notes 1, 2. Prerequisite: ENG 310 or instructor approval.

ENG 457 Studies in American Poetry. (3)
selected semesters
May be repeated for credit when topics vary. See ENG Notes 1, 2, 3. Prerequisite: ENG 241 or 242 or instructor approval.

ENG 459 Studies in African American/Caribbean Literatures. (3)
selected semesters
Studies in African American or Caribbean literatures according to genre, period, theory, or selected authors. May be repeated for credit when topics vary. Cross-listed as AFH 459. Credit is allowed for only AFH 459 or ENG 459. See ENG Notes 1, 2, 3.

ENG 461 Studies in Women and Literature. (3)
selected semesters
Advanced topics in literature by or about women. May be repeated for credit when topics vary. See ENG Notes 1, 2, 3.

ENG 464 Studies in Drama. (3)
selected semesters
Selected topics in the history and theory of the genre. See ENG Notes 1, 2, 3. Prerequisite: ENG 221 or 222 or 241 or 242 or instructor approval.

ENG 465 Studies in Film. (3–4)
selected semesters
Advanced topics in cinema. Lecture, viewing, discussion. See ENG Notes 1, 2.

ENG 469 Science and Literature. (3)
selected semesters
Historical and theoretical links between science and literature, from Francis Bacon to the present, examined in cultural context. May be repeated for credit when topics vary. Lecture, discussion. See ENG Notes 1, 2, 3.

ENG 471 Literature for Adolescents. (3)
fall and spring
Prose and poetry that meet the interests and capabilities of junior high and high school students. Stresses recent literature. Requires passing grade of at least "C" before students are permitted to student teach in English. See ENG Notes 1, 2, 3.

ENG 480 Methods of Teaching English: Composition. (3)
fall or spring and summer
Methods of instruction, organization, and presentation of appropriate content in the teaching of composition and other writing skills. See ENG Notes 1, 2.

ENG 482 Methods of Teaching English: Language. (3)
fall or spring and summer
Methods of instruction, organization, and presentation of appropriate content in language and usage for junior and senior high schools. Lecture, discussion, lab. See ENG Notes 1, 2.

ENG 500 Research Methods. (3)
once a year
Methodology and resource materials for research. Analysis of criticism and scholarship, including evaluation of sources.

ENG 501 Introduction to Comparative Literature. (3)
selected semesters
Problems, methods, and principles, illustrated by selected critical essays and literary texts.

ENG 502 Contemporary Critical Theory. (3)
once a year
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)
selected semesters
Elements of Old English grammar, with selected readings.

ENG 508 Old English Literature. (3)
selected semesters
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)
selected semesters
Study of the principal dialects of the language, with selected readings. Prerequisite: graduate standing.

ENG 512 The Teaching of Composition. (3)
selected semesters
Theory and practice of teaching writing at all levels. Emphasizes current research. Prerequisites: teaching experience; instructor approval.

ENG 515 Middle English Literature. (3)
selected semesters
English literature from the 12th through the 15th centuries, exclusive of Chaucer. Prerequisite: ENG 509 or instructor approval.

ENG 517 Contemporary Rhetorical Theory. (3)
once a year
Investigates the work of such important rhetorical theorists as Burke, Toulmin, Perelman, Gates, and Cixous.

ENG 520 Renaissance Literature. (3)
selected semesters
Poetry and prose of the English Renaissance, excluding drama.

ENG 521 Shakespeare. (3)
once a year
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)
selected semesters
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)
fall
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)
spring
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)
selected semesters
Intensive study in the rhetorical categories of invention, arrangement, style, aims, modes, and forms of written discourse.

ENG 545 Studies in English Literature. (3)
selected semesters
Selected authors or issues. May be repeated for credit.

ENG 547 Studies in American Literature. (3)
selected semesters
Selected authors or issues. May be repeated for credit.

ENG 549 Studies in Comparative Literature. (3)
selected semesters
Selected authors or issues. May be repeated for credit.

ENG 550 Contemporary Comparative Literature. (3)
selected semesters
Comparative studies in modern literature in English and other literatures in translation. May be repeated for credit when topics vary.

ENG 559 Advanced Study in African American/Caribbean Literatures. (3)
selected semesters
Advanced study in African American or Caribbean literatures, theory, and criticism. May be repeated for credit when topics vary.

ENG 560 Studies in Dramatic Forms. (3)
selected semesters
Selected topics in dramatic and cinematic literature, history, criticism, theory, and crossdisciplinary study. May be repeated for credit when topics vary. Lecture, studio.

ENG 571 Advanced Study in Literature for Adolescents. (3)
selected semesters
History and criticism of adolescent literature. Prerequisite: ENG 471 or instructor approval.

ENG 573 Censorship and Literature. (3)
selected semesters
History of censorship, primarily in the United States, and significant court decisions that affected writers and books.

ENG 580 Practicum. (1–12)
selected semesters

ENG 591 Seminar. (3)
fall and spring
Selected topics regularly offered in the various areas of English studies.

ENG 594 Conference and Workshop. (1–12)
selected semesters

ENG 598 Special Topics. (1–4)
selected semesters

ENG 599 Thesis. (1–12)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

LINGUISTICS (LIN)

LIN 500 Research Methods. (3)
fall
Methodology and resource materials for research. Analysis of criticism and scholarship, including evaluation of sources.

LIN 505 American English. (3)
spring
Development of the English language in America, including a survey of geographical and social dialects.

LIN 510 English Linguistics. (3)
fall
Current approaches to the study of the English language.

LIN 511 Phonetics and Phonology. (3)
spring
Current trends in phonological theory and its basis in acoustic and articulatory phonetics. Prerequisite: LIN 510 (or its equivalent) or instructor approval.

LIN 513 Semantics. (3)
fall in even years
Current approaches to linguistic meaning with particular attention to English. Prerequisite: LIN 510 (or its equivalent) or instructor approval.

LIN 514 Syntax. (3)
spring
Analyzes syntactic structure by contemporary theoretical models with a focus on English. Prerequisite: LIN 510 (or its equivalent) or instructor approval.

LIN 516 Pragmatics and Discourse Theory. (3)
fall in odd years
Study of language use in context and of language structures in conversation and written text. Lecture, discussion. Prerequisite: LIN 510 (or its equivalent) or instructor approval.

LIN 548 Studies in English Language. (3)
selected semesters
Selected authors or issues. May be repeated for credit.

LIN 572 Theories Underlying the Acquisition of English as a Second Language. (3)
fall
Theories of second language acquisition including the linguistic, cognitive, affective, and sociocultural aspects.

LIN 574 The Teaching of English as a Second Language. (3)
spring
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)
once a year
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)
selected semesters
Survey of studies in second language acquisition in the context of recent sociolinguistic theory.

LIN 577 Grammar for TESL. (3)
selected semesters
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)
fall and spring
Selected topics.

LIN 593 Applied Project. (3)
fall and spring
Preparation of a supervised applied project that is a graduation requirement in the TESL professional major. Independent study with consultation.

LIN 599 Thesis. (1–12)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Environmental Design and Planning

Interdisciplinary Doctoral Program

www.asu.edu/caed/phd_program

480/965-4620

ARCH 126

K. David Pijawka, Director, Executive Committee

Agribusiness and Resource Management
Professors: Brady, Brock
Associate Professors: Green, Miller, Whysong

Architecture
Regents' Professor: J. Cook
Professor: Ozel
Associate Professors: Bryan, Ellin, Zygas
Assistant Professors: Caicco, Hejduk, Kobayashi, Lerum

Design
Professors: Brandt, Giard, Kroelinger
Assistant Professor: McCoy

Planning and Landscape Architecture
Professors: Kihl, Lai, Mushkatel, Pijawka
Associate Professors: Cameron, E. Cook, Guhathakurta, Kim, Yabes
Assistant Professors: Crewe, Musacchio

The Executive 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.

For more information, access the program Web site at www.asu.edu/caed/phd_program, or send e-mail to caed.phd@asu.edu.

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, facilities planning and management, fire protection, human factors in design, 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 architecture and design, history of building science, history of city planning, and landscape theory and criticism.

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 1 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.

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 candidate evaluation 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 receives an annual evaluation. Students 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 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 list that follows provides an indication of some of the research topics currently being explored by the doctoral students in the program, as well as core faculty within the college. Topics may change during the course of the research, either by expanding or narrowing the focus of the topic. This list is not inclusive of all research. For more information about student and faculty research, access the Web site at www.asu.edu/caed/phd_program/index.html.

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 Resources. 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.

Environmental Resources. Through faculty from the Morrison School of Agribusiness and Resource Management 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 598 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Arts and Crafts Movement in Design
- Computational Models in Environmental Design
- Ecological Assessment and Evaluation
- Elderly Housing Issues in the U.S. Southwest
- Ethics in Environmental Design and Planning
- Human Comfort
- Integral Urbanism
- Issues in Environment and Behavior Studies
- Issues in Industrial Design
- Issues in Sustainable Design
- New Evaluation Methods for the Built Environment
- Philosophy of Environmental Design Research

EPD 700 Interdisciplinary Research Methods. (3)
fall
Introduces the philosophy and methodology of interdisciplinary research in environmental design and planning. Seminar. Fee.

EPD 710 Current Research in Design. (3)
spring
Review and critical evaluation of contemporary literature and method in architecture, building science, interior design, industrial design, and landscape architecture. Seminar. Fee.

EPD 712 Current Research in Planning. (3)
spring
Review and critical evaluation of contemporary literature and method in environmental planning, landscape ecology, urban design, and urban and regional planning. Seminar. Fee.

EPD 714 Current Research in History, Theory, and Criticism. (3)
spring
Review and critical evaluation of contemporary literature and method in the theory and history of architecture, design, and planning. Seminar. Fee.

EPD 792 Research. (1–12)
selected semesters

EPD 799 Dissertation. (1–12)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 48.

Environmental Planning

Master’s Program

www.asu.edu/caed
480/965-7167
AED 158

Hemalata Dandekar, Director

Professors: Kihl, Lai, Mushkatel, Pijawka

Associate Professors: Cameron, Cook, Guhathakurta, Kim, McSherry, Yabes

Assistant Professors: Crewe, Ewan, Fish Ewan, Musacchio

The faculty in the School of Planning and Landscape Architecture offer a graduate program leading to the professional Master of Environmental Planning degree. Three areas of concentration 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 96, 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 concentration 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, graphic design, 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 community 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.

The College of Architecture and Environmental Design/North building

Jeff Havir photo

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 47 semester hours or 50 with an optional internship. The program has the typical distribution as follows:

Required core courses, including two four-hour studios	28
Specialization courses	15
Optional internship	3
Thesis	4
Total	50
Total without internship	47

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 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

Scholarly activity of the School of Planning and Landscape Architecture can be clustered into eight areas:

1. community-based and urban design studies,
2. environmental planning,
3. historical research and preservation,
4. housing and urban policy,
5. international research,
6. landscape ecology and design,
7. planning theory and education, and
8. urban-environmental modeling.

Community-based and Urban Design Studies. The community-based and urban design studies often relate to growth management and development concerns. Many local communities support this work including Native American groups such as the Hopi nation and the Town of Guadalupe. The National Endowment for the Arts has provided support through the Your Towns Program—focusing on rural communities—and the Mayor's Institute—focusing on design issues of cities.

Environmental Planning. The faculty have published numerous articles and received funding in such environmental planning areas as siting hazardous facilities, measuring impacts of land uses on biodiversity, analyzing environmental hazards, and designing land evaluation and site assessment systems.

Historical Research and Preservation. Historical research and preservation concerns the study of special places and the people who created them.

Housing and Urban Policy. The housing and urban policy cluster involves social and health concerns, affordable housing, sustainable home design, and transportation planning.

International Research. International research includes funded studies along the U.S. Mexico border as well as work in other countries.

Landscape Ecology and Design. Landscape ecology and design research includes work focused on river corridors, watersheds, riparian areas, wetlands, and environmentally sensitive lands. The landscape ecological research has received significant support from many federal, state, and city agencies.

Planning Theory and Education. The planning theory and education cluster concerns critical urban, landscape, and environmental issues that advance the disciplines in the school: landscape architecture and planning.

Urban-environmental Modeling. Urban-environmental modeling involves long-term urban ecological research and integrated models for large-scale planning.

LANDSCAPE ARCHITECTURE (PLA)

PLA 411 Landscape Architecture Theory and Criticism. (3)
spring
Critically analyzes landscape architecture theories and projects to evaluate validity of design and contribution to society. Prerequisites: PLA 310, 361, 362, 420, 461.

PLA 461 Landscape Architecture V. (4)
fall
Landscape ecological planning: collection and application of ecological data relevant to planning and design at landscape scale. Studio. Fee. Prerequisite: PLA 362.

PLA 485 International Field Studies in Planning and Landscape Architecture. (1–12)
fall, spring, summer
Organized field study of planning and landscape architecture in specified international locations. May be repeated for credit with school approval. Study abroad. Cross-listed as PUP 485. Credit is allowed for only PLA 485 or PUP 485.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

URBAN AND ENVIRONMENTAL PLANNING (PUP)

PUP 412 History of the City. (3)
fall
The city from its ancient origins to the present day. Emphasizes European and American cities during the last five centuries. Cross-listed as APH 414. Credit is allowed for only APH 414 or PUP 412.

PUP 420 Theory of Urban Design. (3)
spring
Analyzes the visual and cultural aspects of urban design. Theories and techniques applied to selected study models. Prerequisite: junior standing.

PUP 433 Zoning Ordinances, Subdivision Regulations, and Building Codes. (3)
spring
Analyzes zoning ordinances, subdivision regulations, building codes, and other planning implementation techniques relative to local development. Prerequisite: admission to upper division or instructor approval.

PUP 434 Urban Land Economics. (3)
spring
Interaction between space and economic behavior. Examines the use and value of land through economic theories. Prerequisite: admission to upper division or instructor approval.

PUP 436 City Structure and Planning. (3)
spring
Political structure and organization of government as it relates to planning. Prerequisite: PUP 301.

PUP 442 Environmental Planning. (3)
fall
Environmental planning problems, including floodplains, 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)
spring
History, theory, and principles of historic preservation. Emphasizes legal framework and methods practiced. Lecture, off-campus field study. Prerequisite: instructor approval.

PUP 445 Women and Environments. (3)
fall
Examines the role women play in shaping the built environment; ways built/natural forms affect women's lives. Focuses on contemporary U.S. examples. Prerequisite: admission to upper division or graduate standing.

PUP 452 Ethics and Theory in Planning. (3)
fall
Ethics and theory of professional planning practice in urban and regional communities. Prerequisite: admission to upper division or instructor approval.

PUP 485 International Field Studies in Planning and Landscape Architecture. (1–12)
fall, spring, summer
Organized field study of planning and landscape architecture in specified international locations. May be repeated for credit with school approval. Study abroad. Cross-listed as PLA 485. Credit is allowed for only PLA 485 or PUP 485.

PUP 498 Pro-Seminar. (1–7)
fall
Topics may include the following:
- Senior Pro-Seminar. (1)

PUP 501 The Idea of Planning. (3)
fall
Comprehensive review of planning profession within a political, governmental, multicultural, and gender framework.

PUP 510 Citizen Participation. (3)
spring
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)
fall
Reviews 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)
fall
Tools useful for urban planning research; emphasizes research design and survey methods. Pre- or corequisite: PUP 501 or instructor approval.

PUP 525 Urban Housing Analysis. (3)
fall
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)
spring
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)
spring
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 542 Environmental Administration and Planning. (3)
spring
Environmental administration of policies and their relationship to environmental planning practices. Prerequisite: PUP 442.

PUP 544 Urban Land Use Planning. (3)
spring
Theory and methods of urban land use planning, including the rational planning process, comprehensive, functional, and neighborhood plans. Pre- or corequisite: PUP 501 or instructor approval.

PUP 546 Urban Design Policy. (3)
selected semesters
Advanced study of local, state, and federal urban design policy. Prerequisite: PLA 420 or PUP 420.

PUP 561 Urban Design Studio. (4)
selected semesters
Current urban form and urban landscape design problems within the Phoenix-centered region. Studio.

PUP 572 Planning Studio I: Data Inventory and Analysis. (4)
fall
Comprehensive planning workshop dealing with real community problems. Focuses on the data gathering and analysis steps of the planning process. Fee. Prerequisite: Master of Environmental Planning major or instructor approval.

PUP 574 Planning Studio II: Options and Implementation. (4)
spring
Comprehensive planning workshop dealing with real community problems. Focuses on the development of options, plan making, and plan implementation. Studio. Fee. Prerequisite: PUP 572 or instructor approval.

PUP 575 Environmental Impact Assessment. (3)
spring
Criteria and methods for compliance with environmental laws; develops skills and techniques needed to prepare environmental impact statements/assessments.

PUP 576 GIS Studio. (3)
spring
GIS as a tool to address large, multifaceted planning problems. Prerequisites: a combination of GPH 373 (or 598) and PAF 591 and PUP 322 or only instructor approval.

PUP 584 Internship. (3)
fall, spring, summer session 1
Internship under the supervision of practitioners in the Phoenix area or other locales. Credit/no credit.

PUP 591 Seminar. (1–12)
fall and spring
Topics may include the following:
- Transportation Systems Pro-Seminar

PUP 598 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Air Transportation Regulation
- Airport Systems
- Transportation Planning and the Environment

PUP 599 Thesis. (1–12)
fall, spring, summer session 1
Fee.

PUP 622 Planning Methods II: Quantitative Planning Analysis. (3)
spring
Methods and models used as the basic quantitative techniques of urban, regional, and environmental planning and policy analysis. Prerequisites: PUP 524; a course in statistics; instructor approval.

PUP 642 Land Economics. (3)
fall
Land use and locational impact of economic activity and the urban real property market. Prerequisite: instructor approval.

PUP 644 Public Sector Planning. (3)
spring
Urban fiscal problems and public goods provision in state and local governments. Prerequisites: a course in microeconomics; instructor approval.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 48.

Environmental Resources

Master’s Program

cactus.east.asu.edu

480/727-1585

CNTR 20

Raymond A. Marquardt, Dean

Professors: Brady, Brock

Associate Professors: Green, Miller, Whysong

The faculty of the Morrison School of Agribusiness and Resource Management, at ASU East, offer a program leading to the M.S. degree in Environmental Resources. Areas of concentration are offered in natural resource management, GIS/remote sensing, and range ecology. The faculty

in this program also participate in offering the Ph.D. in Environmental Design and Planning program. See "Doctor of Philosophy," page 96, 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
MORRISON SCHOOL OF AGRIBUSINESS
AND RESOURCE MANAGEMENT
ARIZONA STATE UNIVERSITY EAST
7001 E WILLIAMS FIELD ROAD
MESA AZ 85212-6032

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 Morrison School of Agribusiness and Resource Management and the Graduate College on March 15.

For spring enrollment, application materials are due in the Morrison School of Agribusiness and Resource Management 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. A minimum grade of "B" is required in all core courses. First-year students are expected to complete ERS 550 Vegetation Dynamics, ERS 591 Environmental Resources Seminar, and ERS 551 Advanced Environmental Statistics. Second-year students are required to complete ERS 691 Seminar 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

The faculty of environmental resources is engaged in a number of research projects of global, national, regional, or state importance. Scholarship in service to community is the hallmark of a state-supported university and continues to be in the Morrison School of Agribusiness and Resource Management.

A few examples of this scholarship are a project involved in "The Adaptation of Sonoran Desert Vegetation to Wildfire on the Tonto National Forest"; a "Wildlife Vegetation Inventory for Northern Phoenix"; an extensive program in "Transborder Watershed Resources"; and an investigation into the "Effects of Livestock Use Levels on Riparian Trees on the Verde River."

ENVIRONMENTAL RESOURCES (ERS)

ERS 402 Vegetation Measurement. (4)
spring
Vegetation sampling and inventory as related to animal-habitat relations. Lecture, lab, 1 weekend field trip. Prerequisites: a combination of ERS 301 and 307 and 350 and program major or only instructor approval.

ERS 415 Wildlife Life Histories. (4)
spring
Life histories of the major mammal, reptile/amphibian, and avian species found in the Southwest, with emphasis on management. Lecture, lab. Prerequisite: BIO 370 or 385.

ERS 420 Ecological Restoration. (3)
spring
Techniques of ecological restoration applied for the improvement of arid and semiarid land and sensitive habitats. Weekend field trips.

ERS 425 Soil Classification and Management. (3)
selected semesters
Principles of soil genesis, morphology, and classification. Presents management and conservation practices. Prerequisite: ERS 225.

ERS 433 Riparian Ecosystem Management. (3)
selected semesters
Examines 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)
selected semesters
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 448 Soil Ecology. (3)
selected semesters
Soils viewed in an ecosystem context, soil-plant relationships, nutrient budgets, and abiotic factors that influence soil processes. Prerequisites: a combination of BIO 320 and ERS 225 and 226 or only instructor approval.

ERS 449 Landscape Ecology. (3)
selected semesters
Causes and ecological consequences of spatial and temporal patterns in the environment. Prerequisite: ERS 301.

ERS 460 Applied Systems Ecology. (3)
selected semesters
Systems approach applied to analysis and management of natural resource ecosystems. Uses simulation models. 2 hours lecture, 3 hours lab. Prerequisites: ERS 350 (or its equivalent); a course in ecology.

ERS 465 Surface Water Quality. (3)
spring in odd years
Examines factors that impact water quality. Surface water sampling and analysis with interpretation for wildlife, humans, and other users. Prerequisites: ERS 364, 365.

ERS 474 Wildlife Ecology. (3)
selected semesters
Integrates ecological concepts as applied to wildlife populations and their interaction with the habitat and other species. Lecture, lab, 1 weekend field trip.

ERS 475 Wildlife Management. (4)
spring
Principles and techniques of applied ecology for the management and wildlife populations. Lecture, lab. Prerequisites: ERS 311 and 474 (or their equivalents).

ERS 480 Ecosystem Management and Planning. (3)
spring
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 its equivalent); senior standing.

ERS 485 GIS in Natural Resources. (3)
fall
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 its equivalent).

ERS 486 Remote Sensing in Environmental Resources. (4)
spring
Principles and application of remote sensing technologies in natural resource management. Integration of computerized data from aerial photography and LanSat imagery in resource management. Lecture, lab. Prerequisite: ERS 485 (or its equivalent).

ERS 490 Recent Advances in Environmental Resources. (1)
fall and spring
Current literature and significant developments involving environmental resources. May be repeated for credit.

ERS 500 Research Methods. (1–12)
selected semesters

ERS 533 Riparian Ecology. (3)
selected semesters
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)
selected semesters
Reaction of plants to environmental stresses; aerial pollutants, fire, herbivores, mechanical treatments, pesticides, and soil amendments. 1 weekend field trip. Prerequisite: instructor approval.

ERS 550 Vegetation Dynamics. (4)
fall
Dynamics of vegetation emphasizing ecological succession, applications of landscape ecology and GIS, and analysis of vegetation data. Field trips, studio. Prerequisite: a course in introductory statistics.

ERS 551 Advanced Environmental Statistics. (4)
spring
Advanced statistical procedures for environmental resources. Techniques for analyzing research data that do not meet assumptions. Studio. Prerequisite: ERS 350 (or its equivalent).

ERS 553 Advanced Animal Nutrition. (4)
selected semesters
Metabolic and physiological interactions of nutrients in wild and domesticated animals consuming natural feeds. Lecture, lab.

ERS 560 Systems Ecology. (3)
selected semesters
Quantitative description and mathematical modeling of ecosystem structure and function. Techniques for model construction and simulation. Lecture, lab. Prerequisites: ERS 350 (or its equivalent); computer programming; 6 hours in ecological studies.

ERS 561 Spatial Statistics and GIS. (3)
fall
Dependent spatial data, analysis and description, semivariograms, variograms, kriging, and GIS analysis. Lecture, lab. Prerequisites: ERS 350 and 485 (or their equivalents).

ERS 580 Practicum. (1–12)
selected semesters

ERS 584 Internship. (1–12)
selected semesters

ERS 585 Spatial Modeling with GIS. (3)
fall
GIS technology for spatial modeling of natural resources. Practical application of GIS technology for problem solving. Lecture, lab. Prerequisite: ERS 485 (or its equivalent) or instructor approval.

ERS 590 Reading and Conference. (1–12)
selected semesters

ERS 591 Environmental Resources Seminar. (1–12)
selected semesters

ERS 592 Research. (1–12)
selected semesters

ERS 593 Applied Project. (1–12)
selected semesters

ERS 594 Conference and Workshop. (1–12)
selected semesters

ERS 595 Continuing Registration. (1)
selected semesters

ERS 598 Special Topics. (1–4)
selected semesters

ERS 599 Thesis. (1–12)
selected semesters

ERS 691 Seminar. (1–12)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 48.

Exercise and Wellness

Master’s Program

William J. Stone, Chair

Professors: Burkett, Corbin, Stone

Associate Professor: Swan

Assistant Professors: Jones, Phillips, Tudor-Locke

Lecturer: Woodruff

The faculty of Exercise and Wellness at ASU East offer a graduate program leading to the M.S. degree in Exercise and Wellness. Faculty also participate in an interdisciplinary Ph.D. program in Curriculum and Instruction with a concentration in exercise and wellness. For more information, see “Curriculum and Instruction,” page 171.

MASTER OF SCIENCE

All applicants for the M.S. degree program in Exercise and Wellness 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 availability and compatibility of research interests with a potential mentor. International applicants whose native language is not English must also submit a Test of English as a Foreign Language score. Applications are reviewed by faculty only once a year. Priority is given to applications completed by January 1. The program requires a minimum of 30 semester hours, including a minimum of 12 semester hours of research course work (EXW 500, 501, 599), 12 to 15 semester hours of EXW graduate concentration courses and three semester hours of an approved elective. Course work is selected by the student in consultation with an advisor and supervisory committee.

Deficiencies. Applicant transcripts are evaluated to assure competency in the following areas: health behavior change (health psychology), use of computers, basic nutrition, basic wellness, exercise prescription, and exercise testing. Competency in areas considered to be prerequisite to each of the listed competencies are also evaluated. Deficiencies are noted at the time of admission and may be satisfied by completing undergraduate or graduate courses or by a competency examination.

Foreign Language Requirements. None.

Thesis Requirements. A thesis is required.

Final Examinations. A final oral examination in defense of the thesis is required.

RESEARCH ACTIVITY

Research in Exercise and Wellness is enhanced by the existence of research laboratories. Extensive research is also conducted in the field (work site, community, school). The research of Exercise and Wellness faculty and graduate students focuses on the fitness, health and wellness benefits of healthy lifestyles; such as regular physical activity, sound nutrition, and effective stress management. The focus is also on disease prevention and fitness. All groups in the developmental spectrum (children to senior adults) are studied. Among the areas of current interest to faculty and graduate students are physical activity and fitness program effectiveness (strength, cardiovascular fitness, flexibility, and body composition), women's health issues, motivation to adhere to healthy lifestyles, physical activity and fitness assessment, and environmental health and wellness issues.

EXERCISE AND WELLNESS (EXW)

EXW 420 Exercise Testing. (3)
fall and spring
Theoretical basis and practical application of pre-exercise screening, exercise testing, estimates of energy expenditure, and interpretation of results. Lecture, lab. Fee. Prerequisites: EXW 315; current CPR certification.

EXW 425 Exercise Prescription. (3)
spring
Theoretical basis for and application of general principles of exercise prescription to various ages, fitness levels, and health states. Prerequisites: EXW 320, 330. Pre- or corequisite: EXW 420.

EXW 442 Physical Activity in Health and Disease. (3)
spring
Examines the role of physical activity and fitness in the development of morbidity and mortality throughout the human life span. Prerequisite: EXW 315.

EXW 450 Cultural and Social Issues in Exercise and Wellness. (3)
spring
Examines contemporary cultural and social issues in physical activity. Focus on theories of social behavior, racial, ethnic, and cultural differences. Prerequisite: PGS 101.

EXW 460 Resistance Training Application and Theory. (3)
fall
Fosters critical thinking as it applies to resistance training theory. Pre- or corequisite: EXW 315.

EXW 500 Research Methods. (3)
fall
Introduces the basic aspects of research, including problem selection, literature review, instrumentation, data handling, methodology, and writing the report.

EXW 501 Research Statistics. (3)
spring
Statistical procedures; sampling techniques, hypothesis testing, and experimental designs as they relate to research publications.

EXW 505 Applied Exercise and Wellness Laboratory Techniques. (3)
spring
Investigative techniques used in the applied exercise testing/prescription laboratory. Emphasizes cardiorespiratory assessment, energy balance, body composition, and electrocardiography. Lecture, lab. Fee.

EXW 534 Sports and Fitness Conditioning. (3)
fall
Bases of sports and fitness conditioning, including aerobic and anaerobic power, strength, flexibility, and analysis of conditioning components for sports and fitness.

EXW 536 Physiological Aspects of Physical Activity and Chronic Disease. (3)
fall
Role of physiological mechanisms associated with acute and long-term physical activity and its influence on chronic disease and wellness.

EXW 542 Health Promotion. (3)
spring
Theory and research concerning fitness and wellness programs in nutrition, physical activity, smoking cessation, and stress management.

EXW 544 Fitness/Wellness Management. (3)
spring
Development of the fitness/wellness industry. Planning, organizing, promoting, and managing fitness/wellness programs.

EXW 575 Teaching Lifetime Fitness. (3)
spring
Organizing and implementing physical fitness programs in the schools with emphasis on individual problem solving.

EXW 591 Seminar. (1–12)
selected semesters

EXW 599 Thesis. (1–12)
selected semesters

EXW 640 Analysis of Variance for Exercise and Wellness. (3)
fall
Analysis of variance methods with an emphasis on research measures of human performance. Prerequisite: graduate introduction to statistics.

EXW 642 Exercise Epidemiology. (3)
spring
Physical activity, exercise, and physical fitness and the development of chronic disease.

EXW 643 Correlation/Regression/Multivariate Statistics. (3)
spring
Graduate-level statistics course for Ph.D./master's students who will be doing research in the area of exercise and wellness. Prerequisite: graduate ANOVA course.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Exercise Science

Interdisciplinary Doctoral Program

www.asu.edu/clas/espe/ExScPhD.htm

480/965-9580

PEBE 107B

Kathleen S. Matt, Director, Executive Committee

Anthropology
Professor: Marzke

Bioengineering
Associate Professors: He, Sweeney, Yamaguchi

Biology
Professors: Hazel, Satterlie
Associate Professor: Harrison

Exercise Science and Physical Education
Regents' Professor: Landers
Professors: Krahenbuhl, Martin, Matt, Stelmach
Associate Professors: Hinrichs, Morgan, Treasure, Willis
Assistant Professors: Etnier, Robertson, Santello

Psychology
Professors: Karoly, Linder
Assistant Professors: E. Amazeen, P. Amazeen, 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, Bioengineering, Biology, Exercise Science and Physical Education, Family and Human Development, Psychology, and Psychology in Education. Courses, however, are not limited to these academic units. Concentrations are available in biomechanics, motor behavior, physiology of exercise, and sport psychology.

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 four research areas: biomechanics, motor behavior, physiology of exercise, and 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), 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 match of research interests with those of available mentors. To be considered for research or teaching assistantships, all application materials should be received before January 15.

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 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. 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.

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.

COURSES

For courses, refer to the course listings under the following majors: Anthropology, Bioengineering, Biology, Chemical Engineering, Chemistry, Educational Psychology, Family and Human Development, Exercise Science/Physical Education, and Psychology. A limited number of applicable courses are also available through other departments.

Exercise Science/Physical Education

Master's Programs

www.asu.edu/clas/espe
480/965-9580
PEBE 107B

Philip E. Martin, Chair

Regents' Professor: Landers

Professors: Darst, Krahenbuhl, Martin, Matt, Pangrazi, Stelmach

Associate Professors: Hinrichs, Morgan, Treasure, Willis

Assistant Professors: Etnier, Huey, Robertson, Santello

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 a concentration in 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 212.

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," page 165.

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, physical education (elementary, secondary, and adapted), motor behavior (motor learning and control, motor development), and sport and exercise 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 January 15. 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 (three), 501 (three), and 599 (six). 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 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 semester hours of required core courses, six semester hours of cognate area, and nine semester 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.

Caroline Ketcham, a doctoral student in exercise science, conducts eye-tracking experiments with college students, healthy senior citizens, and Parkinson's Disease patients.

Tim Trumble photo

EXERCISE SCIENCE/PHYSICAL EDUCATION (EPE)

EPE 400 Teaching Physical Activity Concepts. (3)
fall and spring
Analyzes and critiques teaching concepts, principles, and skills outlined in Arizona Physical Activity Standards. Evaluates national guidelines for promoting physical activity. Prerequisites: ENG 101 (or 107), 102 (or 108); EPE 200 (or its equivalent).

EPE 413 Qualitative Analysis in Sport Biomechanics. (3)
spring
Develops 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)
fall
Muscular contributions to human movement, muscle mechanics, electrophysiological basis, and practical application of electromyography. Lecture, discussion. Prerequisites: EPE 335, 340; instructor approval.

EPE 444 Metabolic Adaptations to Exercise Training. (3)
fall, spring, summer
Examines physiologic adaptations to exercise training as they relate to metabolism and tissue functions. Prerequisite: EPE 340.

EPE 452 Exercise Psychology. (3)
spring
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)
spring
Research and theories on developing muscular strength; programs for developing muscular strength. Lecture, discussion. Prerequisites: EPE 335, 340.

EPE 500 Research Methods. (3)
fall
Introduces 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)
spring
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)
fall
Investigative techniques used in the applied exercise physiology laboratory. Emphasizes pulmonary function, body composition, and cardiorespiratory assessment. Lecture, lab. Fee. Prerequisite: EPE 340.

EPE 510 Introduction to Biomechanics Research Methods. (3)
fall
Applies 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. (3)
fall
Current research in sport psychology with an emphasis on performance enhancement. Includes questionnaire, psychophysiological, and behavioral research methods. Lecture, discussion. Prerequisites: EPE 448, 500.

EPE 521 Motor Development, Control, and Learning. (4)
spring
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)
spring
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)
fall
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)
spring
Physiological aspects of women engaging in physical activity. Emphasizes factors affecting performance and health throughout life. Prerequisite: EPE 340.

EPE 561 Administration of Athletics. (3)
selected semesters
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)
fall
Contemporary adapted, developmental, remedial, and corrective physical education programs; understanding of principles, problems, and recent developments in this area.

EPE 572 Trends and Issues in Physical Education. (3)
spring
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)
fall
Current curriculum and instruction practices and research in secondary school physical education. Prerequisite: ESPE major or teaching experience.

EPE 576 Physical Education for Elementary School Children. (3)
fall
Current practices and research pertaining to elementary school physical education programs.

EPE 578 Student Teaching in Secondary Schools. (6–12)
fall and spring
Practice of teaching. Relationship of theory and practice in teaching. Prerequisite: completion of all required course work (or its equivalent) prior to student teaching.

EPE 599 Thesis. (1–12)
selected semesters

EPE 610 Advanced Topics in Biomechanics. (3)
spring
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 621 Motor Learning/Control. (3)
fall
Discussion of contemporary research issues in motor learning and control. Includes behavioral and neurophysiological issues. Lecture, discussion. Prerequisite: EPE 521.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Family and Human Development

Master's Program

www.asu.edu/clas/fhd

480/965-6978

COWDN 106

Richard A. Fabes, Chair

Professors: Christopher, Fabes, Griffin, Hoover, Ladd, Martin, Roosa

Associate Professors: Boulin Johnson, Dumka, Wilson

Assistant Professors: Hanish, Liu, Madden-Derdich, Spinrad, Updegraff

Senior Lecturer: Weigand

Lecturer: Bodman

Students may pursue the M.S. degree in Family and Human Development with a concentration in family studies. Areas of study are available in child development and family relationships.

Students applying to this program are required to submit scores on the Graduate Record Examination (verbal and quantitative sections).

MASTER OF SCIENCE

Admission. Admission to the M.S. degree program in Family and Human Development 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 Master of Science 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. Applicants interested in the marriage and family therapy (MFT) specialization must indicate this on their application form. Evaluation of applicants includes a personal interview. Separate application and acceptance, including an interview, is required for admission to the MFT program.

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 or college, the program of study is submitted to the Graduate College for final approval. The following requirements must be met for the concentration.

Family Studies. Students complete the requirements for a master's in either child development or family relationships. 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. Typically, the MFT specialization is a three-year program.

Core Requirements. All students must take the following courses: FAS 500, FAS 531, CDE 531, CDE 534 or FAS 580; PSY 530; PSY 529 or FAS 580.

Child Development. The required courses are CDE 533 and six semester hours of CDE elective selected (with approval of the student's advisor). Six semester hours of thesis work is also required.

Family Relationships. The required courses are FAS 539 and six semester hours of FAS elective selected (with approval of the student's advisor). Six semester hours of thesis work is also required.

Thesis Requirements. A thesis is required.

Final Examinations. A final oral examination in defense of the thesis is required.

RESEARCH ACTIVITY

The research activities of the faculty and students in the Department of Family and Human Development (FHD) are

devoted to understanding and finding solutions to some of the most contemporary and critical problems faced by children and families. These topics include issues related to the effects of social and cultural environments on children and families; such as the effects of poverty, schooling, community violence, and child care.

In addition, FHD faculty research focuses on topics related to family and marital functioning. Specific areas include marital interaction, parenting and parent-child relationships, sexuality, dating relationships, family diversity, approaches to marital and family therapy, divorce, step families, and public policy. Research topics related to children, adolescents, and infants include the development of emotion, gender-role development, early intervention for children who are biologically or socially at risk, the factors that promote positive infant development, the causes and treatment of childhood autism, sibling and peer relationships, and how family relationships influence childhood development. Strong emphasis is placed on the acquisition of sophisticated theoretical, methodological, and statistical skills necessary to conduct and evaluate basic and applied research.

CHILD DEVELOPMENT (CDE)

CDE 430 Infant/Toddler Development in the Family. (3)
fall and spring
Examines the development of infants/toddlers, the socialization processes of families, and the interactions of these processes. Prerequisite: CDE 232 (or its equivalent).

CDE 437 Observational and Naturalistic Methods of Studying Children. (3)
selected semesters
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 in psychology.

CDE 444 Children and Poverty. (3)
fall
Impact that poverty has on children and their families. 2 hours lecture, 3 hours lab. Prerequisites: CDE 232 (or its equivalent); 6 hours in upper-division social sciences.

CDE 531 Theoretical Issues in Child Development. (3)
fall
Major developmental theories, related research, and their application to family interaction. Prerequisites: both CDE 430 and 437 (or their equivalents) or only instructor approval.

CDE 533 Research Issues in Child Development. (3)
spring
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)
spring
Integrates child development, family theory, and research to understand developmental problems and provide a foundation for intervention. Prerequisites: CDE 531; FAS 500.

CDE 634 Advanced Applied Child Development. (3)
spring
Advanced training in research and theory-based approaches to developing and evaluating prevention programs for children at risk. Prerequisite: CDE 534 or instructor approval.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 48.

FAMILY STUDIES (FAS)

FAS 431 Parent-Adolescent Relationships. (3)
fall
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)
selected semesters
Normative changes in families over time from formation until dissolution. Emphasizes the marital subsystem in middle and later years. Prerequisites: both CDE 232 and FAS 331 or only instructor approval.

FAS 435 Advanced Marriage and Family Relationships. (3)
fall and spring
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.

FAS 440 Fundamentals of Marriage and Family Therapy. (3)
fall and spring
Introduces the fundamental orientations of marriage and family therapy.

FAS 500 Research Methods. (4)
fall
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)
fall
Introduces major marriage and family therapy orientations. Reviews history, theory, application, and outcome research for each orientation. Prerequisite: admission to graduate program in Family and Human Development with a concentration in family studies or instructor approval.

FAS 531 Family Theory Development. (3)
spring
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)
fall
Critical review of current theory and empirical evidence connecting marital and family interaction patterns with aberrant behavior. Prerequisite: PGS 466 or PSY 573 (or its equivalent) or instructor approval.

FAS 537 Interpersonal Relationships. (3)
fall
Critical examination of current theoretical and research developments in the area of interpersonal relationships. Emphasizes applications for research and intervention. Prerequisite: FAS 435 (or its equivalent) or instructor approval.

FAS 538 Advanced Techniques in Marriage and Family Therapy. (3)
spring
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)
fall
Critical review of current and past research in the area of family dynamics. Emphasizes interactional processes within the family. Prerequisite: FAS 435 (or its equivalent) or instructor approval.

FAS 540 Assessment in Marriage and Family Therapy. (3)
spring
Assessment and outcome evaluation of couples and families involved in marital and family therapy. Lecture, lab. Prerequisites: FAS 500 (or its equivalent); PSY 530; instructor approval.

FAS 580 Marriage and Family Therapy Practicum. (1–12)
fall and spring
Supervised clinical experience in marriage and family therapy; includes development of assessment and outcome evaluation skills. Lecture, lab. Topics may include the following:
- First semester. (3)
- Second semester. (3)

• Third semester. (3)
Prerequisite: instructor approval.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Family Science

Doctoral Program

www.asu.edu/clas/fhd

480/965-6978

COWDN 106

Richard A. Fabes, Chair

Professors: Christopher, Fabes, Griffin, Hoover, Ladd, Martin, Roosa

Associate Professors: Boulin Johnson, Dumka, Wilson

Assistant Professors: Hanish, Liu, Madden-Derdich, Spinrad, Updegraff

The faculty in the Department of Family and Human Development offer a degree program leading to the Ph.D. degree in Family Science. Programs of study are available in child development and family studies. An area of concentration is available in marriage and family therapy (MFT).

DOCTOR OF PHILOSOPHY

The Ph.D. degree in Family Science prepares researchers in the fields of family processes, family relationships, and human development within the context of families. Students can receive advanced training in theory, clinical strategies (MFT), research methodology, and several substantive fields that are part of family and human sciences.

The program is designed to prepare graduates to assume leadership roles in public or privately funded mental health agencies, governmental posts, 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 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 semester hours (postbaccalaureate) is required in clinical supervision, practicum, and internship. The 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 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 collaborative arrangements with the ASU Prevention Intervention Research Center. The Department of Family 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.

COURSES

For courses, see listings under "Family and Human Development," page 215.

Fine Arts

COLLEGE OF FINE ARTS (CFA)

CFA 422 Concepts in Collaborative Multimedia. (3)
spring
Designed to bring students from different disciplines throughout the Herberger College of Fine Arts to experience the collaboration process in creating art. Lab, studio.

CFA 522 Concepts in Collaborative Multimedia. (3)
spring
Designed to bring students from different disciplines throughout the Herberger College of Fine Arts to experience the collaboration process in creating art. Lab, studio.

CFA 584 Internship. (1–12)
fall and spring

CFA 598 Special Topics. (1–4)
fall and spring

CFA 684 Internship. (1–12)
fall and spring

CFA 784 Internship. (1–12)
fall and spring

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 48.

French

See “Languages and Literatures,” page 245.

Geographic Information Science

Interdisciplinary Certificate Program

www.asu.edu/giscert
480/965-3414
LSE 218
480/727-1288
AGB2 114

John Briggs, Director, Executive Committee
William Miller, Director, Executive Committee

Geography
Professor: Burns
Assistant Professor: Wentz

Planning and Landscape Architecture
Associate Professor: Guhathakurta
Assistant Professor: Musacchio

Plant Biology
Professor: Klopatek

Public Affairs
Associate Professor: Briggs
Assistant Professor: DeLorenzo

Under the auspices of the Graduate College, the interdisciplinary certificate program in Geographic Information Science (GIS) is administered by an Executive Committee. The objective of this program is to enable existing ASU graduate students and GIS professionals with advanced degrees to learn how to apply GIS concepts and technology for the purposes of spatial analysis.

A minimum of 16 semester hours consisting of three required and two elective courses (three semester hours each) plus a capstone seminar (one semester hour) is required to complete the GIS Certificate. For a full description of the program course work, access the GIS Web site at www.asu.edu/giscert.

Current graduate students receive priority admission to the certificate program. Students qualify for admission to the certificate program by maintaining good standing in a cooperating department and completing an application specific to the GIS Certificate. Practicing professionals who already hold a graduate degree furnish proof of an advanced degree by a formal transcript and enroll as nondegree graduate students through the Graduate College. Prospective students must complete prerequisites listed for the level one required course, or pass a proficiency test.

Geography

Master’s and Doctoral Programs

geography.asu.edu
480/965-7533
SCOB 330

Breandán Ó hUallacháin, Chair

Professors: Arreola, Balling, Brazel, Burns, Cerveny, Dorn, Gober, Ó hUallacháin, Pasqualetti, Zehnder

Associate Professors: Fall, Kuby, McHugh

Assistant Professors: Edsall, Ellis, Li, Wentz

Lecturer: Shaeffer

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 181, 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 semester 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 Recruiting and Admissions Committee and the chair of the Department of Geography. 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
GCU	585	Advanced Research Methods in Geography 3
GCU	591	Seminar ..... 3 or GPH 591 Seminar (3) or graduate 500-level course in geography (3)
GCU	599	Thesis ..... 6 or GPH 599 Thesis (6)
Total		 15

The remaining 15 semester 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 96, 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

1. GCU 529;
2. GCU 585;
3. and two three-semester-hour seminars (GCU 591 or GPH 591) or graduate courses (500-level) in geography.

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.

CULTURAL GEOGRAPHY (GCU)

GCU 414 Teaching Geography Standards. (3)
fall and summer
Introduces Arizona Geography Standards for K–12 educators, emphasizing exciting curricula and illustrated with best practices by master teachers. Internet.

GCU 421 Geography of Arizona and Southwestern United States. (3)
fall and spring
Geography of the Southwest with an emphasis on Arizona. Divided into physical geography, history, people, and economy.

GCU 423 Geography of South America. (3)
selected semesters
Prerequisite: GCU 323 or instructor approval.

GCU 424 Geography of Mexico and Middle America. (3)
once a year
Central America and Mexico. Prerequisite: GCU 323 or instructor approval.

GCU 425 Geography of the Mexican American Borderland. (3)
spring
Geography of a binational and bicultural region. Examines settlement, boundary issues, ethnic subregions, population change, industrial development, and urban growth. Field trip. Fee.

GCU 426 Geography of Russia and Surroundings. (3)
selected semesters
Examines the geography of Russia and other post-Soviet states. Prerequisite: GCU 121 or instructor approval.

GCU 433 Geography of Southeast Asia. (3)
spring
Examines the biophysical and social features of Southeast Asian nations and peoples. Prerequisite: GCU 326 or instructor approval.

GCU 441 Economic Geography. (3)
once a year
Spatial distribution of primary, secondary, and tertiary economic and production activities. Prerequisite: GCU 141 or instructor approval.

GCU 442 Geographical Analysis of Transportation. (3)
fall
Networks, modes, economics, and flows at the urban, national, and international scales. Prerequisite: GCU 141 or 441.

GCU 444 Geographic Studies in Urban Transportation. (3)
spring
Current urban transportation issues in metropolitan Phoenix. Lecture, team project. Prerequisite: GCU 361.

GCU 453 Recreational Geography. (3)
selected semesters
Examines problems surrounding the organization and use of space for recreation. Introduces geographic field survey methods of data collection and analysis. Possible Saturday field trips.

GCU 455 Historical Geography of U.S. and Canada. (3)
selected semesters
Geographical perspective on the evolution of the United States and Canada from pre-Columbian times to early 20th century.

GCU 474 Public Land Policy. (3)
selected semesters
Geographic aspects of federal public lands, policy, management, and issues. Emphasizes western wilderness and resource development problems.

GCU 495 Quantitative Methods in Geography. (3)
fall and spring
Statistical techniques applied to the analysis of spatial distributions and relationships. Introduces models and theory in geography. Prerequisite: MAT 119.

GCU 496 Geographic Research Methods. (3)
fall and spring
Scientific techniques used in geographic research. Prerequisites: GCU 495; GPH 371, 491.

GCU 515 Human Migration. (3)
fall
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)
selected semesters
Determination, classification, and analysis of spatial variations in land-use patterns. Examines the processes affecting land-use change. Prerequisite: 15 hours in geography or instructor approval.

GCU 529 Contemporary Geographic Thought. (3)
fall
Comparative evaluation of current philosophy concerning the nature and trends of geography. Prerequisites: 15 hours in geography; instructor approval.

GCU 585 Advanced Research Methods in Geography. (3)
spring
Specialized research techniques and methodologies in economic, political, or cultural geography.

GCU 591 Seminar. (1–3)
fall, spring, summer
Selected topics in economic, political, or cultural geography. Possible field trips. Topics may include the following:
- Transportation Systems Pro-Seminar
- Urban Geographic Information Systems

GCU 596 History of Geographic Thought. (3)
selected semesters
Historical development of geographic thought from pre-Greek days to the early 20th century.

GCU 598 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Geography of the Mexican American Borderland. (3) Fee.

GCU 599 Thesis. (6)
fall and spring

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 48.

PHYSICAL GEOGRAPHY (GPH)

GPH 401 Topics in Physical Geography. (1–3)
once a year
Open to students qualified to pursue independent studies. Possible field trips. Prerequisite: instructor approval.

GPH 405 Energy and Environment. (3)
spring
Sources, regulatory and technical controls, distribution, and consequences of the supply and human use of energy. Prerequisite: a course in physical or life sciences or instructor approval.

GPH 409 Synoptic Meteorology I. (4)
fall
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)
spring
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)
once a year
Introduces physiography and the physical elements of the environment. Credit is allowed for only GPH 411 or 111. Field trips.

GPH 412 Physical Climatology. (3)
once a year
Physical processes in the earth-atmosphere system on regional and global scales; concepts and analysis of energy, momentum, and mass balances. Prerequisites: both GPH 212 and 213 or only instructor approval.

GPH 413 Meteorological Instruments and Measurement. (3)
once a year
Design and operation of ground-base and aerological weather measurement systems. Collection, reduction, storage, retrieval, and analysis of data. Field trips. Prerequisites: both GPH 212 and 213 or only instructor approval.

GPH 414 Climate Change. (3)
spring
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)
once a year
Studies 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. Fee. Prerequisites: GPH 211 (or its equivalent); a General Studies L course.

GPH 422 Plant Geography. (3)
selected semesters
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. Prerequisites: preferably both PLB 200 and 201 or only BIO 187 or only GPH 111.

GPH 433 Alpine and Arctic Environments. (3)
selected semesters
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. Prerequisite: GPH 111 or instructor approval.

GPH 471 Geographics: Interactive and Animated Cartography and Geovisualization. (3)
selected semesters
Advanced cartography, stressing influence and application of the computer on geographic representation. Emphasizes creation of maps for the Internet. Lecture, lab. Prerequisites: GPH 371 or instructor approval.

GPH 473 Geographic Information Science II. (3)
fall
GIS as a basis for microcomputer spatial analysis and synthesis. Includes digitizing, database organization, spatial retrieval, and graphics. Lecture, lab. Prerequisites: GPH 373 (or instructor approval); CSE 100.

GPH 474 Dynamic Meteorology I. (3)
fall
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)
spring
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)
once a year
Problems of environmental quality, including uses of spatial analysis, research design, and field work in urban and rural systems. Field trips. Prerequisite: instructor approval.

GPH 483 Geographic Information Analysis. (3)
fall
Basics of spatial data analysis. Topics include point pattern analysis, spatial autocorrelation, spatial regression, and kriging. Lecture, lab. Prerequisites: both one 200-level or above course in geography or biology or plant biology or geology or planning and one basic statistics course (GCU 495).

GPH 491 Geographic Field Methods. (3)
spring and summer
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. Fee. Prerequisites: GCU 102, 121; GPH 111.

GPH 494 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Geographic Information Analysis

GPH 511 Fluvial Processes. (3)
once a year
Geographical aspects of processes of river erosion, transportation, sedimentation: emphasizing spatial characteristics of forces, resistance, landforms, sediment; includes computer applications. Prerequisites: both GPH 111 (or GLG 101) and 211 (or GLG 362) or only instructor approval.

GPH 533 Snow and Ice. (3)
spring
Processes, distribution, climatic interactions of snow/ice emphasizing mass balance, snow stratigraphy/metamorphism and glacier/snowpack climatology. Lecture, field work. Prerequisite: instructor approval.

GPH 573 Geographic Information Science III. (3)
spring
In-depth look at programming within GIS. Focuses on programming and methodology, utilizing specific software, and basic scientific computing. Lecture, lab. Prerequisite: GPH 473 or instructor approval.

GPH 575 Geographic Applications of Remote Sensing. (3)
selected semesters
Uses 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. Prerequisites: GCU 585 (or GPH 491); GPH 372.

GPH 591 Seminar. (1–3)
fall and spring
Selected topics in physical geography. Possible field trips.

GPH 596 Advanced Spatial Statistics. (3)
spring
Multivariate and advanced statistical techniques including Box-Jenkins modeling and spectral analysis. Requires project papers and presentations. Seminar. Prerequisite: GCU 495 (or its equivalent).

GPH 598 Special Topics. (1–4)
selected semesters
Topics may include the following:
- Intermediate Geographic Information Systems

GPH 599 Thesis. (6)
fall and spring

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Geological Sciences

Master's and Doctoral Programs

geology.asu.edu
480/965-5081
PS F686

Simon M. Peacock, Chair

Regents' Professors: Buseck, Greeley, Moore

Professors: Burt, Christensen, Farmer, Fink, Holloway, Knauth, Peacock, Reynolds, Shock, Stump, Tyburczy, Williams

Associate Professors: Arrowsmith, Leshin, O'Day, Sharp

Assistant Professors: Fouch, Garnero

The faculty in the Department of Geological Sciences offer graduate programs leading to the M.S. and Ph.D. degrees in Geological Sciences.

Students admitted to the Master of Education degree program in Secondary Education may also elect geological sciences as the subject matter field. See "Master of Education," page 181, 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 geological sciences. See "Natural Science," page 279, 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. The deadline for applications for the fall term is December 15.

FIELD CAMP REQUIREMENT FOR M.S. AND PH.D. STUDENTS

All Geological Sciences graduate students must have completed the equivalent of the department's six-semester-hour GLG 451 Field Geology I and 452 Field Geology II sequence. 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 geological sciences 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 Geological Sciences 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 geological sciences courses; the remainder may include work either in geological sciences 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 semester 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 96, for general requirements.

Breadth Requirement. All students must demonstrate breadth in Geological Sciences 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 semester 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; environmental and aqueous geochemistry; geochemistry and microbiology of hydrothermal systems; paleoclimate records; thermodynamics of fluid-mineral interfaces; synchrotron-based X-ray spectroscopies; secondary ion mass spectrometry; 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. Seismology; mantle anisotropy; core-mantle boundary region; geodynamics, mantle flow and rheology; seismotectonics; earthquake surface rupture and paleoseismology; environmental geophysics; high pressure experimental geophysics; mantle structure; physics and chemistry of earth and planetary interiors; thermal modeling of subduction zones.

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.

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.

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.

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.

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; micro- and isotopic analysis of meteorites and planetary materials.

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.

For details about the most current research activity, see the Geological Sciences Web site at geology.asu.edu.

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 Geological Sciences, 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 Geological Sciences 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 (≤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 Geological Sciences 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.

GEOLOGICAL SCIENCES (GLG)

GLG 405 Geology of the Moon. (3)
selected semesters
Current theories of the origin and evolution of the moon through photogeological analyses and consideration of geochemical and geophysical constraints. Possible field trips to examine Arizona geology. Fee. Prerequisite: GLG 105 or instructor approval.

GLG 406 Geology of Mars. (3)
selected semesters
Geological evolution of Mars through analyses of spacecraft data, theoretical modeling, and study of terrestrial analogs; emphasizes current work. Possible field trips to examine Arizona geology. Fee. Prerequisite: GLG 105 or instructor approval.

GLG 410 Computers in Geology. (3)
fall
Geological computer skills including data processing, visualization, presentation, numerical analysis, software and hardware applications. 2 hours lecture, 3 hours lab. Prerequisites: both GLG 101 and an upper-division course in geology or only instructor approval.

GLG 412 Geotectonics. (3)
selected semesters
Earthquakes, earth's interior, formation of oceanic and continental crust, and plate tectonics. Emphasizes current work. Prerequisite: GLG 310.

GLG 416 Field Geophysics. (3)
spring
Methods of applied geophysical exploration; seismic refraction, gravity, electrical resistivity, geomagnetics. Includes survey planning, data acquisition, processing, analysis, and interpretation. Lecture, field exercises. Prerequisite: a course in geology or instructor approval.

GLG 418 Geophysics. (3)
fall
Solid earth geophysics; geomagnetism, gravity, seismology, heat flow. Emphasizes crust and upper mantle. Prerequisites: a combination of GLG 310 and MAT 272 and PHY 131 or only instructor approval.

GLG 419 Geodynamics. (3)
selected semesters
Emphasizes application of continuum principles to geological problems, including lithospheric stresses, heat transfer, fluid mechanics, and rock rheology. Prerequisite: PHY 131.

GLG 420 Volcanology. (3)
once a year
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. Fee. Prerequisite: GLG 424.

GLG 424 Petrology. (3)
fall
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. Fee. Prerequisite: GLG 321.

GLG 435 Sedimentology. (3)
spring
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. Fee. Prerequisites: GLG 102, 321.

GLG 441 Ore Deposits. (3)
selected semesters
Origin, occurrence, structure, and mineralogy of ore deposits. Possible weekend field trips. Fee. Prerequisite: GLG 424 or instructor approval.

GLG 451 Field Geology I. (3)
spring
Geological mapping techniques using topographic maps and aerial photos. Intensive field-based instruction. Lab. Prerequisites: GLG 310, 321.

GLG 452 Field Geology II. (3)
summer
Continuation of GLG 451. Lab. Prerequisite: GLG 451.

GLG 455 Advanced Field Geology. (3–4)
once a year
Geologic mapping in igneous, sedimentary, and metamorphic terrains of the Basin and Range province of Arizona. May be repeated for credit. Weekend field trips. Fee. Prerequisite: instructor approval.

GLG 456 Cordilleran Regional Geology. (3)
selected semesters
Systematic coverage through space and time of the geological development of western North America, emphasizing the western United States. Fee. Prerequisite: senior major or graduate student in Geological Sciences or instructor approval.

GLG 461 Geomicrobiology. (3)
spring
Past and present interactions among microbial life, geological materials, and biogeochemical cycles involving carbon, sulfur, phosphate, nitrogen, and minerals. Cross-listed as MIC 461. Credit is allowed for only GLG 461 or MIC 461. Prerequisites: introductory courses in chemistry and microbiology (or geological sciences); instructor approval.

GLG 470 Hydrogeology. (3)
spring
Geology of groundwater occurrence, aquifer and well hydraulics, water chemistry and quality, contaminant transport, remediation. Emphasizes quantitative methods. Prerequisites: GLG 101 (or 103); MAT 270; PHY 121.

GLG 481 Geochemistry. (3)
spring
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 346) or GLG 321.

GLG 485 Meteorites and Cosmochemistry. (3)
selected semesters
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)
fall, spring, summer
Special topics in a range of fields in geology. May be repeated for credit. Fee. Prerequisite: instructor approval.

GLG 500 Geology Colloquium. (1)
fall and spring
Presentation of recent research by faculty and invited guests. 1 semester required for all Geological Sciences graduate students. May be repeated for a total of 2 semester hours. Requires research paper. Prerequisite: instructor approval.

GLG 501 Geology of Arizona. (3)
once a year
Basic and historical geology, fossils, mining, energy resources, environmental problems, landscape development, and meteorites, cast in examples from Arizona. Requires research paper.

GLG 504 Geology of the Grand Canyon. (2)
selected semesters
Reviews the discovery, history, origin, and geology of the Grand Canyon of the Colorado River in Arizona. Requires 6-day field trip down the river (first 6 days after commencement in May) at student's expense. Requires field research and term paper on trip.

GLG 510 Advanced Structural Geology. (3)
selected semesters
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. Fee. Prerequisites: both GLG 310 and 424 or only instructor approval.

GLG 520 Advanced Physical Volcanology. (2–3)
selected semesters
Selected volcanologic topics, including explosive eruption processes, lava flow mechanics, and intrusive mechanisms. Possible field trips. Fee. Prerequisite: GLG 420 or instructor approval.

GLG 524 Advanced Igneous Petrology. (3)
selected semesters
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. Fee. Prerequisite: GLG 424.

GLG 581 Isotope Geochemistry. (3)
selected semesters
Geochemistry and cosmochemistry of stable and radioactive isotopes; geochronology; isotope equilibria. Prerequisite: instructor approval.

GLG 582 Physical Geochemistry. (3)
selected semesters
Applies thermodynamic and kinetic principles to geochemical processes. Prerequisite: CHM 341 (or 346) or GLG 321.

GLG 591 Seminar. (1–3)
fall, spring, summer
Topics in a range of fields in geology. May be repeated for credit. Fee. Prerequisite: instructor approval.

GLG 592 Research. (1–12)
fall, spring, summer

GLG 598 Special Topics. (1–4)
fall, spring, summer
Special topics in geological sciences. May be repeated for credit. Topics may include the following:
- Advanced Field Geology. (1–3)
  Fee.
- Clastic Sedimentology and Petrology. (1–3)
  Fee.
- Cordilleran Regional Geology. (1–3)
  Fee.
- Fundamental Planetary Geology. (1–3)
- Geology of Mars. (1–3)
  Fee.
- Methods in Geoscience Teaching. (1–3)
- Ore Deposits. (1–3)
  Fee.
- Orogenic Systems. (1–3)
- Petrology-Petrography. (1–3)
  Fee.
- Principles of Stratigraphy. (1–3)
  Fee.
- Remote Sensing. (1–3)
- Sedimentology. (1–3)
  Fee.
- Volcanology. (1–3)
  Fee.

Prerequisite: instructor approval.

GLG 599 Thesis. (1–12)
fall, spring, summer

GLG 792 Research. (1–12)
fall, spring, summer
GLG 799 Dissertation. (1–15)
fall, spring, summer
Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

German

See "Languages and Literatures," page 245.

Gerontology

Interdisciplinary Certificate Program

ASU Main

www.asu.edu/graduate/gerontology
480/965-3225
WHALL 116

ASU West

www.west.asu.edu/chs/grn
602/543-6642
FAB S170

William E. Arnold, Director, ASU Main

Anthropology
Professor: Carr

Communication
Professor: Arnold

Design
Associate Professor: Cutler

Economics
Professor: Hogan

English
Professor: Kehl

Exercise Science and Physical Education
Regents' Professor: Landers
Professor: Stelmach
Assistant Professor: Etnier

Exercise and Wellness (ASU East)
Professor: Corbin
Associate Professor: Swan
Assistant Professor: Phillips

Family and Human Development
Professor: Hoover

Geography
Associate Professor: McHugh

Health Administration and Policy
Professor: Schneller

History
Professor: Gratton

Marketing
Associate Professor: Stephens

Music
Professor: Crowe
Assistant Professor: Rio

Nursing
Professor: Gale
Associate Professors: Killeen, Komnenich, McCarthy

Nutrition (ASU East)
Professors: Manore, Vaughan

Psychology
Professors: Karoly, Okun, Reich, Sadalla, Zautra
Associate Professor: Leshowitz

Psychology in Education
Professor: Strom

Sociology
Professors: Kronenfeld, Kulis
Associate Professors: Blair, Keith, Miller-Loessi, Sullivan

Janet H. Shirreffs, Director, ASU West

Communication Studies
Associate Professor: Waldron

Education
Professor: Harris
Associate Professor: Achilles

Psychology
Professor: McGovern
Associate Professor: Náñez
Assistant Professor: Burleson

Recreation and Tourism Management
Professors: Gitelson, Knopf, Searle, Shirreffs

Social Work
Professor: Brawley
Associate Professor: Fitzpatrick
Visiting Assistant Professor: McCabe

Sociology
Assistant Professor: Carter
Senior Lecturer: Luken

An interdisciplinary, 21-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 nondegree 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, call 480/965-3225. Additional information about the ASU West program is available by calling 602/543-6642.

GERONTOLOGY (GRN)

ASU Main

GRN 430 Multidisciplinary Approaches to Gerontology. (3)
once a year
Examines literature that each discipline brings to the study of gerontology. Covers both theory and practice. Lecture, discussion.

GRN 431 Caregiving. (3)
once a year
Examines theory and practice of caregiving for the senior population. Lecture, discussion.

GRN 440 Aging and Wellness. (3)
fall and spring
One-on-one service/experiential learning with seniors from the community. May be repeated for credit. Lecture, lab.

GRN 450 Biology of Aging. (3)
spring
Examines normal biological aging and changes in the functional capabilities in the elderly. Lecture, lab.

GRN 460 Alzheimer's and Related Dementias. (3)
fall and spring
Familiarization with Alzheimer's disease and related dementias from a caregiver's perspective. Lecture, lab.

GRN 484 Undergraduate Internship. (3–6)
fall, spring, summer

GRN 494 ST: Undergraduate Special Topics. (3)
fall and spring

GRN 498 PS: Undergraduate Pro-Seminar. (3)
spring

GRN 499 Undergraduate Individualized Instruction. (3)
fall, spring, summer

GRN 530 Multidisciplinary Approaches to Gerontology. (3)
once a year
Examines literature that each discipline brings to the study of gerontology. Covers both theory and practice. Lecture, discussion.

GRN 531 Caregiving. (3)
once a year
Examines theory and practice of caregiving for the senior population. Lecture, discussion.

GRN 540 Aging and Wellness. (3)
fall and spring
One-on-one service/experiential learning with seniors from the community. Lecture, lab. Cross-listed as SWG 517. Credit is allowed for only GRN 540 or SWG 517.

GRN 550 Biology of Aging. (3)
spring
Examines normal biological aging and changes in the functional capabilities in the elderly. Lecture, lab.

GRN 560 Alzheimer's and Related Dementias. (3)
fall and spring
Familiarization with Alzheimer's disease and related dementias from a caregiver's perspective. Lecture, lab.

GRN 584 Graduate Internship. (3–6)
fall, spring, summer

GRN 590 Graduate Reading and Conference. (3)
fall, spring, summer

GRN 591 Graduate Seminar. (1–6)
fall and spring

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

Health Services Administration

Master's Program

www.cob.asu.edu//mba/day_mhsa/mhsa_info.cfm

480/965-7778

BA 318

Eugene S. Schneller, Director

Professors: Forsyth, Johnson, Kirkman-Liff, Schneller

Assistant Professor: Rivers

The faculty in the School of Health Administration and Policy, College of Business, offer a graduate program leading to the Master of Health Services Administration degree. This degree is offered only in conjunction with the ASU M.B.A.

MASTER OF HEALTH SERVICES ADMINISTRATION

The ASU M.B.A/M.H.S.A. is a concurrent degree program structured to prepare students to become managers and leaders in contemporary health-related industries and systems. The curriculum is designed to equip graduates with knowledge of the broad continuum of healthcare products and services, advanced managerial knowledge and analytical skills, as well as in-depth preparation in one of the four ASU M.B.A. areas of study: financial management and markets, information management, services marketing and management, and supply chain management. Students graduate from this program prepared to assume advanced leadership roles in a wide range of settings, including biotechnology corporations, consulting firms, delivery systems, health financing, health information organizations, and pharmaceutical industry. This preparation consists of the core ASU M.B.A. curriculum, a series of eight M.H.S.A. courses, a summer internship, and one of the ASU M.B.A. areas of study.

Admission. Applications should be submitted online. For the general requirements, see "Admission to the Graduate College," page 84. Applicants are required to submit evidence of their ability to pursue a graduate degree program in

The university's first six McNair scholars were named in 2001. In addition to a three-year research or teaching assistantship provided by the academic unit, this fellowship includes a $5,000 per year stipend enhancement for three years, resident/nonresident tuition waiver for three years, and an additional $5,000 to be split across the first two summers. Dennis Durband photo

health services administration successfully. All students must take the GMAT. For more information, call 609/921-9000, send e-mail to etsinfo@ets.org, or write

EDUCATIONAL TESTING SERVICE
ROSEDALE ROAD
PRINCETON NJ 08541-6108

Students must apply separately to the ASU M.B.A. and M.H.S.A. degree programs. Applicants must submit two applications for admission and two copies of all transcripts directly to the Graduate College. Two recommendations commenting on the student's motivation, commitment, achievements, work experience, and opportunity for success in the program are required. The application package includes the M.B.A. supplemental application, which contains a box that must be checked, indicating your interest in the M.H.S.A. degree program. In addition, applicants are required to submit a statement of personal objectives and professional interest statement that reflects your interest in health-related industries and systems. Students should identify their preliminary interest in one of the four M.B.A. specialization areas. Because the ASU M.B.A./M.H.S.A. program begins in early June, preference for admission and financial assistance will be given to applicants applying by the March 1. It is recommended 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. Materials describing the Master of Health Services Administration are available by calling 480/965-7778, accessing the Web site at www.cob.asu.edu/mba/asu_mba_day.cfm, sending e-mail to asuhap@asu.edu, or writing

SCHOOL OF HEALTH ADMINISTRATION AND POLICY
COLLEGE OF BUSINESS
ARIZONA STATE UNIVERSITY
PO BOX 874506
TEMPE AZ 85287-4506

Program of Study. The program of study for the concurrent ASU M.B.A./M.H.S.A. consists of a minimum of 72 semester hours. The total amount of semester hours a student is required to take is dependent upon his or her choice of ASU M.B.A. specialization area.

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).

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 a calculus course (MAT 210).

Foreign Language Requirements. None.

Comprehensive Examinations. All students must successfully complete the integrative seminar, which meets the comprehensive requirement established by the College of Business and Graduate College for the M.H.S.A. degree.

Thesis Requirements. None.

HEALTH SERVICES ADMINISTRATION (HSA)

HSA 502 Health Care Organization. (3)
once a year
Concepts, structures, functions, and values which characterize contemporary health care systems in the United States.

HSA 505 Managerial and Population Epidemiology. (3)
once a year
Quantitative tools to make health care management decisions including biostatistics, epidemiology, and cost-effectiveness analysis. Prerequisite: HSA 561 or a course in basic statistics.

HSA 512 Health Care Economics. (3)
once a year
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)
once a year
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)
once a year
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)
once a year
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 540 Health Care Outcomes. (3)
once a year
Project-oriented course on application of efficiency-based methods for the evaluation of the outcomes of health care. Seminar, individual student research. Prerequisite: HSA 512 or enrollment in Ph.D. program.

HSA 542 Health Care Jurisprudence. (3)
once a year
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)
fall and spring
Introduces organizational theory and management of complex organizations within the historical and contemporary contexts of the U.S. public health.

HSA 561 Biostatistics. (3)
fall
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)
once a year
Functional relationships among managerial elements of health care institutions with major focus on hospital governance and policy dynamics.

HSA 563 Economics for Public Health Management. (3)
fall
Introduces concepts and methods used to direct and understand production and distribution of health care services.

HSA 564 Health Care Finance. (3)
once a year
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)
once a year
Current policy issues in health through concepts of access, cost, and quality; issues relating to disease trends and policy formulation.

HSA 566 Basic Principles of Epidemiology. (3)
spring
Basic principles of epidemiology, evaluation of etiology, natural history, intervention therapy, and disease prevention. Lecture, lab. Prerequisite: Master of Public Health major or instructor approval.

HSA 571 Managed Care. (3)
selected semesters
Trends in managed care/integrated systems, complexities of balancing objectives (e.g., financial and quality). A two-semester-long marketplace simulation. Prerequisite: HSA 502.

HSA 573 Comparative Health Systems. (3)
once a year
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)
selected semesters
Management of long-term care services and facilities, including behavioral health and rehabilitation programs.

HSA 589 Integrative Seminar. (3)
fall, spring, summer
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. (1–12)
once a year
Topics may include the following:
- Behavioral Health. (3)
- Cost Containment and Quality Assurance. (3)
- Health Care Economic Outcomes. (3)
- Health Care Policy. (3)
- Managing Physicians. (3)
- Topics in Health Services Research. (3)

HSA 593 Applied Project. (3)
fall, spring, summer
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 Special Topics. (1–4)
once a year
Topics may include the following:
- Epidemiology. (3)

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 48.

Higher and Postsecondary Education

Master's and Doctoral Programs

coe.asu.edu/elps
480/727-7083
ED 138A

Gary R. Hanson, Academic Program Coordinator

Professors: Fenske, Hanson, Turner, Valverde, Webb

Associate Professors: Hartwell-Hunnicutt, Rund, Wilkinson

Research Professor: de los Santos

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.

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. Preapproval 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 185. See "Doctor of Philosophy," page 96, 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 181.

DOCTOR OF EDUCATION

Applicants for admission to the Doctor of Education program must submit scores on the GRE.

See "Doctor of Education," page 182, for information on the Doctor of Education degree.

RESEARCH ACTIVITY

Current faculty research includes a focus on the impact of affirmative action policies on student recruitment, enrollment, and retention; equity and access for students of color within the educational system; minorities as research subjects in higher education; student financial aid policies; hiring policies and diversity; and K–16 reform policy.

HIGHER AND POSTSECONDARY EDUCATION (HED)

HED 510 Introduction to Higher Education. (3)
fall
Overview of American higher education, including philosophical, political, and social aspects.

HED 515 Student Diversity in Higher Education. (3)
spring
Introduces the demographic profile of college students and addresses diverse students' access, retention, and graduation. Lecture, collaborative learning.

HED 527 Seminar: Student Affairs Administration. (3)
fall
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)
fall and spring
History, functions, organization, and current issues. Meets Arizona community college course requirement for certification.

HED 602 Institutional Research/Strategic Planning. (3)
fall
Provides an overview of policy research and planning in higher education at the campus system and governing/coordinating agency levels. Lecture, group discussion, research projects. Prerequisite: HED 510.

HED 603 Computer-Assisted Qualitative Data Analysis. (3)
spring
Emphasizes the applied and computing aspects of qualitative research design, data analysis, and reporting of results. Lecture, lab, demonstrations. Prerequisite: COE 503 (or its equivalent).

HED 611 Curriculum and Instruction. (3)
spring
Curriculum development, instructional organization, and improvement of instruction in higher education. Prerequisite: HED 510.

HED 644 Higher Education Finance and Budgeting. (3)
spring
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)
fall
Analyzes legal issues related to higher education; examines key court decisions. Prerequisite: HED 510.

HED 679 The American College Student. (3)
spring
Overview of American college student from demographic, background characteristics, and values/attitudes/perspectives. Includes access, persistence, and degree completion. Lecture, group discussion, research projects. Cross-listed as CED 656. Credit is allowed for only CED 656 or HED 679.

HED 687 Governance, Coordination, and External Influences in Higher Education. (3)
spring in odd years
Study of governance and coordination in higher education systems and the impact of external forces on them. Lecture, discussion.

HED 688 Organizational Theory. (3)
spring
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)
fall
Theory and practice of leadership and administration in higher education institutions.

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see "Omnibus Courses," page 48.

History

Master's and Doctoral Programs

www.asu.edu/clas/history/graduate/graduate.html

480/965-5778

SS 204

Noel J. Stowe, Chair

CORE FACULTY

Regents' Professor: Iverson

Professors: Adelson, Batalden, Burg, Davis, Fuchs, Giffin, Gratton, Green, Kleinfeld, Lavrin, Luckingham, MacKinnon, Rosales, Simpson, Stowe, Tambs, Tillman, Trennert, Warnicke

Associate Professors: Barnes, Carroll, Gray, Gullett, Hendricks, Kahn, Longley, Rush, Samuelson, Smith, Soergel, Stoner, Thornton, VanderMeer, Warren-Findley

Assistant Professors: Koopmans, Manchester, Thompson, Wilson

Senior Instructional Professional: Luey

AFFILIATED FACULTY

Biology
Professor: Pyne

Chicana and Chicano Studies
Associate Professor: Escobar

Women's Studies
Professor: Rothschild

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 the public sector, or in business, and those now holding or looking for educational posts in elementary and secondary schools and community colleges.

Students admitted to the Master of Education (M.Ed.) degree program with a major in Secondary Education may elect history as the subject matter field.

MASTER OF ARTS

See "Master's Degrees," page 93, for general requirements.

Admission. Applications for the master's program must be accompanied by the applicant's scores on the Graduate Record Examination (GRE); three letters of recommendation from faculty members or others who are qualified to judge the applicant's potential for advanced study in history; a résumé; a writing sample; and a statement of purpose.

Forms and instructions for filling them out are available from the graduate administrative assistant, the Graduate College Web site (www.asu.edu/graduate) and the Department of History Web site (www.asu.edu/clas/history). M.Ed. applicants must submit scores from both the GRE aptitude and advanced history tests. For M.Ed. program requirements, see "M.Ed. Degree in Secondary Education," page 231.

All applications and supporting materials are reviewed by the graduate committee of the department. The committee 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, public history, United States, and U.S. Western. For information on the concentration in public history, see "Public History Concentration," page 231. Under the United States concentration, students may choose to specialize in a variety of areas; some examples are African-American, American Indian, Chicana/Chicano, and women.

Program of Study

M.A. Degree in History. A minimum of 30 semester hours of graduate course work are required for the M.A. in History. Upon matriculation, the student, in consultation with the graduate director, selects a faculty advisor in the student's area of concentration. The faculty advisor directs the student toward completion of required course work. The 30 semester hours must conform to the following guidelines:

ASU President Lattie Coor officially opens Graduate and Professional Student Appreciation Week on the ASU Main campus.

Dennis Durband photo

1. At least 24 semester hours of course work in history is required. With the approval of the supervisory committee, candidates may add to the 24 semester hours, six semester hours of closely related course work in another academic unit (this does not apply to students in the public history concentration).
2. Eighteen of the 24 semester hours must be in 500-level history courses. 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 graduate administrative assistant for details.
3. Six of the 18 semester hours must be in comparative courses (HST 551 to HST 555). This requirement does not apply to students with a concentration in public history.
4. At least three of the 24 semester hours must be in HST 591 Seminar (in the major field of study).
5. At least six semester hours of HST 599 Thesis are required of students writing an M.A. thesis. The thesis equivalent substitutes six semester hours of HST 592 in place of six semester hours of HST 599 and incorporates an additional three semester hours of HST 591 into the program.

Public History Concentration. Candidates admitted to the M.A. degree in History with a concentration in public history select two areas of emphasis, one of which is public history, and must complete HST 502 and at least two short courses (of one semester hour each). Beyond these requirements, each of the six emphases within public history has other specific requirements, which are listed in the department's graduate handbook. The following is a list of the differing minimum number of semester hours for a degree in each of the six emphases: 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 of the department for inclusion in the program of study must be approved in advance by the appropriate program director.

M.Ed. Degree in Secondary Education. Candidates for the M.Ed. degree in Secondary Education with an emphasis in history must complete 15 semester hours of history course work. Three of the 15 semester hours must be in historiographic survey (HST 512 to HST 515). Three of the 15 semester hours must be in either comparative courses (HST 551 to HST 555) or a research seminar (HST 591). Overall, 12 of the 15 semester hours must be in 500-level history courses. 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. All candidates for the M.Ed. must maintain at least a 3.00 G.P.A. in HST 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 master's thesis or its equivalent is required. Students have two options: They can either write an M.A. thesis or take the M.A. thesis equivalent. The M.A. thesis is approximately 100 pages in length and is based on original research. Students who choose this option must enroll for six semester hours of thesis work (HST 599).

The M.A. thesis equivalency is composed of two parts: (1) two three semester hour seminars (HST 591) on a broad topic and (2) two three semester hour research courses (HST 592) on a topic derived from the first research course.

Both the M.A. thesis and the M.A. thesis equivalent must be prepared according to Graduate College requirements, and defended, and approved by a thesis committee. Bound copies of both are placed in Hayden Library and the Department of History.

Final Examinations. A final oral defense of the thesis or the thesis 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 96, for general requirements.

Admission. Applications for the Ph.D. degree in History 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, a résumé, and a statement of purpose. Applications and supporting materials are reviewed by the graduate committee of the Department of History. The committee recommends to the Graduate College that the applicant be granted regular or provisional admission or be denied admission.

Program of Study. For students admitted to the doctoral program with a master's degree or other graduate credits in hand, the requirements for the Ph.D. are an additional 54 semester hours of credit in residence, which should consist of 30 semester hours of historical study and 24 semester hours of dissertation research and writing. All 54 semester hours have to be taken after admission to the program. A minimum of 84 semester hours is required for the doctorate.

For students admitted to the doctoral program directly from a baccalaureate program, the requirements for the Ph.D. are 84 semester hours of course work, which should consist of 60 semester hours of historical study and 24 semester hours of dissertation research and writing. A minimum of 54 semester hours must be taken while the student

is in residence after admission to the doctoral program. These hours should conform to the expectations of students who enter with a master's degree or other graduate credits in hand.

Upon matriculation, the student, in consultation with the graduate director, selects a faculty advisor in the area of concentration. Together the faculty advisor and student select a Ph.D. program committee consisting of at least three faculty members. In consultation with the student, the committee draws up the program of study and helps direct the student to the completion of required course work.

The program of study (a minimum of 60 graduate semester hours of history) required of all students in the doctoral program must conform to the following guidelines:

1. At least 36 semester hours must be at the 500-level or above;
2. If 400-level courses are taken as part of the program of study, the student must have documented proof that they were taken for graduate credit, contact the graduate administrative assistant for details;
3. At least six semester hours must be in historiographic course work (HST 512 to HST 515);
4. At least three semester hours must be in a comparative course (HST 551 to HST 555);
5. At least nine semester hours must be in research seminars (HST 591); and
6. 24 semester hours of dissertation research and writing are required.

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 is free to approve the substitution of a demonstrated capacity in some other research skill, such as quantitative or statistical analysis, archival management, historical preservation, oral history, or educational technology.

Preliminary Reviews. During the first academic year of residence, students are required to schedule a preliminary review with their program committee. A preliminary review is an oral interview during which a student defends the program of study and his or her progress in the program to that point. Students who fail this review must withdraw from the program.

It is recommended that students make arrangements for the preliminary review by February 1 and have the preliminary review completed by March 1. It is further recommended that the student demonstrates a satisfactory reading knowledge of at least one foreign language before scheduling the review.

Comprehensive Examinations. Candidates for the doctoral degree must display a command of the historical knowledge in their chosen fields of study. This command is determined through a series of written and oral assessments known collectively as the comprehensive examinations. Comprehensive examinations are taken after the student has completed 60 semester hours of graduate course work. Students are allowed to retake the written portions of the comprehensive examination only once. Only upon successful completion of the written portions of the examination are students allowed to sit for the oral portion. The comprehensive examinations are conducted by the program committee.

Dissertation Committee. Upon satisfactory completion of the comprehensive examination, a supervisory committee for the dissertation is selected. In consultation with the director of Graduate Studies, the student chooses a chair of the dissertation committee. In consultation with the chair, the student then chooses two other faculty members to serve on the dissertation committee. The role of the committee is to approve the subject and title of the dissertation and to advise the candidate during the completion of the research and writing of the dissertation.

Dissertation Prospectus. Before a candidate is permitted to begin researching a dissertation topic, the candidate must prepare a prospectus of four to seven pages outlining the thesis. The prospectus presents the connection between the thesis and relevant historiography. The prospectus must be presented to the dissertation committee by the end of the semester following the comprehensive exams. The topic must 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.

Consult the graduate handbook for more information on the composition of a dissertation prospectus.

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 department imposes additional admission requirements and includes periodic evaluations of public history students' progress. (The business emphasis requires prerequisites in the business field.) Enrollment is limited to provide careful preparation and advising. 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 311, for more information.)

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. 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.

HISTORY (HST)

HST 405 Colonial American History to 1763. (3)
once a year
Political, economic, social, and cultural history of the colonial era. Concentrates on English colonies, with some consideration of Spanish, French, and other colonial regions in North America.

HST 406 The American Revolution, 1763–1789. (3)
once a year
Causes, course, and consequences of the American Revolution culminating in the ratification of the Constitution.

HST 407 The Early U.S. Republic, 1789–1850. (3)
once a year
Political, social, economic, and cultural development of the United States from the Revolution to 1850.

HST 408 Civil War and Reconstruction. (3)
once a year
Explores the causes, conduct, and consequences of the American Civil War, concentrating on the years 1848 to 1877.

HST 409 The Emergence of the Modern United States, 1877 to 1918. (3)
once a year
Triumph of modern political, social, and economic structures and values, 1877–1918; role of region, religion, race, and ethnicity.

HST 410 The Modern United States, 1918 to 1945. (3)
once a year
1920's boom and the crash, the Depression and the New Deal response. The Second World War at home and abroad.

HST 411 The Postwar United States, 1945 to 1973. (3)
once a year
Cold War, prosperity, reform, and immense social and political change in the U.S.

HST 412 The Contemporary United States, 1973 to the Present. (3)
once a year
End of the Cold War, political crises, and cultural transformations in the U.S.

HST 414 The Modern U.S. Economy. (3)
selected semesters
Origins of 19th-century slavery and industrialization; 20th-century crisis and regulation: political economy of an advanced capitalist democracy. Prerequisite: ECN 111 (or 112) or HST 109 (or 110).

HST 415 Unequal Sisters: Women and Political and Cultural Change. (3)
once a year
Examines race, ethnic, and class differences among women, focusing on the political and cultural experiences of women in the U.S.

HST 416 Indian History of the Southwest. (3)
once a year
Reviews historical events from prehistoric peoples, the Spanish and Mexican periods, and the U.S. period from 1846 to present.

HST 417 Topics in Mexican American History. (3)
once a year
Focuses on specific topics in Mexican American history including immigration, civil rights, the Chicano Movement, union activism, and regional and generational differences.

HST 423 The Tudor Monarchy. (3)
once a year
Political, cultural, and social foundations of 16th-century England.

HST 424 The Stuart Transformation of England. (3)
once a year
Political, social, economic, and cultural developments in 17th-century England.

HST 426 The British Empire. (3)
once a year
British imperialism and colonialism in Africa, the Americas, Asia, and the South Pacific. Prerequisite: upper-division standing or instructor approval.

HST 427 The French Revolution and the Napoleonic Era. (3)
once a year
Conditions in Pre-Revolutionary and Revolutionary France; organization of France under Napoleon and impact of French changes upon Europe.

HST 428 Modern France. (3)
selected semesters
Social, political, economic, and cultural transformations of French society, 1815–present. Impact of industrialization, war, and revolution on people's lives. Prerequisite: upper-division standing or instructor approval.

HST 429 Modern Germany. (3)
once a year
Germany since 1871.

HST 430 Hitler: Man and Legend. (3)
once a year
Biographical approach to the German Third Reich emphasizing nature of Nazi regime, sociocultural issues, World War II, and historiography.

HST 431 Eastern Europe and the Balkans Before 1914. (3)
selected semesters
Empire and nation in Eastern Europe and the Balkans before World War I, emphasizing Hapsburg and Ottoman lands.

HST 432 Eastern Europe and the Balkans in the 20th Century. (3)
selected semesters
Politics and culture in Eastern Europe and the Balkans from World War I to the present.

HST 435 The Russian Empire. (3)
fall
Development of Russian imperial institutions and civil society from the 17th to the early 20th centuries. Lecture, discussion.

HST 436 The Soviet Experiment. (3)
spring
Communist revolutionaries' rule of Russia, focusing on utopian culture, Stalinist terror, heroism in war, and the breakup of the former USSR.

HST 437 Spain Through the Golden Age. (3)
selected semesters
Cultural, economic, political, and social development of Spain from antiquity to the late 17th century.

HST 438 Modern Spain. (3)
selected semesters
Cultural, economic, political, and social development of modern Spain.

HST 441 Spanish South America. (3)
selected semesters
Political, economic, and social development of the Spanish-speaking nations of South America since independence. 19th-century developments.

HST 442 Spanish South America. (3)
once a year
Political, economic, and social development of the Spanish-speaking nations of South America. 20th-century developments.

HST 443 The United States and Latin America. (3)
once a year
Latin American struggle for diplomatic recognition, attempts at political union, participation in international organizations since 1810, and relations between the United States and Latin America.

HST 445 20th-Century Cuba. (3)
once a year
History of Cuba from colonial era to formation of the early republic; political, economic, social development in late 20th century. Lecture, discussion.

HST 446 Colonial Mexico. (3)
once a year
Political, economic, social, and cultural developments from pre-Columbian times to 1810.

HST 447 Modern Mexico. (3)
once a year
Political, economic, social, and cultural developments from 1810 to the present.

HST 451 Chinese Cultural History. (3)
selected semesters
China's classics in translation studied both for their intrinsic ideas and for the origins of Chinese thought.

HST 452 Chinese Cultural History. (3)
selected semesters
Evolution of Confucian thought, its synthesis with Taoism and Buddhism, and modern reactions against, and uses of, Confucian traditions.

HST 453 The People's Republic of China. (3)
selected semesters
Analyzes major political, social, economic, and intellectual trends in China since the founding of the People's Republic in 1949.

HST 455 The United States and Japan. (3)
fall
Cultural, political, and economic relations in the 19th and 20th centuries. Emphasizes post-World War II period.

HST 456 The Vietnam War. (3)
once a year
Intersection of American and Asian histories in Vietnam, viewed from as many sides as possible.

HST 460 History of Fire. (3)
fall
Global survey of the natural and cultural history of fire. Lecture, discussion.

HST 480 Methods of Teaching History: Classroom Resources. (3)
fall
Methods in instruction, organization, and presentation of the subject matter of history and closely allied fields. Prerequisites: HST 300; ITC admission.

HST 481 Methods of Teaching History: Community Resources. (3)
spring
Identify community-based resources for teaching history, work with resources, and learn how to integrate them into the secondary classroom. Lecture, lab. Prerequisites: HST 300; ITC admission.

HST 484 Internship. (1–4)
selected semesters

HST 492 Honors Directed Study. (1–6)
selected semesters

HST 493 Honors Thesis. (3)
selected semesters

HST 494 Special Topics. (1–4)
selected semesters

HST 498 PS: History Pro-Seminar. (3)
fall and spring
Required course for majors on topic selected by instructor; writing-intensive course related to the development of research skills and writing tools used by historians. Prerequisites: HST 300; History major.

HST 499 Individualized Instruction. (1–3)
selected semesters

HST 500 Methods of Historical Investigations. (1–12)
selected semesters

HST 502 Public History Methodology. (3)
fall
Introduces historical research methodologies, techniques, and strategies used by public historians. Readings, short papers, and guest speakers. Required for students in the public history concentration.

HST 512 Western Civilization to the Enlightenment. (3)
fall
Systematically examines various interpretations of Western civilization from the ancient Middle Eastern civilizations to the European Enlightenment. Seminar.

HST 513 Western Civilization Since the French Revolution. (3)
spring
Systematically examines various interpretations of Western civilization since the French Revolution. Seminar.

HST 514 Historians of the United States. (3)
selected semesters
Study of the history of American historical writing from the early colonial days to the 20th century.

HST 515 Studies in Historiography. (3)
fall and spring
Methods and theories of writers of history. May be repeated for credit.

HST 525 Historical Resource Management. (3)
fall
Identification, documentation, and interpretation of historic period buildings, sites, and districts. Emphasis on interdisciplinary efforts among historians, architects, and anthropologists.

HST 526 Historians and Preservation. (3)
spring
Preparation of historians for public and private historic preservation programs. Prerequisite: HST 525 or instructor approval.

HST 527 Historical Administration. (3)
fall
Preparation of historians in administration of archives and historical sites, museums, societies, and offices in government agencies.

HST 532 Community History. (3)
selected semesters
Techniques and methods of community history emphasizing local resources. Required for community history option. Seminar.

HST 551 Comparative Histories of War and Revolution. (3)
once a year
Comparative field course of the themes of war and revolution.

HST 552 Comparative History of Family and Community. (3)
selected semesters
Comparative course with a focus on family, including minority and ethnic groups, in society.

HST 553 Comparative History of State and Institutions. (3)
selected semesters
Comparative course that explores the changing nature of central institutions and government.

HST 554 Comparative Historical Population Studies: Ethnicity, Economy, and Migration. (3)
selected semesters
Comparative course that explores the impact of social, cultural, or economic changes in the population.

HST 555 Comparative Historical Topics. (3)
selected semesters
Analyzes a variety of specific social, political, cultural, and intellectual topics.

HST 584 Internship. (1–12)
selected semesters

HST 590 Reading and Conference. (1–12)
selected semesters

HST 591 Seminar. (3)
selected semesters
May be repeated for credit.

HST 592 Research. (1–12)
selected semesters

HST 595 Continuing Registration. (1)
selected semesters

HST 598 Special Topics. (1–4)
selected semesters
Reading courses designed to increase familiarity with a particular topic and the important writing concerning it. May be repeated for credit. Topics may include the following:
- Asian History. (3)
- English and British History. (3)
- European History. (3)
- Latin American History. (3)
- U.S. History. (3)

HST 599 Thesis. (1–12)
selected semesters

HST 684 Internship. (1–12)
selected semesters

HST 690 Reading and Conference. (1–12)
selected semesters

HST 695 Continuing Registration. (1)
selected semesters

HST 700 Public History Research Methods. (1–12)
selected semesters

HST 790 Reading and Conference. (1–12)
selected semesters

HST 791 Seminar. (1–12)
selected semesters

HST 792 Research. (1–12)
selected semesters

HST 795 Continuing Registration. (1)
selected semesters

HST 799 Dissertation. (1–15)
selected semesters

Omnibus Courses. For an explanation of courses offered but not specifically listed in this catalog, see “Omnibus Courses,” page 48.

History and Theory of Art

See “Ph.D. in History and Theory of Art,” page 118.

ASU Art Professor Randall Schmidt works on a plaster cast inside his studio.

Tim Trumble photo