Dance

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PROFESSORS
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KAPLAN, MATT, MOONEY

ASSISTANT PROFESSORS
JACKSON, PARK, VISSICARO

MASTER OF FINE ARTS

The faculty in the Department of Dance offer a graduate program leading to the Master of Fine Arts degree in Dance.

See pages 105–108 for information on the Master of Fine Arts degree.

RESEARCH AND CREATIVE ACTIVITY

Research and creative activities in the Department of Dance include the following: the creation and performance of new works of dance and music; collaboration with other artists; theory and teaching of improvisation, choreography, and performance; ideokinesis and kinesiology; and labanotation theory, practice, and reconstruction of dances from notated scores. This work is fostered by the availability of a new state-of-the-art experimental theatre and sound and media labs.

DANCE HISTORY (DAH)

DAH 501 Philosophy of Dance. (3) S
Analysis of traditional and contemporary theories of dance with regard to issues of expression, form, and meaning.

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

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

DANCE (DAN)

DAN 423 Dance, Computers, and Multimedia. (3) F, S
Introduction to desktop multimedia as it relates to dance creation, education, production, and research. Lecture, lab.

DAN 434 Technique and Theory of Modern Dance. (3) F, S
Preparation in the performance and comprehension of professional level modern dance technique. 6 hours weekly. May be repeated for credit. Placement audition required.

DAN 435 Technique and Theory of Ballet. (2) F, S
The study of professional advanced ballet technique with emphasis on preparation for performance. 4 hours weekly. May be repeated for credit. Placement audition required.

DAN 471 Dance Arizona Repertory Theatre. (3) F, S
Professional modern dance company experience and community outreach. Opportunity to work with faculty, guest performers, and choreographers. Lecture, studio.

DAN 480 Senior Performance in Dance. (2) F
Original choreography for group performance with analysis and critique of problems encountered in production. Must be repeated for a total of 4 credits. Prerequisites: DAN 364, 365.

DAN 510 Dance Stagecraft and Production. (1–3) F, S
Theory of costuming, lighting, makeup, scenery, and sound as related to dance performance. May be repeated once for credit. Lecture, studio. Prerequisite: DAN 211 or equivalent.

DAN 521 Sound Lab I. (1) F
Introduction to tape recording, sound mixing, audio tape editing for dance choreographers. Lecture, lab. Prerequisite: instructor approval.

DAN 522 Sound Lab II. (1) S
Continuation of DAN 521. Emphasis on development of audio compositions for choreographic projects. Lecture, lab. Prerequisite: DAN 521.

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

DAN 534 Technique and Theory of Modern Dance. (2) F, S
Preparation in the performance and comprehension of professional-level modern dance for first-year graduate students. 6 hours weekly. May be repeated for credit. Placement audition required.

DAN 535 Technique and Theory of Ballet. (1) F, S
Graduate study of ballet technique. May be repeated for credit. Placement audition required. Studio.

DAN 542 Ideokinesis. (2) F
A theoretical examination of ideokinetic methods of facilitating postural change and movement efficiency.

DAN 550 Graduate Dance Pedagogy: Modern. (3) S
Overview of the role of modern dance technique and theory in the university curriculum including current pedagogical theory, diversity, gender. May follow or precede internship in practical teaching.

DAN 551 Graduate Dance Pedagogy: Ballet. (3) F
Advanced analysis of teaching techniques for ballet. Prerequisite: instructor approval.

DAN 561 Choreographer/Composer Workshop. (1–3) N
Analysis of, experimentation with, and practice in working with composers of music for choreography. Open to experienced choreographers and composers. Lecture, studio. Prerequisite: instructor approval.

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

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

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

DAN 580 Performance Studies Practicum. (2) F, S
Projects include dances reconstructed from labanotation and from, student-, faculty-, or guest artist-created performance events. Studio, lab.

DAN 591 Seminar. (0–3) F, S
Seminar focusing on enrichment topics, production aspects of thesis projects, teaching concerns, special lectures, films, or critiques.

DAN 634 Technique and Theory of Modern Dance. (2) F, S
Preparation in the performance and comprehension of professional-level modern dance for second-year graduate students. 6 hours weekly. May be repeated for credit. Placement audition required.

DAN 640 Advanced Problems in Analysis of Dance Technique. (3) S
Theories and principles of human anatomy, kinesiology, and the psychology of learning applied to analysis of dance movement. Prerequisites: DAN 340 and 342 *or* instructor approval.

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

DAN 671 Dance Arizona Repertory Theatre. (3) F, S
Professional modern dance company experience and community outreach. Opportunity to work with choreographers, faculty, and guest performers. Lecture, studio.

DAN 693 M.F.A. Project. (1–9) F, S, SS
Preparation for required M.F.A. project approved by the student's supervisory committee. Work is followed by a final oral examination and documentation appropriate to the project. Prerequisite: committee approval.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Design

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ASSISTANT PROFESSORS
BERNARDI, HARMON-VAUGHAN, NICKERSON, RANDALL

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. See pages 112–114 for information on the Master of Science in Design degree.

The faculty in the school also participate in offering the Ph.D. in Environmental Design and Planning program. See pages 198–200 for information on this Ph.D. degree program.

MASTER OF SCIENCE IN DESIGN

The program leading to the Master of Science in Design degree prepares graphic designers, industrial designers, and interior designers for leadership positions in industry research and teaching.

E-mail and Web Addresses

E-mail inquiries or requests should be addressed to robert.lee.wolf@asu.edu. Information about the program in Design, and the College of Architecture and Environmental Design in general, may be found on the Web at www.asu.edu/caed/Design.

RESEARCH ACTIVITY

Faculty in graphic design, industrial design, and interior design are involved in the following areas of research: human factors, material design, computer-assisted design, lighting and acoustical design, design history, exhibit design, environmental design, facilities planning and management, methodology, theory and criticism, and wayfinding. The College of Architecture and Environmental Design maintains a high-bay research facility, a lighting laboratory, a human factors laboratory, an extensive shop facility, as well as a state-of-the-art material resource center. The college's Research and Service Foundation provides facilities for basic research and community service activities in energy technology, design, and planning.

DESIGN (DSC)

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

DSC 524 Illumination and Acoustics. (3) N
Research and laboratory investigation of advanced illumination and acoustics issues of facility design. Emphasis on human factors and performance aspects. Prerequisites: INT 457 and 458 *or* equivalents.

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

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

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

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

DSC 552 Computer Simulation in Design. (3) F
The use of computer graphics as a medium to develop and present images of the environment for analysis and perception. Lecture, lab. Prerequisite: senior or graduate standing.

DSC 553 Computer Imaging and Visual Perception. (3) S
Issues and applications of computer simulation as a tool for describing and testing human interface with the environment. Lecture, lab. Prerequisite: senior or graduate standing.

DSC 558 Daylighting. (3) N
Daylighting as a design determinant; concepts, techniques, methodology, experiments, and case studies. Lecture, studio. Prerequisite: senior or graduate standing.

DSC 580 Practicum: Methods of Teaching Design. (3) F
Background and development of design education theories. Concepts of studio teaching methods. Comprehensive student project development and evaluation methods. Prerequisite: graduate standing.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

GRAPHIC DESIGN (GRA)

GRA 481 Visual Communication V. (3) F, S
Studio problems with an emphasis on analysis, problem solving, and professional portfolio preparation. 6 hours a week. Prerequisites: GRA 385, 387.

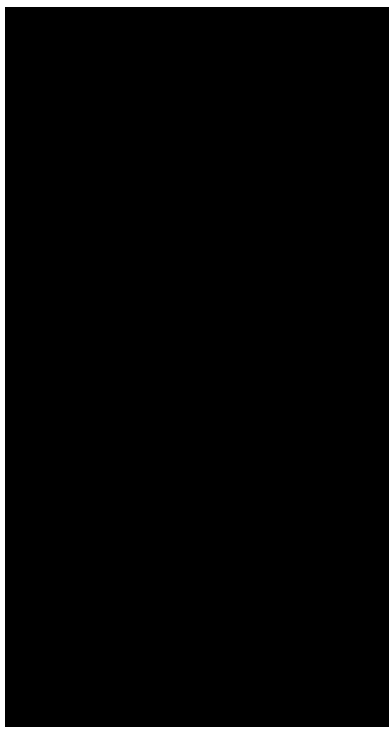
GRA 482 Visual Communication VI. (3) S
Individual and group projects with outside clients. All projects culminate in an exhibit. 6 hours a week. Prerequisite: GRA 481.

GRA 485 Graphic Design Workshop. (3) F, S, SS
Preprofessional client/designer situations from concept to printed work. Studio workshop and internships for selected students. 6 hours a week. May be repeated once for credit. Prerequisite: instructor approval.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

INDUSTRIAL DESIGN (IND)

IND 460 Design Project I. (5) F
Complete analysis of the product unit as an element of mass production, featuring marketing, technology, human factors, and visual design. Emphasis on professional standards. 10 hours studio. Prerequisites: DSC 484; IND 361.



IND 461 Design Project II. (5) S
Product design, with emphasis in systems interaction. Culmination of design process and technique. Individual project direction is encouraged. 10 hours studio. Prerequisite: IND 361.

IND 474 Design Seminar. (3) S
Manufacturer's liability, statutes, regulations, and common law rules; role of expert witnesses; insurance and product safety programs. Seminar. Prerequisite: senior standing.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

INTERIOR DESIGN (INT)

INT 412 History of Decorative Arts in Interiors. (3) F
The design of decorative arts as an expression of cultural influences and as an extension of interior spaces. Prerequisite: INT 311 or instructor approval. *General Studies: HU.*

INT 413 History of Textiles in Interior Design. (3) S
Cultural and historical expression of textiles as related to interiors. May include field trips. Prerequisite: INT 412 or instructor approval.

INT 422 Facilities Planning and Management I. (3) F
The facility management process in large-scale organizations. Planning, long-range forecasting, and productivity. Project management methodologies using micro-based software programs. Prerequisite: senior standing.

INT 423 Facilities Planning and Management II. (3) S
The formation of facilities policies, procedures, and standards. The facilities database, space allocations, and management process. Evaluation of programming criteria. Prerequisites: INT 422; senior standing.

INT 442 Specifications and Documents for Interiors. (3) F
Contract specifications, documents, schedules, and bidding procedures for interior design. Prerequisites: INT 341, 365. *General Studies: L2.*

INT 457 Acoustics for Interior Design. (3) F
Physical properties of sound. Studies pertaining to sound-absorbing materials, constructions, and room acoustics. Prerequisites: MAT 170; PHY 111, 113.

INT 458 Lighting for Interior Design. (3) S
Light as an aspect of interior design. Evaluation of light sources for distribution, color, and cost.

INT 466 Interior Design Studio V. (5) F
Advanced interior design problem solving, design theory, and criticism. Thesis project development based upon the major's concentration. 10 hours studio. Prerequisite: department approval.

INT 467 Interior Design Studio VI. (5) S
Advanced series of specialized projects or continuation of thesis project based upon the major's concentration. 10 hours studio. Prerequisite: department approval.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Economics

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ASSOCIATE PROFESSORS
AHN, MANELLI, REFFETT, REISER, SCHLEE, WILSON, WINKELMAN

ASSISTANT PROFESSORS
CHADE, DATTA, HENDRICKS

SENIOR LECTURER
ROBERTS

The faculty in the Department of Economics, College of Business, offer programs leading to the M.S. and the Ph.D. degrees in Economics.

The faculty also participate in offering the professional program leading to the Master of Business Administration (see page 102) and the program leading to the Ph.D. degree in Business Administration (see pages 143–149). Further information concerning the degree programs in Economics can be obtained from the Director of Graduate Programs, Department of Economics.

Admission. See the general requirements for admission to the Graduate College on pages 89–90. In addition, each applicant to either graduate program must submit three letters of recommendation from academic sources and test scores for the general aptitude portion of the Graduate Record Examination (GRE). Submission of scores from the GRE advanced test in economics is recommended. Applications should be received at the Department of Economics by March 1 if the student is seeking a graduate assistantship.

Students are expected to have demonstrated competency in economics at a minimum level through ECN 313 and 314 and in mathematics through MAT 271. Passing grades in the equivalents of these courses taken at other colleges are accepted as a demonstration of competency. Additional courses in calculus, linear algebra, and statistics are recommended before the first semester in the program.

Students with inadequate undergraduate preparation in economics or mathematics may be required to remove deficiencies before enrolling in graduate courses.

FIELDS OF STUDY

Graduate students may choose from several fields of study: econometrics, health economics, industrial organization, international economics, labor economics, macroeconomics, and public economics. The goal of the econometrics field is to provide students with the tools needed to empirically assess economic models using data obtained from observation of real world phenomena. Course work emphasizes applications as well as theory. The intent of the health economics field is to provide students with the tools needed to assess and critique the concepts, structures, functions, and values that characterize contemporary health care systems. Course work focuses on the economics of production and distribution of health care services, with special emphasis on the impact of regulation, competition, and economic incentives. Work in biostatistics can be included. The field of industrial organization is concerned with the theory and empirical evidence concerning the organization of firms and industries. Topics include the "law and economics" of monopoly, collusion, business pricing and marketing practices, corporate control, mergers and acquisitions. The international economics field examines both the theoretical and empirical literature associated with the determinants of comparative advantage, trade patterns and commercial policy effects on such patterns, the determinants of exchange rates and international financial flows, and effects of international linkages on the domestic economy. The labor economics field

includes the study of labor force participation, unemployment, the role and effect of education and other personal variables on earnings, geographical and interfirm earning differentials, the demand for labor, discrimination, the role and economic effects of unions, personnel practices and policies, and similar topics. The intent of the macroeconomic field is to provide the student with tools needed to assess both theoretically and empirically modern macroeconomic models. Public economics is concerned with the positive and normative study of government's effect on the economy. Course work focuses on evaluating the economic consequences of government policies and on the application of economics to political science. See the Department of Economics Graduate Student Handbook for specific field requirements.

MASTER OF SCIENCE

The M.S. degree program is designed to provide broad training in economics. The purpose is to equip the student with sufficient knowledge of economic analysis and techniques to undertake supervised research positions, to teach in two-year colleges, to assume business or government positions, or to undertake the more intensive and specialized work leading to the Ph.D. or J.D. degree.

Program of Study. See pages 97–99 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 four-year institutions of higher education and for research positions in public agencies and private business organizations.

Program of Study. See pages 120–122 for general requirements. In addition to completing 60 hours of credit beyond the bachelor's degree (30 hours beyond the master's degree) and 24 hours research dissertation credit, the Ph.D. student must accomplish five tasks:

1. meet qualification requirement,
2. present at least two fields of study,
3. pass the comprehensive examination,
4. pass the dissertation proposal defense, and
5. complete a dissertation with an oral defense.

See the department of Economics Graduate Student Handbook for details concerning these tasks.

Qualifying Examinations. The student must demonstrate proficiency in economic theory and application by passing both the microeconomic and macroeconomic qualifying examinations. These examinations are given at the beginning of the fall semester of the second year of graduate study. The student must demonstrate proficiency in statistical and econometric analysis by passing ECN 525 and ECN 526.

Fields of Study. Students are required to present at least one primary field and one secondary field for the Ph.D. The primary field must be the one in which the comprehensive examination is taken; usually this is the field in which dissertation work is contemplated.

Comprehensive Examination. The comprehensive examination consists of a written research paper, a written examination, and an oral examination. The research paper consists of both a general and detailed literature review of the dissertation area as well as a description of the proposed dissertation topic. The written examination consists of questions designed to test the student's knowledge of the proposed research area. Examination questions are designed to cause the student to examine the research topic in considerable depth and breadth. The oral examination consists of questions designed to test the student's knowledge of the proposed research area. Examination questions are designed to expand on the written examination as well as to provide guidance on the dissertation research.

Dissertation Proposal Defense. Students prepare a preliminary draft of the dissertation proposal before taking the comprehensive examination. Upon passing the comprehensive examination, students submit a revised dissertation proposal to their supervisory committee that formalizes the research agenda and incorporates the supervisory committee's suggestions. The dissertation proposal must be defended orally.

Admission to Candidacy. The student should apply promptly for admission to candidacy after passing the comprehensive field examination, oral examination, and the dissertation proposal defense.

Dissertation Requirements. A dissertation representing original research work of high quality, demonstrating the student's proficiency in the field, is required.

Foreign Language Requirements. None.

Final Examinations. An oral examination in defense of the dissertation is required.

RESEARCH ACTIVITY

There is a strong commitment to professional research in the Department of Economics. Faculty are actively engaged in both applied and theoretical research in a variety of areas. Topics of recently published research include: optimal labor contracts and involuntary unemployment; efficient estimation with dynamic panel data; the effects of restructuring and privatization in Central and Eastern Europe; unemployment insurance programs; the economics of mob goods; the stability of long-run money demand; an empirical methodology for cointegrated systems; job search; labor market consequences of U.S. immigration; volatility in foreign

exchange markets; equity control of multinational firms by less developed countries; optimal portfolios; the demand for insurance and insurable assets; wage uncertainty and competitive equilibrium in labor markets; exchange rate dynamics; real business cycle analysis; strategic information manipulation in duopolies; non-expected utility theory; comparative statics under uncertainty; the value of information in alternative economic environments; and an empirical examination of organization structure.

Research tools at ASU are excellent. The Hayden Library holds an extensive collection of works in economics and related areas. The Noble Science and Engineering Library is a designated U.S. Patent Depository. ASU has computer facilities that provide exceptional support for processing empirical research. A remote site terminal for both batch processing and time sharing is located in the College of Business.

ECONOMICS (ECN)

ECN 436 International Trade Theory. (3) A
The comparative-advantage doctrine, including practices under varying commercial policy approaches. The economic impact of international disequilibrium. Prerequisite: ECN 314 or instructor approval. *General Studies: SB, G.*

ECN 438 International Monetary Economics. (3) A
History, theory, and policy of international monetary economics. Balance of payments and exchange rates. International financial markets including Eurocurrency markets. Prerequisite: ECN 313 or instructor approval. *General Studies: SB, G.*

ECN 441 Public Finance. (3) A
Public goods, externalities, voting models, public expenditures, taxation, and budget formation with emphasis on the federal government. Prerequisite: ECN 314 or instructor approval. *General Studies: L2/SB.*

ECN 453 Government and Business. (3) A
Development of public policies toward business. Antitrust activity. Economic effects of government policies. Prerequisite: ECN 314 or instructor approval.

ECN 480 Introduction to Econometrics. (3) A
Elements of regression analysis: estimation, hypothesis tests, prediction. Emphasis is on use of econometric results in assessment of economic theories. Prerequisite: instructor approval. *General Studies: N2.*

ECN 498 Pro-Seminar. (3) A
Topic chosen from current area of interest. Prerequisites: ECN 313 and 314 *or* instructor approval.

ECN 502 Managerial Economics. (3) F, S
Application of microeconomic analysis to managerial decision-making in areas of demand, production, cost, and pricing. Evaluation of competitive strategies. Prerequisite: MBA degree program student.

ECN 503 Global Economics for Managers. (3) F, S
Macroeconomic analysis of issues related to economic growth, inflation, interest rates behavior, unemployment, exchange rate determination, and global competitiveness.

ECN 504 History of Economic Thought. (3) S
Historical development of economic theory. Emphasis on the development of economic analysis from preclassical economics through Keynes. Prerequisite: ECN 510 or instructor approval.

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

ECN 510 Microeconomic Theory and Applications. (3) F, S
Application of economic theory to production, consumer demand, exchange, and pricing in a market economy. Prerequisites: ECN 112 and calculus *or* instructor approval.

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

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

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

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

ECN 515 Advanced Macroeconomic Analysis. (3) F
Focus on current research areas in macroeconomics and monetary theory with emphasis on methods in economic dynamics and numerical techniques. Prerequisite: ECN 511 or instructor approval.

ECN 516 Economics of Uncertainty, Information, and Strategic Behavior. (3) F
Economic behavior under uncertainty; markets and contracts under asymmetric information; the theory of games with incomplete information and applications. Prerequisite: ECN 512 or instructor approval.

ECN 517 Monetary Theory. (3) F
Traditional and post-Keynesian monetary theory, interest rate determination, the demand and supply of money. Prerequisite: ECN 511 or instructor approval.

ECN 521 Labor Economics I. (3) F
Development of basic theoretical models for analyzing labor market issues. Prerequisite: ECN 510 or instructor approval.

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

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

ECN 526 Econometrics II. (3) F
Estimation and inference of qualitative and limited dependent variable models as well as general multiple equation models. Prerequisite: ECN 525 or instructor approval.

ECN 527 Econometrics III. (3) S
Generalized method of moment estimation, estimation with censored and truncated samples, nonlinear models, panel-data models, econometrics of nonstationarities. Prerequisite: ECN 526 or instructor approval.

ECN 531 Comparative Economic Systems. (3) F
Philosophical foundations of major economic systems and of properties of principal system models. Comparison of alternative institutions and system components of contemporary economies. Prerequisites: ECN 509 and 510 *or* instructor approval.

ECN 536 International Trade Theory. (3) S
Theories of comparative advantage and their empirical verification. Theory and political economy of commercial policy. Resource transfers and the role of the multinational corporation. Prerequisites: ECN 509 and 510 *or* instructor approval.

ECN 538 International Monetary Theory and Policy. (3) F
The foreign exchange market, balance of payments, and international financial institutions and arrangements; theory and applications. Prerequisites: ECN 509 and 510 *or* instructor approval.

ECN 541 Public Economics. (3) S
Economics of collective action, public spending, taxation, and politics. Impact of central governmental activity on resource allocation and income distribution. Prerequisite: ECN 510 or instructor approval.

ECN 553 Industrial Organization. (3) S
Analysis of structure, conduct, and performance in industrial markets; the economics of organizations. Prerequisite: ECN 510 or instructor approval.

ECN 560 Economics of Growth and Development. (3) F
Economic problems, issues, and policy decisions facing the developing nations of the world. Prerequisites: ECN 509 and 510 *or* instructor approval.

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

ECN 585 Mathematics for Economists. (3) F
Survey of mathematical ideas encountered in economics and econometrics: nonlinear programming, the Kuhn-Tucker theorem, concave programming, optimization over time. Prerequisite: calculus or instructor approval.

ECN 591 Economics Seminar. (1–3) F, S, SS
Presentations by outside speakers, department faculty, and graduate students of work in progress. Prerequisite: instructor approval.

ECN 593 Applied Projects. (3) F
Preparation of a supervised applied project typically in conjunction with an internship. Prerequisites: ECN 510, 511.

ECN 594 Conference and Workshop in Economics. (1–12) F, S, SS
Topics such as the following are offered:
(a) Economic Analysis Workshop. Introduction to Economic Analysis. Prerequisite: Ph.D. degree program student.
(b) Macroeconomic Topics Workshop. Issues in macroeconomic theory. Prerequisite: ECN 513 or instructor approval.
(c) Microeconomic Topics Workshop. Issues in microeconomic theory. Prerequisite: ECN 514 or instructor approval.

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

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Education Core Courses

The core courses for the College of Education graduate programs carry the prefix "COE." These courses are no longer required for all graduate majors in the College of Education. Contact the appropriate division to obtain specific core requirements.

COLLEGE OF EDUCATION (COE)

COE 501 Introduction to Research and Evaluation in Education. (3) F, S, SS
Overview of educational inquiry from controlled, quantitative to qualitative, naturalistic. Emphasis on locating and critically interpreting published research.

COE 502 Introduction to Quantitative Methods. (3) F, S, SS
Topics in statistical analysis, measurement, and research design. Exploratory data analysis, estimation theory, and statistical inference. Use of computers for data analysis. Cross-listed as EDP 502.

COE 503 Introduction to Qualitative Research. (3) F, S, SS
Terminology, historical development, approaches (including ethnography, ethnomethodology, critical theory, grounded theory, and hermeneutics), and qualitative versus quantitative social sciences; methods of inquiry. Cross-listed as EDP 503.

COE 504 Learning and Instruction. (3) F, S, SS
Introduction to psychology of learning and instruction. Includes the foundations of learning theories and their application to educational practice. Cross-listed as EDP 504.

COE 505 American Education System. (3) F, S, SS
Political, social, historical, and philosophical analyses of American education at all levels. Examination of primary sources, legal findings, and case studies.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Educational Administration and Supervision

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ASSISTANT PROFESSORS
MARGOLIS, PEÑA

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 the Educational Leadership and Policy Studies major, described on pages 184–185. See pages 120–122 for information on the Ph.D. degree.

Applicants for admission to the M.Ed. degree program must submit scores on either the Graduate Record Examination (GRE) or the Miller Analogies Test (MAT); scores on the GRE are preferred. A minimum of 36 hours is required for the M.Ed. degree. Applicants for admission to the doctoral degree programs must submit scores on the GRE.

Candidates for all degrees must pass a written comprehensive examination. An oral examination over the written portion of the comprehensive examination may be required of Ed.D. candidates at the discretion of the student's program committee. In addition, candidates for the Ed.D. must pass a final oral examination in defense of the dissertation. Candidates for the M.Ed. and Ed.D. programs may be required to take certain College of Education core courses depending upon previous experience and education. Pre-approval by an advisor is required. The core courses are COE 501, 502, 503, 504, and 505. See the "Education Core Courses" on this page for listing. A set of research courses is required for the Ed.D. degree.

MASTER OF EDUCATION

See pages 103–104 for information on the Master of Education degree.

DOCTOR OF EDUCATION

See pages 118–119 for information on the Doctor of Education degree.

RESEARCH ACTIVITY

Faculty research includes the study of economics and financing of education, competency performance, administrator preparation, roles and characteristics of school administrators, educational demographics, equity in leadership, administrative decision processes, evaluation of teaching performance, evaluation of administrative performance, community education, effects of legislative budget limitations, personnel administration communications, alternative school programs, policy formation, and planning and school board problems. Students have the opportunity to work on research projects in the College of Education and in school districts and educational agencies throughout the state. The division is a member of the University Council for Educational Administration.

EDUCATIONAL ADMINISTRATION AND SUPERVISION (EDA)

EDA 501 Competency/Performance in Educational Administration. (3) F, SS
The nature of educational administration and the concept of competency as it applies to educational administration.

EDA 507 Computers in Educational Administration. (3) F, S
Survey of computer use and applications in educational administration. Lecture, lab. Cross-listed as EMC 507.

EDA 510 Introduction to Organization and Administration of American Public Schools. (3) F, S
Organizational structure and administration of public education are explored through the application of legal and ethical concepts and relevant information of the social sciences. Cross-listed as SPF 510.

EDA 511 School Law. (3) S
Constitutional, statutory, and case law that relates to all school personnel, pupils, the school district, and other governmental units. Contracts, dismissals, tenure, retirement, pupil injuries, liability of personnel and district, school district boundary changes, and bonding.

EDA 521 Evaluation of Teaching Performance. (3) F
In-depth analysis of legal basis of teacher appraisal, teacher competency, measurement of teacher performance, and application of performance appraisal systems. Prerequisite: COE 504.

EDA 524 Theory and Application of Educational Administration. (3) F, SS
History and development of public school administration in the United States; current organizational patterns for public education at local, intermediate, state, and national levels; current theoretical positions in educational administration.

EDA 525 Human Relations and Societal Factors in Education. (3) N
Interrelations between problems of educational administration and interdisciplinary social sciences. Communications skills, morale, authority, and perception. Concepts from political science, economics, and social-psychology useful to the administrator.

EDA 526 Instructional Supervision. (3) F, S, SS
Administering curriculum improvement, in-service education, evaluating, and improving teaching competence; administrative instructional responsibilities.

EDA 527 Managerial Functions in School Administration. (3) N
Relates to the work of the central district office staff and the school principal. Use of human resources, educational planning, and organization and management of time.

EDA 544 Public School Finance. (3) F
Measures of ability, efforts, and educational need; capital outlay funding; tax revenues; federal, state, and local financing alternatives; major issues and trends in the financing of public education.

EDA 548 Community Relations in Education. (3) N
Administrative factors of primary importance in developing community involvement in public schools. Emphasis on theory and skill of school system and individual communication.

EDA 555 Educational Facility Planning. (3) N
School building needs, educational planning for facilities, responsibilities of architects, duties of contractors, and equipping and furnishing of school buildings.

EDA 571 School Business Management. (3) F, S, SS
Purchasing, budgeting, accounting, payroll management, auditing, financial reporting, insurance, and administration of nonteaching personnel and services.

EDA 573 School Personnel Administration. (3) S
Organization for personnel services; development of policy to govern selection, orientation, placement, remuneration, transfers, separations, and development of morale among instructional and noninstructional personnel.

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

EDA 634 Instructional Leadership. (3) N
Curricular practices and processes used by instructional leaders who plan, organize, and coordinate the professional activities in elementary and secondary schools. Prerequisite: EDA 526.

EDA 675 Politics of Education. (3) S
Social science theory and research are used to consider the political context of educational policy making. Prerequisite: COE 505.

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

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

EDA 711 Administrative Leadership. (3) F
Emphasis on research in leadership; application of research findings to administrative and supervisory functions in educational endeavors. Prerequisites: EDA 524; 30 semester hours in educational administration; admission to doctoral program.

EDA 722 Administration of Instructional Improvement. (3) S
Recent research relating to administrative and supervisory responsibilities for the improvement of the educational program. Effective processes by administrators, supervisors, consultants, and coordinators. Prerequisites: 30 semester hours in educational administration; admission to doctoral program.

EDA 733 Administrative Management. (3) S
Recent research relating to school management. School finance, law, buildings, transportation, food services, and supply management. Prerequisites: EDA 527, 544, 571; 30 semester hours in educational administration; admission to doctoral program.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Educational Leadership and Policy Studies

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REGENTS' PROFESSOR
BERLINER

PROFESSORS
APPLETON, BARONE, FENSKE, GLASS, METOS, NORTON, RENDÓN, RICHARDSON, SMITH, STOUT, WEBB

ASSOCIATE PROFESSORS
CASANOVA, HARTWELL-HUNNICUTT, LEVAN

ASSISTANT PROFESSORS
MARGOLIS, PEÑA

The faculty in the Division of Educational Leadership and Policy Studies offer a Ph.D. degree with an interdisciplinary approach to complex problems of educational policy and leadership. It brings together scholarly interests found in educational administration, higher education, and social and philosophical foundations of education. Emphasis is placed upon critical thought, theories and practice within political, demographic, historical, sociocultural, and intellectual contexts in the United States and other nations. The purpose of the program is to develop educational researchers, policy analysts, and leaders for careers in schools, colleges, universities, and government and private agencies.

DOCTOR OF PHILOSOPHY

See pages 120–122 for general requirements.

Admission. In addition to meeting Graduate College minimum requirements, applicants must submit scores on the Graduate Record Examination, a statement of intent, a résumé, and three letters of recommendation. The admission committee meets in early February. All required materials must be in the division office in early January to assure review. Students entering the program must have a bachelor's or master's degree in either education or an appropriate subject field (e.g., an-

thropology, economics, history, philosophy, or sociology), or additional courses are required in the areas of deficiency before admission to the program. Contact the division office for the appropriate admissions application.

Program Committee. The program committee (chair and at least two other members) advises in the preparation of the program of study and administers the comprehensive examinations. The committee must be approved by the dean of the Graduate College.

Dissertation Committee. After passing the comprehensive examination, a dissertation committee is formed upon the approval of the dean of the Graduate College. The dissertation committee approves the subject and title of the dissertation. Members of the program committee may also serve as members of the dissertation committee; however, the committees may have different memberships. The dissertation chair must be a faculty member designated eligible to serve in this capacity by the dean of the Graduate College.

Program of Study. Students entering the Ph.D. program are expected to meet the requirement of an 84-semester-hour program of study (including the semester hours transferred from the master's degree in a related discipline). The following represents components of a program of study.

Policy Studies Foundation. At the heart of the Ph.D. program are 27 semester hours of course work on the foundations of policy studies. During the students' first year in the program, they take a two-semester sequence, Proseminar I and II (6 hours). In addition, they take Evaluation Theory (3 hours). In the second year, students enroll for Theoretical Issues in Policy Studies (3 hours). Other required courses in this category are Politics of Education, Theory of Educational Organization, Foundations of American Education, and Policy Issues in Learning and Instruction (3 hours each). To understand the economic and financial aspects of educational policy, students take one of the following three courses (3 hours each): Public School Finance, Higher Education Finance and Budgeting, or Political Economy.

Advanced Research Methods. Students must complete a minimum of nine semester hours of research methods beyond the core courses. Courses satisfying this requirement can be taken outside the College of Education curricula with the committee chair's approval. The courses taken deepen the student's research emphasis, whether it is qualitative or quantitative.

Specialty Studies. Each student completes 12 semester hours of course work in an area of special interest. This course work represents added depth in the specialty in which the student plans to practice as a scholar, administrator, or policy analyst. These courses are normally selected from those offered within the division.

Practicum. Students must earn three semester hours of credit for a supervised practicum. This work is planned in conjunction with the student's committee chair and involves applied work in a practical setting relating to the student's intended postdoctoral position.

Research and Dissertation. Each Ph.D. candidate is required to complete a minimum of 24 semester hours of research and dissertation.

Foreign Language Requirements. None.

Comprehensive Examinations. The examination centers on the professional focus and the cognate study and must be passed before admission to candidacy. A written examination is required; an oral examination over the written portion may be required at the discretion of the student's program committee.

Dissertation Precis and Proposal. The precis is a 15-page summary of the dissertation research proposed by the student. Upon approval of the precis by the dissertation 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

Faculty research focuses on issues in education from preschool to higher education, such as: culture, language, and the schools; access to education by women and ethnic minorities; financing public education; the role of educational leaders; the schools' use of technology. The approach is interdisciplinary since problems in education are illuminated by all of the social and behavioral sciences as well as the humanities. Research techniques include both quantitative and qualitative methods.

Educational Media and Computers

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PROFESSORS
BITTER, McISAAC

ASSISTANT PROFESSOR
FLEMISTER

The faculty in the Division of Curriculum and Instruction offer a graduate program leading to the Master of Education degree in Educational Media and Computers.

A concentration in educational media and computers is offered through the interdisciplinary Ph.D. degree in Curriculum and Instruction. See pages 175–177 for more information on the Ph.D. degree in Curriculum and Instruction.

MASTER OF EDUCATION

The M.Ed. program emphasizes the use of media and computers in education. Students study the design, production, selection, utilization, and evaluation of instructional programs. Students may also select an area of concentration in business education.

The graduate program prepares students to work with a wide range of media and computers in schools and in business training programs. Potential employment opportunities for graduates include positions as media specialists, computer coordinators, and computer education instructors in schools and universities. Graduates are also prepared to design multimedia training materials and computer-based training programs for business and industry.

A minimum of 36 hours is required in the master's degree program. Each master's degree candidate in Educational Media and Computers produces and orally defends an instructional unit.

In addition to meeting minimum Graduate College requirements for master's degree admission, each applicant must provide

1. Graduate Record Examination verbal test scores, Miller Analogies Test scores, or Test of English as a Foreign Language scores (for international students);
2. three letters of recommendation;
3. up-to-date résumé; and
4. a statement of professional goals.

For information on course work pertaining to media and computers, contact the program coordinator (EDB 146).

See pages 103–104 for information on the Master of Education degree.

RESEARCH ACTIVITY

The faculty in educational media and computers maintain an active program of research and development that has been supported by funds from federal agencies, private corporations, and the university. General research areas include (1) the design of effective multimedia and computer-based instruction and (2) the effective utilization of multimedia and computers in schools. Students participate in research and development activities as an integral part of their degree programs.

BUSINESS EDUCATION (BUE)

BUE 480 Teaching Business Subjects. (3) S
Organization and presentation of appropriate content for business subjects in the secondary school.

BUE 501 Principles of Business Education. (3) F
History, philosophy, principles, and objectives of business and distributive education.

BUE 502 Organization and Management of Cooperative Programs. (3) F
Work-study programs for business occupations in high schools and community colleges.

BUE 503 Competency-Based Business and Vocational Education. (3) S
Development and administration of competency-based individualized programs in business and vocational education.

BUE 505 Current Literature in Business and Vocational Education. (3) S
Critical analyses, generalizations, and trends in business and vocational education.

BUE 506 Information Processing for Business and Vocational Teachers. (3) SS
Development of curriculum and strategies for teaching information processing; hardware/software evaluation and equipment acquisition techniques in business and vocational education.

BUE 512 Technology in Business and Vocational Education. (3) SS
Emerging curricula and instructional technology in business and vocational education.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

EDUCATIONAL MEDIA AND COMPUTERS (EMC)

EMC 405 Presentation Technology for Multimedia. (3) F
An exploration of multimedia hardware and software used in creating presentations for educational, corporate, and commercial applications.

EMC 406 Computer Graphics and Animation. (3) S
The study and application of design and animation techniques for use in video or computer-based presentations.

EMC 455 Animation and Special Effects. (3) F
An examination of the art, science, and impact of animation and other special effects used in film.

EMC 503 Current Issues and Problems in Media/Computer Education. (3) F
Introduction to current theory and practice in instructional media and computers. Overview of production areas.

EMC 505 Presentation Techniques for Multimedia. (3) F
An exploration of multimedia hardware and software used in creating presentations for educational, corporate, and commercial applications. Lecture, lab.

EMC 506 Computer Graphics and Animation. (3) S
The study and application of design and animation techniques for use in video or computer-based presentations. Lecture, lab.

EMC 507 Computers in Educational Administration. (3) F, S
Survey of computer use and applications in educational administration. Lecture, lab. Cross-listed as EDA 507.

EMC 511 Computer Applications in Education. (3) F, SS
Use and evaluation of computers for word processing, information management, graphics, and authoring instruction in educational settings.

EMC 513 Introduction to Multimedia. (3) F
Introduction to multimedia, emphasizing applications for business, industry, and public and higher education.

EMC 521 Instructional Media Design. (3) F, S
Preparing specifications for instructional television, film, slide/tape programs, and computer-based instruction. CD-ROM. Prerequisite: EMC 511 or instructor approval.

EMC 522 Evaluating Computer Materials. (3) S, SS
Selection, utilization, design, and evaluation of instructional computer material. Focus on learning theory, criteria for evaluating educational software. Prerequisite: EMC 521 or instructor approval.

EMC 523 Telecommunication for Instruction. (3) F
Introduction to Internet resources for educators. Instructional applications of distance-learning technologies.

EMC 524 Imaging Technology. (3) F
Use of optical scanning and digital data manipulation of photographs for use in educational presentations and publications.

EMC 525 Presentation Graphics. (3) S
Design, production, and display of computer graphics for group presentations. Prerequisite: EMC 521 or instructor approval.

EMC 527 Instructional Television. (3) F
Design and production of instructional programs for television. Lecture, lab. Prerequisite: EMC 521 or instructor approval.

EMC 528 Photomedia Production. (3) S
Design and production of multimedia programs. Emphasis on slide/tape format. Prerequisites: EMC 521 and 524 and 525 *or* instructor approval.

EMC 530 Development of Computer-Based Instruction. (3) S
The systematic design, development, and formative evaluation of computer-based instruction. Prerequisite: EMC 511 or instructor approval.

EMC 531 Hypermedia. (3) F
The application of HyperCard and other support software in the design and production of instructional computer-based material for business, industry, and public and higher education. Lecture, lab.

EMC 532 Desktop Publishing. (3) F, SS
Design and production of educational materials using computer-based word processing, graphics, and page layout programs. Lecture, lab.

EMC 535 Interactive Video. (3) S
The use of various authoring systems and support programs to assist in the design and production of regular and repurposed interactive video. Lecture, lab.

EMC 584 Educational Media Internship. (1–6) F, S, SS
Prerequisites: EMC 521; LNT 502; instructor approval.

EMC 637 Computers in Elementary School Curriculum. (3) SS
Experiences with educational uses of computers; computer awareness, family/societal impact, classroom applications/software, and curriculum development.

EMC 701 Advanced Technologies in Education. (3) S
Examining the role and impact of artificial intelligence, expert systems, and related advanced technologies in education.

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

EMC 703 Research in Educational Telecommunications. (3) S
Seminar with emphasis on research in telecommunications and distance education. Prerequisite: EMC 523 or instructor approval.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Educational Psychology

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REGENTS' PROFESSORS
BERLINER, KULHAVY

PROFESSORS
BARONA, GLASS, GRINDER, HARRIS, KERR, KRUS, NELSEN, SMITH, STROM

ASSOCIATE PROFESSORS
BEHRENS, BETZ, MOORE, SANTOS DE BARONA

ASSISTANT PROFESSORS
NAKAGAWA, ROBERTS, STAFFORD

The faculty in the Division of Psychology in Education offer graduate programs leading to the M.A., Master of Education, and Ph.D. degrees in Educational Psychology. In the Ph.D. program, concentrations are available in lifespan developmental psychology; measurement, statistics, and methodological studies; and school psychology.

Students applying for admission to any of these programs are required to submit scores on the Graduate Record Examination (GRE).

The Master of Education degree program requires 36 semester hours of graduate course work. The M.A. degree program requires 30 semester hours of graduate course work, which includes a thesis. In the M.A. program, areas of study are available in measurement, statistics, and methodological studies and life-span developmental psychology. All applicants must submit scores of the GRE. All programs except school psychology (see "School Psychology," on this page) have deadlines of October 15 for receiving all application materials, including test scores, to be considered for admission for the following semester. All degree programs require written comprehensive examinations; doctoral degree programs require a final oral examination as well. Additional information on these degree programs may be obtained from the Division of Psychology in Education.

MASTER OF ARTS

See pages 97–99 for information on the M.A. degree.

MASTER OF EDUCATION

See pages 103–104 for information on the Master of Education degree.

DOCTOR OF PHILOSOPHY

The Ph.D. degree in Educational Psychology with a concentration in school psychology is accredited by the American Psychological Association and the National Association of School Psychologists.

School Psychology. The faculty specializing in school psychology offer a scientist-practitioner program leading to the Ph.D. degree. The program provides preparation in academic and professional areas through course work, research, practica, and internship. Graduates are employed in school districts, behavioral health settings serving children and adolescents, and universities. All application materials, including test scores, must be received by January 15 to be considered for admission the following academic year. For more information on the faculty, the programs of study, and admission requirements, applicants should contact the Division of Psychology in Education and request the *School Psychology Program* brochure.

See pages 120–122 for information on the Ph.D. degree.

RESEARCH ACTIVITY

Research in methodology includes the development and assessment of theory and techniques of design, statistics, psychometrics, and evaluation. Specific topics include multivariate analysis, personnel and program evaluation, qualitative methodology, and use of computers in instruction and testing.

Research in human development includes studies of critical thinking, moral development and honesty, prejudice, belief systems, authority, social environments of schools, and cultural influences on development.

School psychology research involves assessment of cognitive and academic skills, classroom processes and school cultures, and assessment of minority individuals. Additional research topics in

school psychology include cognitive-emotional processes in achievement motivation, cognitive behavioral interventions, and social-cognitive development.

EDUCATIONAL PSYCHOLOGY (EDP)

EDP 502 Introduction to Quantitative Methods. (3) F, S, SS
Topics in statistical analysis, measurement, and research design. Exploratory data analysis, estimation theory, and statistical inference. Use of computers for data analysis. Cross-listed as COE 502.

EDP 503 Introduction to Qualitative Research. (3) F, S, SS
Terminology, historical development, approaches (including ethnography, ethnomethodology, critical theory, grounded theory, and hermeneutics), and qualitative versus quantitative social sciences; methods of inquiry. Cross-listed as COE 503.

EDP 504 Learning and Instruction. (3) F, S, SS
Introduction to psychology of learning and instruction. Includes the foundations of learning theories and their application to educational practice. Cross-listed as COE 504.

EDP 510 Essentials of Classroom Learning. (3) F, S, SS
Theoretical and empirical foundations of learning in the classroom milieu. Critical exposure to research and method in instructional psychology. Cross-listed as LNT 510.

EDP 513 Child Development. (3) F, S, SS
Examination of problems and achievements experienced by children growing up in a technological society. Emphasis on discovering the child's perspective.

EDP 514 Psychology of the Adolescent. (3) F, S, SS
Cognitive, physical, and social development of adolescents in contemporary society. Impact of family, school, and work place on adolescent development. Prerequisite: EDP 310 or PGS 100 or equivalent.

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

EDP 534 Principles of Behavior Modification. (3) F
Principles of conditioning as applied to behavior modification; current research on the experimental analysis of behavior in educational psychology.

EDP 540 Theoretical Views of Learning. (3) F, S
Classical and cognitive theories of learning, plus recent orientations. Illustrative experimental and rational foundations; implications for educational practice. Cross-listed as LNT 540.

EDP 542 The Psychology of Learning and Instruction. (3) S
Critical review and evaluation of research on learning variables relevant to acquisition and retention of instructional materials. Lab. Cross-listed as LNT 542.

EDP 550 Introduction to Measurement in Education. (3) F, S
Nature and types of educational measures. Critiquing and selecting appropriate measuring devices. Constructing measuring devices. Social controversies about tests. Lecture, lab. Prerequisite: EDP 502 or instructor approval.

EDP 552 Quantitative Data Analysis in Education I. (3) F, S, SS
Continued treatment of statistical estimation, testing, and research synthesis. Inferential techniques including ANOVA and multiple regression with computers. Lecture, lab. Prerequisite: EDP 502 or instructor approval.

EDP 554 Quantitative Data Analysis in Education II. (3) F, S, SS
Advanced issues in applied multiple regression and ANOVA. Introduction to ANCOVA. Use of computers for data analysis. Lecture, lab. Prerequisite: EDP 552 or instructor approval.

EDP 556 Data Processing Techniques in Measurement and Research. (3) A
Use of statistical packages for data analysis. Emphasis on data management, data structures, and related statistical procedures. Lecture, lab. Prerequisite: EDP 552. Pre- or corequisite: EDP 554 or instructor approval.

EDP 560 Individual Intellectual Assessment. (1–6) F, S
Experience in administering and interpreting individual tests. Theoretical basis for ability testing, ethical considerations, and diagnostic use of test results. Initial enrollment, 3-hour minimum. Lab experience. Prerequisites: EDP 454 and admission to a program in professional psychology *or* instructor approval.

EDP 562 School Psychology: Theory and Practice. (3) F
Development and present status of school psychology, including an overview of assessment and intervention strategies and professional issues.

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

EDP 566 Diagnosis of Learning Difficulties. (3) S
Clinical diagnosis of learning difficulties, emphasizing specific academic problems. Use and interpretation of diagnostic instruments in practical school situations. Prerequisites: EDP 560 and 562 *or* equivalents; instructor approval.

EDP 567 School Psychological Services to Minority Students. (3) S
Historical perspectives and major issues in psychological and academic assessment and interventions with minority school children.

EDP 651 Methods and Practices of Qualitative Research. (3) S
Advanced course for students familiar with theory and extant work. Topics include data collection, analysis, reporting, and an extensive fieldwork project. Prerequisite: COE 503.

EDP 652 Multivariate Procedures in Data Analysis I. (3) F
Introduction to matrix algebra. Application of MANOVA, MANCOVA, power analysis, effect size, discriminant and repeated measures analysis with computers. Lecture, lab. Prerequisite: EDP 554 or instructor approval.

EDP 654 Multivariate Procedures in Data Analysis II. (3) S
Treatment of applied multivariate multiple regression, canonical correlation, factor analysis, log-linear models, and structural equation models with computers. Lecture, lab. Prerequisite: EDP 652 or instructor approval.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Electrical Engineering

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REGENTS' PROFESSORS
BALANIS, FERRY

PROFESSORS
BACKUS, CROUCH, DeMASSA, GOODNICK, GORUR, HEYDT, HIGGINS, KARADY, KOZICKI, PALAIS, PAN, ROEDEL, SADOWSKY, SCHRODER, SPANIAS, THORNTON

ASSOCIATE PROFESSORS
ABERLE, ALLEE, BIRD, CHAKRABARTI, COCHRAN, EL-GHAZALY, EL-SHARAWY, GREENEICH, GRONDIN, HOLBERT, MORRELL, RODRIGUEZ, C. SHEN, J. SHEN, SI, SKROMME, TSAKALIS, TYLAVSKY, ZHANG

ASSISTANT PROFESSORS
CAPONE, KARAM, VASILESKA-KAFEDZISKA

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

The faculty also participate in offering the interdisciplinary program leading to the Ph.D. degree in the Science and Engineering of Materials. See pages 275–277 for program description.

Admission. See the general requirements for admission to the Graduate College on pages 89–90. In addition, a student whose undergraduate degree is not based on an ABET-accredited program must submit scores on the Graduate Record Exam and must have earned the equivalent of a 3.50 GPA in the last

two years of study. All applicants must submit a short statement of purpose to the department. This statement must include the desired area of study within electrical engineering.

MASTER OF SCIENCE

See pages 97–99 for information on the M.S. degree.

MASTER OF SCIENCE IN ENGINEERING

See page 114 for information on the Master of Science in Engineering degree.

A final written comprehensive exam is required for option 2 in this program. Most master's degree students are admitted to the M.S.E. program, option 2. Only those who are offered financial support or who are outstanding students showing research potential are admitted to the M.S. program.

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 pages 120–122 for general requirements.

Program of Study. The program of study should be filed soon after the student has been admitted to the program and the supervisory committee has been formed.

Foreign Language Requirements. None.

Qualifying Examinations. Every student must pass a qualifying examination consisting of a short research paper and an oral presentation of the research. The exam must take place before the end of the second semester in attendance at ASU.

Comprehensive Examinations. Written and oral comprehensive examinations are required before the student is admitted to candidacy. The examinations are administered by the supervisory committee.

Dissertation Requirements. A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required.

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

RESEARCH ACTIVITY

Opportunities at the level of the master's or doctoral degree are offered to students whose goals are research, development, design, manufacturing, systems, engineering management, teaching, or other professional activities in electrical engineering or related disciplines.

Research opportunities in the Department of Electrical Engineering are available in a broad spectrum of subjects encompassing traditional as well as new specialties. Significant research activity exists in solid-state electronics, power systems, electromagnetic, communications, signal processing, control systems, and coherent optics, reflecting the continuing strong interest and cooperation of local industry in these disciplines. Solid-state electronics, telecommunications, and power systems have been selected for support by industry as part of a program establishing excellence centers for engineering at ASU.

The list that follows provides an indication of the breadth of subjects available for research in the department. A research project may embrace more than one of the topics listed and may involve cooperative activity with local industry. The list is not meant to be exhaustive; topics other than those shown may also be suitable.

Solid-State Electronics. Semiconductor crystal growth: Czochralski bulk, epitaxial, (LPE, VPE, MOCVD, and MBE) and thin films. Processing: oxidation, diffusion, ion-implantation, rapid thermal processing, low pressure CVD, reactive ion etching, evaporation, and optical and electron beam lithography. Devices: quantum functional devices, neural network circuits, discrete and integrated circuits, thin film devices, solar cells, lasers, microwave devices, and integrated optical circuits. Characterization: electrical, optical, physical, and chemical measurements, SEM, STM/AFM, Auger surface analysis. Modeling: heterojunction device modeling, MOSFET and bipolar transistor modeling, charge carrier ballistics, Monte Carlo simulations, quantum device modeling, quantum transport, theory of optical processes and effects, and VLSI circuit design and novel architectures.

Power Engineering. Research efforts in power engineering are coordinated through the facility for advanced control of energy and power systems. Power systems: operation analysis, transient stability and reliability analysis, generation and transmission planning, system protection, and application of expert system. Transmission and distribution: electric power quality, distribution system design, load management, and automation. Power electronics: rectifiers and inverts, high power switching devices, power supplies for fusion devices, accelerators, and power conditioning. High voltage DC (HVDC): multi-terminal system control and operation analysis. High voltage techniques: electrical strength of dielectric, insulation coordination, aging of non-ceramic insulators, electric field distribution, and high altitude corona studies. Computer applications: software development for analysis and control, real-time computer control, large network analytical techniques, and neural networks. Solar energy: photovoltaic system design, analysis of dispersed generation, harmonics effect, and system interface. Nuclear plant diagnostics. Power generation: power plant dynamics, modeling, and diagnostics. Advanced instrumentation.

Control Systems. Nonlinear systems analysis and control; adaptive control; robust control; sampled-data and real-time digital control, virtual instrumentation in control; neural networks; system identification and model validation; control of distributed parameter systems; modeling, simulation, and graphical visualization of dynamical systems. Applications to aerospace, robotics, semiconductor process, manufacturing systems, and power systems.

Communications. Digital communications: modulation, coding equalization, wireless communications, multiple access; communications networks: wireless networks, quality of service, integrated services.

Signal Processing. Detection and estimation; signal processing architectures; nonlinear signal analysis; statistical decision theory; spectral estimation; image processing and compression; speech compression, coding and recognition; adaptive signal processing.

Antennas, Microwaves, Computational Electromagnetics, and Radar. Antennas: antenna analysis, design, and measurements; electromagnetic wave

radiation, propagation, scattering, and reception; slotted waveguides; patch antennas; antenna broadbanding techniques. Microwaves: microwave circuits, devices, and systems; microwave, millimeter wave, and optical integrated circuits and transmission lines; transient analysis of striplings and microstrips; printed lines on anisotropy substrates; microwave solid-state circuits and devices and measurement techniques. Packaging of microwave integrated circuits. Computational electromagnetics: Geometrical and physical theories of diffraction; moment method; finite-difference time-domain; finite element. Radar: wideband radar techniques, radar cross section, radar multipath, and tracking.

Lasers and Coherent Optics. Fiber optics: communications, active and passive components, networks, sensors, and system analysis; lasers, optical processing, and holography.

In addition, students are encouraged to undertake interdisciplinary research projects encompassing several technical areas in electrical engineering, as well as other areas of engineering, science and mathematics.

ELECTRICAL ENGINEERING (EEE)

EEE 405 Filter Design. (3) F
Principles of active and passive analog filter design, frequency domain approximations, sensitivity and synthesis of filters. Prerequisite: EEE 303.

EEE 407 Digital Signal Processing. (4) F
Time and frequency domain analysis, difference equations, z-transform, FIR and IIR Digital Filter Design, Discrete Fourier Transform, FFT, and random sequences. Lecture, lab. Prerequisites: EEE 303; MAT 342.

EEE 425 Digital Systems and Circuits. (4) F, S
Digital logic gate analysis and design. Propagation delay times, fan out, power dissipation, noise margins. Design of MOS and bipolar logic families, including NMOS, CMOS, standard and advanced TTL, ECL, and BiCMOS. Inverter, combinational and sequential logic circuit design, MOS memories, VLSI circuits. Computer simulations using PSPICE. Lecture, lab. Prerequisite: ECE 334.

EEE 433 Analog Integrated Circuits. (3) S
Analysis, design, and applications of modern analog circuits using integrated bipolar and field effect transistor technologies. Prerequisite: ECE 334.

EEE 434 Quantum Mechanics for Engineers. (3) F
Angular momentum, wave packets, Schroedinger wave equation, probability, problems in one dimension, principles of wave mechanics, scattering, tunneling, central forces, angular momentum, hydrogen atom, perturbation theory, variational techniques. Prerequisites: ECE 352; EEE 340.

EEE 435 Microelectronics. (3) S
Practice of solid-state device fabrication techniques, including thin film and integrated circuit fabrication principles. Lecture, lab. Pre- or corequisite: EEE 436.

EEE 436 Fundamentals of Solid-State Devices. (3) F, S
Semiconductor fundamentals, pn junctions, metal-semiconductor contacts, metal-oxide-semiconductor capacitors and field-effect transistors, bipolar junction transistors. Prerequisite: ECE 352.

EEE 437 Optoelectronics. (3) N
Basic operating principles of various types of optoelectronic devices which play important roles in commercial and communication electronics; light emitting diodes, injection lasers, and photodetectors. Prerequisite: EEE 436.

EEE 439 Semiconductor Facilities and Cleanroom Practices. (3) F
Microcontamination, controlled environments, cleanroom layout and systems, modeling, codes and legislation, ultrapure water, production materials, personnel and operations, hazard management, advanced concepts. Prerequisite: EEE 435 or instructor approval.

EEE 440 Electromagnetic Engineering II. (4) F, S
Second half of an introductory course in electromagnetic theory and its application in electrical engineering. Analytical and numerical solution of boundary value problems. Advanced transmission lines; waveguides; antennas; radiation and scattering. Lecture, lab. Prerequisite: EEE 340 or equivalent.

EEE 443 Antennas. (3) S
Fundamental parameters; engineering principles and radiation integrals; linear wire antennas; loops and arrays; numerical computations; measurements. Prerequisite: EEE 340 or equivalent.

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

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

EEE 455 Communication Systems. (4) F, S
Signal analysis techniques applied to the operation of electrical communication systems. An introduction to and overview of modern digital and analog communications. Lecture, lab. Prerequisites: EEE 303, 350.

EEE 459 Data Communication Systems. (3) S
System characteristics. Communications media. Communication codes. Data validity checking. Line protocols, terminals, and system configurations. Examples. Prerequisites: EEE 303, 350.

EEE 460 Nuclear Concepts for the 21st Century. (3) N
Radiation interactions, damage, dose, and instrumentation. Cosmic rays, satellite effects; soft errors; transmutation doping. Fission reactors, nuclear power. TMI, Chernobyl. Radioactive waste. Prerequisite: PHY 241 or 361.

EEE 463 Electrical Power Plant. (3) F
Nuclear, fossil, and solar energy sources. Analysis and design of steam supply systems, electrical generating systems, and auxiliary systems. Power plant efficiency and operation. Prerequisites: ECE 301, 340 (or PHY 241).

EEE 470 Electric Power Devices. (3) F
Analysis of devices used for short circuit protection, including circuit breakers, relays, and current and voltage transducers. Protection against switching and lightning over voltages. Insulation coordination. Prerequisite: EEE 360.

EEE 471 Power System Analysis. (3) S
Review of transmission line parameter calculation. Zero sequence impedance, symmetrical components for fault analysis, short circuit calculation, review of power flow analysis, power system stability, and power system control concepts. Prerequisite: EEE 360.

EEE 473 Electrical Machinery. (3) F
Operating principles, constructional details, and design aspects of conventional DC and AC machines, transformers and machines used in computer disc drives, printers, wrist watches, and automobiles. Prerequisite: EEE 360.

EEE 480 Feedback Systems. (4) F, S
Analysis and design of linear feedback systems. Frequency response and root locus techniques, series compensation, and state variable feedback. Lecture, lab. Prerequisite: EEE 303.

EEE 482 Introduction to State Space Methods. (3) F
Discrete and continuous systems in state space form controllability, stability, and pole placement. Observability and observers. Pre- or corequisites: EEE 303, 480; MAT 342.

EEE 490 Senior Design Laboratory. (3) F, S
Project-oriented laboratory. Each student must complete one or more design projects during the semester. Lecture, lab. Prerequisites: ECE 300, 334; EEE 303; senior status. *General Studies: L2.*

EEE 506 Digital Spectral Analysis. (3) S
Principles and applications of digital spectral analysis, least squares, random sequences, parametric, and nonparametric methods for spectral estimation. Prerequisites: EEE 407, 554.

EEE 507 Multidimensional Signal Processing. (3) F
Processing and representation of multidimensional signals. Design of systems for processing multidimensional data. Introduction to image and array processing issues. Prerequisite: EEE 407 or instructor approval.

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

EEE 511 Artificial Neural Computation Systems. (3) F
Networks for computation, learning function representations from data, learning algorithms and analysis, function approximation and information representation by networks, applications in control systems and signal analysis. Prerequisite: instructor approval.

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

EEE 525 VLSI Design. (3) F, S
Analysis and design of Very Large Scale Integrated (VLSI) Circuits. Physics of small devices, fabrication, regular structures, and system timing. Open only to graduate students.

EEE 526 VLSI Architectures. (3) F
Special-purpose architectures for signal processing. Design of array processor systems at the system level and processor level. High-level synthesis. Prerequisite: CSE 330 or EEE 407 or instructor approval.

EEE 530 Advanced Silicon Processing. (3) S
Thin films, CVD, oxidation, diffusion, ion-implantation for VLSI, metallization, silicides, advanced lithography, dry etching, rapid thermal processing. Pre- or corequisite: EEE 435.

EEE 531 Semiconductor Device Theory I. (3) F
Transport and recombination theory, pn and Schottky barrier diodes, bipolar and junction field-effect transistors, and MOS capacitors and transistors. Prerequisite: EEE 436 or equivalent.

EEE 532 Semiconductor Device Theory II. (3) S
Advanced MOSFETs, charge-coupled devices, solar cells, photodetectors, light-emitting diodes, microwave devices, and modulation-doped structures. Prerequisite: EEE 531.

EEE 533 Semiconductor Process/Device Simulation. (3) F
Process simulation concepts, oxidation, ion implantation, diffusion, device simulation concepts, pn junctions, MOS devices, bipolar transistors. Prerequisite: EEE 436 or equivalent.

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

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

EEE 537 Semiconductor Optoelectronics I. (3) F
Electronic states in semiconductors, quantum theory of radiation, absorption processes, radiative processes, nonradiative processes, photoluminescence, and photonic devices. Prerequisites: EEE 434, 436 (or 531).

EEE 538 Semiconductor Optoelectronics II. (3) S
Material and device physics of semiconductor lasers, light-emitting diodes, and photodetectors. Emerging material and device technology in III-V semiconductors. Prerequisite: EEE 537.

EEE 539 Introduction to Solid-State Electronics. (3) F
Crystal lattices, reciprocal lattices, quantum statistics, lattice dynamics, equilibrium, and nonequilibrium processes in semiconductors. Prerequisite: EEE 434.

EEE 541 Electromagnetic Fields and Guided Waves. (3) F
Polarization and magnetization; dielectric, conducting, anisotropic, and semiconducting media; duality, uniqueness, and image theory; plane wave functions, waveguides, resonators, and surface guided waves. Prerequisite: EEE 440 or equivalent.

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

EEE 544 High Resolution Radar. (3) N
Fundamentals; wideband coherent design, waveforms, and processing; stepped frequency; synthetic aperture radar (SAR); inverse synthetic aperture radar (ISAR); imaging. Prerequisites: EEE 303 and 340 *or* equivalents.

EEE 545 Microwave Circuit Design. (3) S
Analysis and design of microwave attenuators, in-phase and quadrature-phase power dividers, magic tee's, directional couplers, phase shifters, DC blocks, and equalizers. Prerequisite: EEE 445 or instructor approval.

EEE 546 Advanced Fiber-Optics. (3) N
Theory of propagation in fibers, couplers and connectors, distribution networks, modulation, noise and detection, system design, and fiber sensors. Prerequisite: EEE 448 or instructor approval.

EEE 547 Microwave Solid-State Circuit Design I. (3) N
Application of semiconductor characteristics to practical design of microwave mixers, detectors, limiters, switches, attenuators, multipliers, phase shifters, and amplifiers. Prerequisite: EEE 545 or instructor approval.

EEE 548 Coherent Optics. (3) N
Diffraction, lenses, optical processing, holography, electro-optics, and lasers. Prerequisite: EEE 440 or equivalent.

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

EEE 550 Transform Theory and Applications. (3) N
Introduction to abstract integration, function spaces, and complex analysis in the context of integral transform theory. Applications to signal analysis, communication theory, and system theory. Prerequisite: EEE 303.

EEE 551 Information and Coding Theory. (3) N
Fundamental theorems of information theory for sources and channels; convolutional and burst codes. Prerequisites: EEE 553, 554.

EEE 552 Digital Communications I. (3) S
Fundamentals of digital communications: complex signal theory; modulation; optimal coherent and incoherent receivers; coded modulation and the Viterbi algorithm. Prerequisites: EEE 455, 554.

EEE 553 Error-Correcting Codes. (3) S
Application of modern algebra to the design of random error-detecting and error-correcting block codes. Prerequisite: EEE 455.

EEE 554 Random Signal Theory I. (3) F
Application of statistical techniques to the representation and analysis of electrical signals and to communications systems analysis. Prerequisites: EEE 303 and 350 *or* instructor approval.

EEE 555 Random Signal Theory II. (3) S
Processing of signals in the presence of noise. Random signals, correlation, frequency spectra, estimation, filtering, noise, prediction, and transients. Prerequisite: EEE 554.

EEE 556 Detection and Estimation Theory. (3) S
Combination of the classical techniques of statistical inference and the random process characterization of communication, radar, and other modern data processing systems. Prerequisites: EEE 455, 554.

EEE 558 Digital Communications II. (3) F
Continuation of EEE 552. Advanced topics in digital communications: synchronization; multipath and fading; equalization; miscellaneous topics. Prerequisite: EEE 552.

EEE 571 Power System Transients. (3) N
Simple switching transients. Transient analysis by deduction. Damping of transients. Capacitor and reactor switching. Transient recovery voltage. Travelling waves on transmission lines. Lightning. Protection of equipment against transient overvoltages. Introduction to computer analysis of transients. Prerequisite: EEE 471.

EEE 572 Advanced Power Electronics. (3) N
Analysis of device operation, including thyristors, gate-turn-off thyristors, and transistors. Design of rectifier and inverter circuits. Applications such as variable speed drives, HVDC, motor control, and uninterruptable power supplies. Prerequisite: EEE 470.

EEE 574 Computer Solution of Power Systems. (3) S
Algorithms for digital computation for power flow, fault, and stability analysis. Sparse matrix and vector programming methods, numerical integration techniques, stochastic methods, solution of the least squares problem. Prerequisite: EEE 471.

EEE 577 Power Engineering Operations and Planning. (3) F
Economic dispatch, unit commitment, dynamic programming, power system planning and operation, control, generation modeling, AGC, and power production. Prerequisite: EEE 471 or graduate standing.

EEE 579 Power Transmission and Distribution. (3) S
High voltage transmission line electric design; conductors, corona, RI and TV noise, insulators, clearances. DC characteristic, feeders voltage drop, and capacitors. Prerequisite: EEE 470.

EEE 581 Filtering of Stochastic Processes. (3) N
Modeling, estimation, and filtering of stochastic processes, with emphasis on the Kalman filter and its applications in signal processing and control. Prerequisites: EEE 482, 550, 554.

EEE 582 Linear System Theory. (3) S
Controllability, observability, and realization theory for multivariable continuous time systems. Stabilization and asymptotic state estimation. Disturbance decoupling, noninteracting control. Prerequisite: EEE 482.

EEE 585 Digital Control Systems. (3) F
Analysis and design of digital and sampled data control systems, including sampling theory, z-transforms, the state transition method, stability, design, and synthesis. Prerequisites: EEE 482, 550.

EEE 586 Nonlinear Control Systems. (3) N
Stability theory, including phase-plane, describing function, Liapunov's method, and frequency domain criteria for continuous and discrete, nonlinear, and time-varying systems. Prerequisite: EEE 482.

EEE 587 Optimal Control. (3) F
Optimal control of systems. Calculus of variations, dynamic programming, linear quadratic regulator, numerical methods, and Pontryagin's principle. Cross-listed as MAE 507. Prerequisite: EEE 482 or MAE 506.

EEE 606 Adaptive Signal Processing. (3) F
Principles/applications of adaptive signal processing, adaptive linear combiner, Wiener least-squares solution, gradient search, performance surfaces, LMS/RLS algorithms, block time/frequency domain LMS. Prerequisites: EEE 506, 554.

EEE 631 Heterojunctions and Superlattices. (3) F
Principles of heterojunctions and quantum well structures, band lineups, optical, and electrical properties. Introduction to heterojunction devices. Prerequisites: EEE 436, 531.

EEE 632 Heterojunction Devices. (3) N
Principles of semiconductor heterojunctions and quantum wells are applied to the analysis of advanced electronic and optical devices. Devices studied are modulation doped field effect transistors (MODFETs), pseudomorphic MODFETs, heterojunction bipolar transistors, quantum well and superlattice optical detectors, modulators, and lasers. Prerequisites: EEE 434, 436, 531, 631.

EEE 641 Advanced Electromagnetic Field Theory. (3) N
Cylindrical wave functions, waveguides, and resonators; spherical wave functions and resonators; scattering from planar, cylindrical, and spherical surfaces; Green's functions. Prerequisite: EEE 541 or equivalent.

EEE 643 Advanced Topics in Electromagnetic Radiation. (3) N
High-frequency asymptotic techniques, geometrical and physical theories of diffraction (GTD and PTD), moment method (MM), radar cross section (RCS) prediction, Fourier transforms in radiation, and synthesis methods. Prerequisite: EEE 543.

EEE 647 Microwave Solid-State Circuit Design II. (3) F
Practical design of microwave free-running and voltage-controlled oscillators using Gunn and Impatt diodes and transistors; analysis of noise characteristics of the oscillator. Prerequisites: EEE 545, 547.

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

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

EEE 732 Advanced Bipolar Devices and Circuits. (3) N
Critical examination of new bipolar device and circuit technologies. Performance trade-offs, scaling effects, and modeling techniques. Prerequisite: EEE 531.

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

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Engineering Courses

Graduate courses offered by the College of Engineering and Applied Sciences that apply to degree requirements are listed under degree majors in this catalog. Basic courses that may be required, or taken as electives, are shown below.

ANALYSIS AND SYSTEMS (ASE)

ASE 485 Engineering Statistics. (3) F, S, SS
Designing statistical studies for solutions to engineering problems. Methods include regression, design and analysis of experiments, and other statistical topics. Prerequisite: ECE 380. *General Studies: N2.*

ASE 496 Professional Seminar. (0) F, S
Topics of interest to students in the engineering special and interdisciplinary studies.

ASE 500 Research Methods: Engineering Statistics. (3) F, S, SS
Designing statistical studies for solutions to engineering problems. Methods include regression, design and analysis of experiments, and other statistical topics. Prerequisite: ECE 380.

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

ASE 586 Partial Differential Equations in Engineering. (3) S
Development and solution of partial differential equations in engineering. Applications in solid mechanics, vibrations, and heat transfer. Prerequisites: ECE 386; MAT 242, 274.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Engineering Science

The faculty of the School of Engineering offer graduate programs leading to the M.S., the Master of Science in Engineering, and the Ph.D. degrees in Engineering Science. An area of study is available in Materials Science and Engineering. Contact the Department of Chemical, Bio, and Materials Engineering.

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.

MASTER OF SCIENCE

See pages 97–99 for information on the M.S. degree.

MASTER OF SCIENCE IN ENGINEERING

See page 114 for information on the Master of Science in Engineering degree.

DOCTOR OF PHILOSOPHY

See pages 120–122 for information on the Ph.D. degree.

RESEARCH ACTIVITY

Engineering Science

Faculty in the School of Engineering offer programs of a special and interdisciplinary nature.

Materials Science and Engineering

Stephen J. Krause
Professor
(EC G202) 602/965–3313

FACULTY
ADAMS, ALFORD, CARPENTER, DEY, KRAUSE, MAHAJAN, MAYER

Faculty members who advise students in this area of study are located within the Department of Chemical, Bio, and Materials Engineering. Courses offered carry the MSE prefix and are listed on pages 151–152 , following the list of courses offered in Materials Science and Engineering.

Requirements for the M.S. degree are described on pages 97–99; those for the Master of Science in Engineering, on page 114; and those for the Ph.D., on pages 120–122.

Each student admitted as a regular degree candidate is required to complete an approved program of study. Students who have an undergraduate degree in an area other than materials science, or a similarly named program, may qualify for admission to a transition program and may be required to take one or more undergraduate courses in preparation for enrollment in graduate courses in Materials Science and Engineering. The program of study of transition students is determined by the student's supervisory committee after review of the student's academic record.

Research activities in Materials Science and Engineering include programs in semiconductor processing and characterization, polymeric and ceramic composites, cuprates for high critical temperature superconductor applications, ferritic thin films for capacitor and memory applications, high temperature materials for space applications, mechanical behavior of high strength Al-Li alloys, environmentally influenced mechanical effects, and microbiologically influenced corrosion reactions.

English

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REGENTS' PROFESSORS
DUBIE, RIOS

PROFESSORS
BENDER, BJORK, BOYER, BRACK, BRINK, BUCKINGHAM, CARLSON, DONELSON, HELMS, KEHL, LESTER, LIGHTFOOT, A. NILSEN, D. NILSEN, RHODES, RICHARD, ROEN, SANDS, WILKINS

ASSOCIATE PROFESSORS
ADAMS, BATES, CHANCY, CORSE, DeLAMOTTE, DUBIE, GOLDBERG, GREEN, GUTIERREZ, HORAN, JANSSEN, D.B. MAHONEY, MAJOR, MILLER, MORGAN, NELSON, OJALA, RAMAGE, SCHWALM, SENSIBAR

ASSISTANT PROFESSORS
BIVONA, CASTLE, FUSE, GOGGIN, HARRIS, JOHNSON, LUSSIER, McCABE, PERRY, PRITCHARD, STEVENS, TOHE, VAN GELDEREN

SENIOR LECTURERS
COOK, DUGAN

LECTURERS
COOPER, DWYER, KYBURZ, D.M. MAHONEY, OBERMEIER, ORLICH, SUDOL, WHEELER

ACADEMIC PROFESSIONAL
GLAU

The faculty in the Department of English offer the M.A. degree in English, the Master of Teaching English as a Second Language degree, and the Ph.D. degree in English.

Students admitted to the Master of Education degree program with a major in Secondary Education may also elect English as the subject matter field. See pages 103–104 for information on the Master of Education degree.

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 pages 105–108 for M.F.A. program descriptions and requirements.

MASTER OF ARTS

This degree is designed to provide further cultural and professional advancement for students of English.

Admission Requirements. The department requires that applicants have an undergraduate major in English and a 3.00 GPA in courses taken in the major field. Those who do not have a major in English are encouraged to register as nondegree students while they take courses in areas of deficiency as identified by the advisor.

Deadline for admission applications and requests for financial assistance, including teaching assistantships, is February 1. Incomplete files are not considered.

Applicants for the M.A. program in English with concentrations in literature and language and rhetoric and composition are required to submit Graduate Record Examination (GRE) General Test scores, three letters of recommendation, a personal statement of aims and purposes, and an academic writing sample.

Applicants for the M.A. program with a concentration in English linguistics must show completion of one upper-division course in a linguistics-related field, and must submit a personal statement of aims and purposes and three letters of recommendation. GRE scores are not required.

Applicants for the M.A. program in English with a concentration in comparative literature must prove fluency in a foreign language to a level sufficient for graduate study.

Program of Study. A student may pursue a concentration in comparative literature, English linguistics, literature and language, or rhetoric and composition.

For the concentration in comparative literature, a candidate must complete 36 semester hours of graduate courses, with a minimum of 12 hours being taken in the Department of Languages and Literatures. Included in the 36 hours must be ENG 500 Research Methods, ENG 501 Introduction to Comparative Literature, and ENG 599 Thesis.

For the concentration in English linguistics, a candidate must complete a minimum of 30 semester hours of graduate courses. The 30 semester hours must include LIN 500 Research Methods, 511, 514, one LIN 591 Seminar, or their equivalents chosen in consultation with the advisor, and ENG 599 Thesis. Electives are chosen in consultation with the advisor.

For the concentration in literature and language, a candidate must complete a minimum of 30 semester hours. The 30 semester hours must include ENG 500 Research Methods; a course in Literary Theory; ENG 599 Thesis, a 12-hour distribution requirement; and six hours of other electives. Two courses selected must carry ENG 591 Seminar credit.

For the concentration in rhetoric and composition, a candidate must complete a minimum of 30 hours of graduate courses, including a 12-hour core, a six-hour thesis, and 12 elective hours that must include six hours of ENG 591 Seminar and may include nine hours of appropriate graduate courses outside the English department.

Foreign Language Requirements. A reading knowledge of French, German, Spanish, or other suitable language is required. The choice of language must be approved by the student's supervisory committee.

Comprehensive Examinations. A comprehensive examination is required for students in the comparative literature concentration. (A detailed description of its scope is available in the Department of English.)

Thesis Requirements. A thesis is required.

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

M.TESL

The Master of Teaching English as a Second Language degree is designed for students who seek a professionally oriented graduate education. For information, see pages 116–117.

DOCTOR OF PHILOSOPHY

See pages 120–122 for general requirements.

Admission Requirements. Applicants for the Ph.D. degree in English are required to submit scores on the GRE (verbal and advanced literature sections), three letters of recommendation, a personal statement of aims and purposes, and an academic writing sample. Deadline for admission applications and requests for financial aid, including teaching assistantships, is February 1. Incomplete files are not considered.

Areas of Concentration. The Ph.D. degree in English offers concentrations in the following areas:

Literature. A minimum of 60 hours of graduate courses (exclusive of dissertation) beyond the bachelor's degree constitutes the formal course preparation. Specifically required are three hours in history of the English language (for example, LIN 505 American English, ENG 507 Old English, ENG 508 Old English Literature, ENG 509 Middle English, and LIN 548 Studies in English Language); six hours in theory courses; and the following distribution requirement: English literature before 1660 (including one course in each of the following: Chaucer, Shakespeare, and Milton); English literature 1660–1900; British literature since 1900; American literature before 1900; and American literature since 1900. Students must take a minimum of five graduate seminars en route to the Ph.D. degree, at least three of which must be taken in the doctoral program at ASU. Up to 12 hours of course work taken outside the department may be counted toward the degree.

Rhetoric/Composition and Linguistics. A minimum of 60 hours of graduate courses (exclusive of dissertation) beyond the bachelor's degree constitutes the formal course preparation. Specifically required are three hours of language (for example, LIN 505 American English, ENG 507 Old English, ENG 508 Old English Literature, ENG 590 Middle English, LIN 548 Studies in English Language); six hours in theory courses; and the following distribution requirements: Syntax/Semantics; Rhetorical Theory; Composition Theory and Method; Philosophy and Theories of Pedagogy; Pragmatics/Sociolinguistics. Students must take a minimum of five graduate seminars en route to the Ph.D. degree, at least three of which must be taken in the doctoral program at ASU. Up to 12 hours of course work taken outside the department may be counted toward the degree.

Foreign Language Requirements. A competent reading knowledge of a language other than modern English is required. The requirement can be met by

1. earning a grade of "B" or higher in a 400- or 500-level course in an appropriate language;
2. demonstrating proficiency by taking a language examination approved by the supervisory committee; and
3. showing native speaker proficiency in a language approved by the supervisory committee.

Ph.D. Examinations. The Ph.D. examination consists of three parts. Part I is a portfolio of three essays, representing different historical periods or fields of concentration and employing more than one critical approach. After successful completion of Part I, the student may advance to Part II, a three-hour written exam in the student's area of specialization based on a bibliography compiled by the student and approved by the student's supervisory committee. Part III is a colloquy, based on a written prospectus, defining the topic, scope, and significance of the dissertation.

Dissertation Requirements. (See dissertation requirements on page 121.) The subject of the dissertation is decided in consultation with the chair of the student's supervisory committee, subject to approval of the director of the Ph.D. program.

Final Examinations. A final examination in defense of the dissertation, arguing for its method and conclusions, is required.

RESEARCH ACTIVITY

Recent and current research by the Department of English faculty includes the following titles and areas: Old English poetry; Arthurian romance; Renaissance literature; the Elizabethan masque; Shakespeare's plays in performance; Spenser biography; wordplay in Milton; literature of the age of discovery and encounter; literature of the Restoration; textual edition of Smollett (nine volumes) and Johnson (three volumes); letters of William Michael Rossetti; Victorian poetry; American sea fiction; Melville; reception of Dickinson's poetry, bibliography of Dickinson criticism; 19th-century American literary periodicals; American writers' responses to Darwin (from Howells to Hemingway); Kate Chopin; *Sehnsucht* in 20th-century American literature; Faulkner; biblical backgrounds for literature; Chicana/o literature; film history; film making in Arizona; science fiction and fantasy; literature and aging; gender studies; contemporary literary theory; translation theory; censorship in American schools; young adult literature; classical, 18th-century and modern rhetoric; stylistics; Latin American literature; composition theory; history of the English curriculum; literary language and the type-token ratio; sociolinguistics; pragmatics and discourse analysis; language and politics; language and gender; iconicity in syntax, connectionism and language teaching; phonology; natural language processing; language typology; language acquisition; English morphological structure; performance and contemporary theater; literatures of the Americas; gender studies in comparative contexts; science and literature; history of secondary English teaching; Irish literature; gay and lesbian studies; post colonialism; Native American literature; Afro-Caribbean literature; Black women writers; modern and contemporary drama; African American literature and popular culture; the representation of fasting women in early modern discourse; early modern prose fiction; contemporary multicultural literature; colonialism and culture; travel literature; William Blake.

Among recent books published by the faculty are *Gospel Fictions; As Far Away as China; Perspectives on Official English; On the Rim of the Mandala; Body Betrayer; Snow Water Cove; Writing Arguments; Groom Falconer; The Lime Orchard Woman; News of the World; The Old English Verse Saints' Lives; The Origins of Faulkner's Art; Richard Brautigan; Screenwriting: A Method; Thematic Relations; Truants; Worlds Within Women: Myth and Mythmaking in Fantastic Literature by Women; Faulkner's Poetry; Emily Dickinson's Critical Reception in the 1890s: A Documentary History; Studies in American Indian Literature; American Indian Women: A Guide to Research; Sacrificial Smoke* (trans.); *Expedition of Humphry Clinker* (ed.)*; Playing With Gender: A Renaissance Pursuit* (ed.)*; Dryden's Aeneid: The English Virgil; Radio Sky; Victorian Sages and Cultural Discourse: Renegotiating Gender and Power* (ed.)*; Teodoro Luna's Two Kisses; Teaching and Learning English Worldwide* (ed.)*; Only a Mother* (trans.)*; The Adventures of Ferdinand Count Fathom* (ed.)*; The History and Adventures of an Atom* (ed.)*; The Clouds of Magellan; Voice of Deliverance: The Language of Martin Luther King, Jr., and Its Sources; American College Life in English Communication; Your Reading; Humor in American Literature: A Selected Annotated Bibliography; Writing Arguments; Voodoo Dreams; The Instinct for Bliss; Inspiring Literacy: Literature for Children and Young Adults* (ed.); *Men Writing the Feminine: Literature, Theory, and the Question of Genders; Lushootseed Dictionary* (ed.); *Writing and Being; Sea Brothers: The Tradition of American Sea Fiction from Moby Dick to Present; Elizabeth Bishop: Her Poetics of Loss; Ismael Reed; Sidney Lumet; Charreria Mexicana An Equestrian Folk Tradition; Gabriela Mistral: An Artist and Her People; Cynewulf: Basic Readings (ed.); Magic City; Presenting M.E. Ker; A Beowulf Handbook; Bob Rafelson; Humor in Irish Literature; Humor in British Literature from the Middle Ages to the Restoration; Major Women Writers of Seventeenth-Century England (ed.); Pig Cookies; The Hotel Eden; Fortress of the Sun; The Descent of Love: Darwin and the Theory of Sexual Selection in American Fiction; Desire and Contradiction: Imperial Visions and Domestic Debates in Victorian Literature; British Imperial Literature, 1870-1940: Writing and the Administration of the Empire; The Rise of Functional Categories; Verbal Agreement and the Grammar behind its Breakdown; Romantic Dynamics: The Poetics of Physicality; Who Wrote the Gospels; Women Shapeshifters: Transforming the Contemporary Novel; Perils of the Night: A Feminist Study of Nineteenth-Century Gothic; Women Imagine Change: A Global Anthology of Women's Resistance from 600 B.C to Present; Framing Silence: Revolutionary Novels by Haitian Women; Searching for Safe Spaces: Afro-Caribbean Women Writers in Exile; Happiness (trans. and ed.); The Writer's Toolbox; Living Rhetoric and Composition: Stories of the Discipline; Thinking and*

Writing by Design; Ntozake Shange: A Critical Study of the Plays; Anne Conway: The Principles of the Most Ancient and Modern Philosophy (trans. and ed.).

English faculty currently serve as editors of *Explorations in Ethnic Studies; Modern Scandinavian Literature in Translation; Rocky Mountain Review of Language and Literature; Centennial Review; Manoa: New Chicano Writing.* Other faculty serve on the editorial boards of *Age of Johnson, English Literature in Transition, MELUS, Metaphor and Symbolic Activity: An Interdisciplinary Journal of Empirical Inquiry, Modern Language Journal, Revista Argentina de Linguistic, Rhetoric Review, Resources for American Literary Study, Dickinson Studies,* and *18th Century: A Current Bibliography; Victorian Poetry; WPA: Writing Program Administration; Studies in American Indian Literature; English Journal; English Education.*

ENGLISH (ENG)

ENG 400 History of Literary Criticism. (3) N
Major critics and critical traditions in the western world. Prerequisite: 6 hours of literature or instructor approval. *General Studies: HU.*

ENG 405 Style and Stylistics. (3) N
Linguistic, rhetorical, and literary approaches to the analysis of style in poetry, fiction, and other forms of written discourse.

ENG 409 Advanced Screenwriting II. (3) N
Application of the principles taught in a complete feature-length screenplay.

ENG 411 Advanced Creative Writing. (3) F, S
Separate poetry and fiction workshops for experienced writers, emphasizing individual style. May be taken once for poetry, once for fiction. Prerequisite: ENG 310 or instructor approval.

ENG 412 Professional Writing. (3) N
Lectures and conferences concerning techniques of writing for publication. Prerequisite: ENG 310 or instructor approval.

ENG 413 History of the English Language. (3) A
Development of English from the earliest times to the modern period. Prerequisite: junior standing or instructor approval. *General Studies: HU.*

ENG 415 Medieval Literature. (3) N
Medieval English literature in translation, from *Beowulf* to Malory (excluding Chaucer), emphasizing cultural and intellectual backgrounds; includes continental works. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

ENG 416 Chaucer: *Canterbury Tales.* (3) A
Chaucer's language, his last work, and its relationship to continental and insular traditions. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

ENG 417 Chaucer: *Troilus and Criseyde* and the Minor Works. (3) N
Chaucer's language, his major poem, and his early works in their medieval context. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

ENG 418 Renaissance Literature. (3) N
Poetry and prose, 1485–1603, excluding the drama. Humanism and major genres; More, Sidney, Spenser, and other representative writers. Prerequisite: ENG 221 or instructor approval. *General Studies: L2/HU.*

ENG 419 English Literature in the Early 17th Century. (3) N
Prose and poetry, exclusive of Milton and the drama. Metaphysical, Cavalier, and neoclassical verse; Donne, Jonson, Bacon, and other representative writers. Prerequisite: ENG 221 or instructor approval. *General Studies: L2/HU.*

ENG 423 Renaissance Drama. (3) N
Drama of the Tudor and early Stuart periods (exclusive of Shakespeare). Includes Kyd, Marlowe, Jonson, and Webster. Prerequisite: ENG 221 or instructor approval. *General Studies: L2/HU.*

ENG 424 Milton. (3) A
Selected prose and poetry, emphasizing *Paradise Lost, Paradise Regained,* and *Samson Agonistes.* Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

ENG 425 Romantic Poetry. (3) N
Poetry of Wordsworth, Coleridge, Shelley, Keats, and Byron. *General Studies: HU.*

ENG 426 Victorian Poetry. (3) N
Poetry of the second half of the 19th century. Special study of Tennyson, Browning, and Arnold. Prerequisite: ENG 222 or instructor approval. *General Studies: L2/HU.*

ENG 427 Restoration and Early 18th Century. (3) N
Writers and movements in the nondramatic literature of the Restoration and early 18th century. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

ENG 428 The Later 18th Century. (3) N
Writers, movements, and books during the second half of the 18th century. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

ENG 430 Victorian Cultural Backgrounds. (3) N
Social, religious, and other cultural issues in prose by such writers as Carlyle, Ruskin, Darwin, Arnold, Pater, and Morris. Prerequisite: ENG 222 or instructor approval. *General Studies: L2/HU.*

ENG 435 19th-Century American Poetry. (3) N
Themes and developments in American poetry to 1900, including Poe, Whitman, and Dickinson. *General Studies: HU.*

ENG 439 Restoration and 18th-Century Drama. (3) S 1999
English drama 1600–1800. Prerequisite: ENG 221 or instructor approval. *General Studies: HU.*

ENG 440 American Literature to 1815. (3) N
Thought and expression from the time of the first English-speaking colonies to 1815. Prerequisite: ENG 241 or instructor approval. *General Studies: HU.*

ENG 441 20th-Century American Drama. (3) N
American drama since World War I, especially experimental techniques. Prerequisite: ENG 241 or 242 or instructor approval. *General Studies: HU.*

ENG 442 20th-Century British and Irish Poetry. (3) N
Theory and practice of poetry since 1900. Prerequisite: ENG 222 or instructor approval.

ENG 443 American Poetry, 1900–1945. (3) N
Developments in theory and practice of major poets. Prerequisite: ENG 241 or 242 or instructor approval. *General Studies: HU.*

ENG 444 Studies in American Romanticism, 1830–1860. (3) N
Cultural expression in works of representative writers. Prerequisite: ENG 241 or instructor approval. *General Studies: HU.*

ENG 445 American Realism, 1870–1900. (3) N
Writers and influences that shaped the development of literary realism. *General Studies: L2/HU.*

ENG 448 20th-Century British and Irish Novel. (3) N
Theory and practice of the novel since 1900. Prerequisite: ENG 222 or instructor approval. *General Studies: HU.*

ENG 451 The Novel to Jane Austen. (3) N
From origins of prose fiction through the 18th century. *General Studies: HU, H.*

ENG 452 The 19th-Century Novel. (3) N
From Scott to Conrad. *General Studies: HU.*

ENG 453 The American Novel to 1900. (3) N
The rise and development of the novel to Dreiser. Prerequisite: ENG 241 or instructor approval. *General Studies: HU.*

ENG 454 The American Novel, 1900–1945. (3) N
Developments in theory and practice of major novelists. Prerequisite: ENG 241 or 242 or instructor approval. *General Studies: HU.*

ENG 455 The Form of Verse: Theory and Practice. (3) N
Types, history, criticism, and schools of theory of metrical form. Analysis of lyric, narrative, and dramatic poetry.

ENG 457 American Poetry Since 1945. (3) A
Major American poets of the period. Developments in theory and practice. Prerequisite: ENG 241 or instructor approval. *General Studies: HU.*

ENG 458 American Novel Since 1945. (3) N
Major novelists of the period. Developments in theory and practice. Prerequisite: ENG 242 or instructor approval. *General Studies: L2/HU.*

ENG 460 Western American Literature. (3) A
Critical examination of ideas and traditions of the literature of the western United States, including the novel. *General Studies: L2/HU.*

ENG 461 Women and Literature. (3) N
Selected topics in literature by or about women. May be repeated for credit when topics vary. *General Studies: HU.*

ENG 462 20th-Century Women Authors. (3) N
Critical examination of literature by 20th-century women writers. May be repeated for credit when topics vary. *General Studies: HU.*

ENG 463 European Drama from Ibsen to 1914. (3) N
Chief continental and British dramatists of the period, emphasizing the beginnings and development of realism. *General Studies: HU.*

ENG 464 European Drama from 1914 to the Present. (3) N
Chief continental and British dramatists of the period, emphasizing experimental techniques. *General Studies: HU.*

ENG 471 Literature for Adolescents. (3) F, S
Prose and poetry that meet the interests and capabilities of junior high and high school students. Recent literature stressed. A passing grade of at least "C" required before students are permitted to student teach in English. *General Studies: HU.*

ENG 480 Methods of Teaching English. (3) F, S
Methods of instruction, organization, and presentation of appropriate content in English. A passing grade of at least "C" required before students are permitted to student teach in English. Prerequisite: ENG 312 or 314 or 413.

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

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

ENG 502 Contemporary Critical Theory. (3) A
An advanced survey of major schools of 20th-century literary and critical theory. Lecture, discussion. Cross-listed as HUM 549.

ENG 507 Old English. (3) N
Elements of Old English grammar with selected readings.

ENG 508 Old English Literature. (3) N
Intensive literary, linguistic, and cultural study of Old English literature. May be repeated for credit when topics vary. Prerequisite: ENG 507.

ENG 509 Middle English. (3) N
A study of the principal dialects of the language with selected readings. Prerequisite: graduate standing.

ENG 512 The Teaching of Composition. (3) N
The theory and practice of teaching writing at all levels. Emphasis on current research. Prerequisites: teaching experience; instructor approval.

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

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

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

ENG 521 Shakespeare. (3) A
A selection of comedies, histories, and tragedies presented in the context of literary history and critical theories, with an emphasis on classical and medieval backgrounds.

ENG 525 American Literary Criticism. (3) N
Analysis and discussion of leading historical and critical interpretations of American literature from the beginnings to the present.

ENG 530 Classical Rhetoric and Written Composition. (3) F 1999
Relationship of major texts in classical rhetoric to developments in composition theory, literary theory, and practice through the 19th century.

ENG 531 Rhetorical Theory and Literary Criticism. (3) S 1999
Intensive study of major rhetorical theorists of the 20th century in such areas as literary criticism, discourse theory, and composition theory.

ENG 532 Composition Theory. (3) N
Intensive study in the rhetorical categories of invention, arrangement, style, aims, modes, and forms of written discourse.

ENG 545 Studies in English Literature. (3) N
This course offers selected authors or issues and may be repeated for credit.

ENG 547 Studies in American Literature. (3) N
This course offers selected authors or issues and may be repeated for credit.

ENG 549 Studies in Comparative Literature. (3) N
This course offers selected authors or issues and may be repeated for credit.

ENG 550 Contemporary Comparative Literature. (3) N
Comparative studies in modern literature in English and other literatures in translation. May be repeated for credit when content varies.

ENG 560 Studies in Dramatic Forms. (3) F, N
Selected topics in dramatic and cinematic literature, history, criticism, theory, and cross-disciplinary study. May be repeated for credit when topic varies. Lecture, studio.

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

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

ENG 591 Seminar. (3) F, S
Selected topics regularly offered in the various areas of English studies.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

LINGUISTICS (LIN)

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

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

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

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

LIN 513 Semantics. (3) F 1998
Current approaches to linguistic meaning with particular attention to English. Prerequisite: LIN 510 or equivalent or instructor approval.

LIN 514 Syntax. (3) S
The analysis of syntactic structure by contemporary theoretical models with a focus on English. Prerequisite: LIN 510 or equivalent or instructor approval.

LIN 516 Pragmatics and Discourse Theory. (3) F 1999
The study of language use in context and of language structures in conversation and written text. Lecture, discussion. Prerequisite: LIN 510 or equivalent or instructor approval.

LIN 548 Studies in English Language. (3) N
This course offers selected authors or issues and may be repeated for credit.

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

LIN 574 The Teaching of English as a Second Language. (3) S
Methods of teaching English as a second language, language teaching trends, practical applications, and the teaching of different skills. Prerequisite: LIN 572 or instructor approval.

LIN 575 Advanced Studies in the Teaching of English as a Second Language. (3) A
Current research issues in the teaching and learning of English as a second language. Prerequisite: LIN 572 or instructor approval.

LIN 576 Sociolinguistic Aspects of Second Language Acquisition. (3) N
A survey of studies in second language acquisition in the context of recent sociolinguistic theory.

LIN 577 Grammar for TESL. (3) N
A survey of major grammatical structures in English and how they can be taught to ESL speakers. Lecture, discussion. Prerequisite: LIN 510.

LIN 591 Seminar. (3) F, S
Selected topics.

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

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Environmental Design and Planning

Michael D. Kroelinger
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SCHOOL OF ARCHITECTURE
Regents' Professor: J. Cook;
Professors: Boyle, El Diasty, McSheffrey, Scheatzle;
Associate Professors: McIntosh, Ozel, Zygas

SCHOOL OF DESIGN
Professors: Kroelinger, Resnikoff;
Associate Professors: Brandt, Dahl, Witt

SCHOOL OF PLANNING AND LANDSCAPE ARCHITECTURE
Professors: Brady, Brock, Kihl, Lai, Mushkatel, Pijawka, Steiner;
Associate Professors: E. Cook, Green, Kim, Miller, Whysong, Yabes;
Assistant Professors: Cameron, Crewe, Guhathakurta

The Committee on Environmental Design and Planning offers a collegewide interdisciplinary program leading to the Ph.D. degree in Environmental Design and Planning. Three areas of concentration are available: design; history, theory, and criticism; and planning. The faculty of the Schools of Architecture, Design, and Planning and Landscape Architecture participate in offering the degree. Faculty from disciplines outside of the College of Architecture and Environmental Design may participate in offering the program if appropriate to the interdisciplinary nature of the student's research interest.

DOCTOR OF PHILOSOPHY

The Ph.D. degree in Environmental Design and Planning is an individualized collegewide interdisciplinary degree that integrates graduate courses and faculty research expertise from a variety of academic areas: architecture, building design, environmental planning, environmental resources, graphic design, industrial design, and interior design. The program is at the cutting edge of creating new knowledge in environmental design and planning. It complements interdisciplinary research in other disciplines within the university. Broad in scope, the program involves multidisciplinary research interests at both micro- and macro-scale levels of design and planning. The program provides research experience for students wishing to pursue careers in academe and in industry as members of interdisciplinary design and planning teams on environmental and energy issues, as well as for those wishing to teach in the architecture, design, or planning fields.

Areas of Concentration

The Ph.D. degree in Environmental Design and Planning offers concentrations in the following areas based on the research and teaching expertise of participating faculty.

Design. Design—microscale issues in the designed environment—includes the study of architecture, building science, graphic design, industrial design, interior design, and landscape architecture. Research fields include acoustics, affordable housing, climate-responsive building, computer-aided design, energy modeling, exhibit design, human factors in design, facilities planning and management, fire protection, industrialized housing, landscape architecture, lighting, passive solar energy and conservation, and site planning and wayfinding.

History, Theory, and Criticism. History, theory, and criticism—cultural and theoretical issues in the history of the environment—includes the study of architecture, environmental planning, industrial design, interior design, landscape architecture, and urbanism. Research fields include study of the arts and crafts movement, contemporary criticism and analysis, design theories and methods, history of building science, history of city planning, landscape theory and criticism, and the history of architecture and design.

Planning. Planning—macroscale issues in the planned environment—includes the study of environmental resource management, landscape architecture, planning, and urban design. Research fields include contemporary urban design, economic development, environmental assessment, environmental planning, ethics in planning, housing and urban development, international development planning, landscape ecology, legal aspects of planning, planning for ethnically diverse populations, the protection of environmentally sensitive areas, public participation, social dimensions of planning, urban design policy, urban planning, and urban and regional development.

Admission Requirements. Students are admitted to the Ph.D. program only upon completion of a master's degree in architecture, industrial design, interior 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
P.O. BOX 871905
TEMPE, AZ 85287–1905

1. a minimum of three letters of reference;
2. a sample of written work and any other evidence relevant to admission to the program;
3. a statement of purpose (summarizing career objectives, the reasons for pursuing a doctoral education, an indication of the proposed area of concentration, and a potential mentor in the College of Architecture and Environmental Design); and
4. Graduate Record Examination (GRE) scores.

A Test of English as a Foreign Language score of at least 600 is required of all applicants whose native language is not English.

Submitted materials are returned after final admission procedures, provided sufficient prepaid postage is enclosed, or if the materials are claimed in person within one year of submission. Unclaimed materials are retained for only one year. The Ph.D. program assumes no liability for lost or damaged materials.

Application Deadlines. All application materials should be received on or before February 15 for fall semester admissions. Applications for associateships and scholarships normally are considered at the same time.

Selection Procedures. The Ph.D. Executive Committee evaluates the applications and supporting materials and recommends to the Graduate College whether the applicant should be granted admission or if admission should be denied. Admission decisions are based on the compatibility of the applicant's career goals with the purpose of the degree program and research interests of faculty, previous academic training and performance, GRE scores, reference letters, and the ability of the potential mentor to devote time to the student.

If admission is provisional, the Graduate College specifies in its letter of admission the provisions to be met to gain regular status. The Ph.D. Program informs successful applicants of the procedures for enrollment.

Program of Study. The Ph.D. degree in Environmental Design and Planning is structured as a 54-semester-hour post-master's program, not as an 84-semester-hour postbaccalaureate program. Students must be thoroughly familiar with design and planning and are expected to demonstrate a high level of academic maturity before being admitted to the program.

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. The program of study consists of a minimum of 54 semester hours of graduate work beyond the master's degree. 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; an additional six semester hours in current research and research methods is required.

Preliminary Candidate Evaluation. Before the end of the first academic semester of course work, the student's mentor and the program director conduct a preliminary evaluation of the student. The evaluation is based on the student's program check sheet, a progress evaluation by the mentor, and an informal meeting with the program director. It is directed at the student's selected area of concentration at the time of their admission to the program.

Performance on the preliminary evaluation candidate serves as a guide to the student's program committee as the committee members counsel the student and formulate a program of study.

Academic Standard and Evaluation. Each student in the program will receive an annual evaluation. Students will submit, to their mentor and the program director, a two-page summation of the academic year. The summation must include proposed research, including progress toward dissertation; a list of goals accomplished during the past academic year; and projected goals for the upcoming academic year. In addition students will present their summation to the CAED core faculty.

Students must meet the minimum Graduate College requirements, but program standards may exceed these requirements. For example, students are expected to

1. have all grades in graduate courses 3.00 GPA or higher,
2. have made sufficient progress in their research projects,
3. have attended or presented papers at seminars/meetings,
4. have accomplished their goals from the previous year, and
5. set realistic goals for the upcoming academic year.

Foreign Language Requirements. None.

Comprehensive Examinations. Upon completion of course work in the Ph.D. program of study and before admission to candidacy and the start of dissertation research, the student must take a written examination on his or her knowledge of the chosen area of concentration and interdisciplinary knowledge, including the ability to communicate across disciplines. The student's program committee conducts an oral examination following the review of the written examination.

Dissertation Requirements. The dissertation must consist of a fully documented written analysis of a problem that is original in nature and extends the knowledge and/or theoretical framework of the field. The research must demonstrate the student's creativity and competence in independent research.

Final Examinations. A final oral examination in defense of the dissertation is required. A candidate must pass the final examination within five years after completing the comprehensive examination.

RESEARCH ACTIVITY

The College of Architecture and Environmental Design maintains a rooftop testing laboratory for solar research, a high-bay research facility, a lighting simulation laboratory, a human factors laboratory, an urban design laboratory, an extensive shop facility, computing resources and laboratories, a material resource center, a general rangeland ecology laboratory, a soils and riparian research laboratory, a GIS laboratory, and a range-wildlife nutrition ecology laboratory. These facilities are augmented by the CAED library, media center, and the Gallery of Design.

Facilities for basic research activities and community service oriented programs in energy technology, design, real estate development, and planning are also provided by the college through the Herberger Center for Design Excellence and the joint urban design program.

Faculty from the three schools participate in research in the following broadly defined areas.

School of Architecture. Architectural design methodology, solar architecture design, energy performance in buildings, architectural computing and graphics, facilities development and management, environments for aging, housing, urban design, building technology, environmental analysis and programming, passive cooling and heating, ecotechniques, arid region building and systems design, and architectural history.

School of Design. Problem-solving strategies; problem definition; aesthetic, political, economic, and social theories; design history, methodology, theory, and criticism; methods as applied to materials culture and human expression; theories and methods of human factors and ergonomics; design production, planning, and marketing; acoustics and lighting design; perception and visual performance; computer imaging, visualization, analysis, and perception; human-machine interface design; product semantics, appropriate technology, and environmental issues; environmental graphics; environmental psychology; corporate, institutional, and healthcare design; postoccupancy evaluation; aging and design; public welfare and safety; rehabilitation, restoration, and preservation design; facility management methodology; design education theory; design forecasting; and collaborative learning and design journalism.

School of Planning and Landscape Architecture—Environmental Planning. Research is primarily conducted in the following four areas.

Urban and Regional Development. Housing, economic and community development, citizen participation, policy analysis, transportation, and the politics of planning.

Urban Design. Urban landscape design, planning and land-use law, urban design theory, development controls, and design guidelines.

Landscape Ecological Planning. Public land management, the conservation of renewable and nonrenewable resources, sustainable development, hazards planning, environmental impact assessment, riparian and wetlands protection, and land-use planning.

International Planning. Housing, economic and community development, urban design, landscape ecology, and agroforestry.

School of Planning and Landscape Architecture—Environmental Resources. Research programs include applications of geographic information systems to resource management, monitoring of ecological change, wildlife habitat ecology, vegetation dynamics, fire ecology, soil ecology and ecosystem restoration.

Range ecology studies investigate various problems, from shrub control and hydrologic research in Arizona chaparral to the use of microcomputers in field data acquisition and the effects of power plant emission on vegetation. Other research has considered the relationships between both livestock and wildlife and their environments.

Environmental Design and Planning

In addition to the EPD 700-level courses, refer to the course listing under the following majors for courses that are available to support the collegewide interdisciplinary degree program in Environmental Design and Planning: architecture, building design, environmental planning, environmental resources, industrial design, interior design, and landscape architecture.

ENVIRONMENTAL DESIGN AND PLANNING (EPD)

EPD 700 Interdisciplinary Research Methods. (3) F
Introduction to the philosophy and methodology of interdisciplinary research in environmental design and planning. Seminar.

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

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

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

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Environmental Planning

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www.asu.edu.caed/Planning/PLCore.html

PROFESSORS
KIHL, MUSHKATEL, PIJAWKA, STEINER

ASSOCIATE PROFESSORS
COOK, KIM, SAN MARTIN, YABES

ASSISTANT PROFESSORS
CAMERON, CREWE, EWAN, FISH-EWAN, GUHATHAKURTA, McSHERRY, WASSERMAN

The faculty in the School of Planning and Landscape Architecture offer a graduate program leading to the professional Master of Environmental Planning degree in Environmental Planning with a concentration in urban planning. Three areas of specialty are offered: urban and regional development, urban design, and landscape ecological planning.

The faculty in the school also participate in offering the Ph.D. degree in Environmental Design and Planning program. See pages 120–122 for information on the Ph.D. degree.

MASTER OF ENVIRONMENTAL PLANNING

See pages 104–105 for information on the Master of Environmental Planning degree.

RESEARCH ACTIVITY

Faculty and students in this graduate program are involved in the following areas of research.

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.

LANDSCAPE ARCHITECTURE (PLA)

PLA 442 Landscape Construction I. (3) F
Landscape constructions focusing on landform transformations. Topics include landform analysis, grading, and earthwork. Studio. Prerequisite: admission to department's professional level or instructor approval.

PLA 443 Landscape Architecture Theory and Criticism. (3) S
Landscape architecture theories and projects are critically analyzed to evaluate validity of design and contribution to society. Prerequisites: PLA 310, 361, 420; PUP 412.

PLA 444 Landscape Construction II. (3) S
Characteristics of materials and methods used in landscape architectural construction. Studio. Prerequisite: PLA 442 or instructor approval.

PLA 461 Landscape Architecture V. (5) F
Landscape ecological planning: collection and application of ecological data relevant to planning and design at landscape scale. Studio. Prerequisite: PLA/PUP 362 or instructor approval.

PLA 485 International Field Studies in Planning and Landscape Architecture. (1–12) F, S, SS
Organized field study of planning and landscape architecture in specified international locations. May be repeated for credit with department approval. Study abroad. Cross-listed as PUP 485.

PLA 546 Urban Design Policy. (3) N
Advanced study of local, state, and federal urban design policy. Cross-listed as PUP 546. Prerequisite: PLA/PUP 420.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

URBAN AND ENVIRONMENTAL PLANNING (PUP)

PUP 412 History of the City. (3) F
The city from its ancient origins to the present day. Emphasis on European and American cities during the last five centuries. Cross-listed as APH 414. *General Studies: H.*

PUP 420 Theory of Urban Design. (3) S
Analysis of the visual and cultural aspects of urban design. Theories and techniques applied to selected study models. Cross-listed as PLA 420. Prerequisite: junior standing. *General Studies: HU.*

PUP 433 Zoning Ordinances, Subdivision Regulations, and Building Codes. (3) F, S
Analysis of zoning ordinances, subdivision regulations, building codes, and other planning implementation techniques relative to local development.

PUP 442 Environmental Planning. (3) F
Environmental planning problems, including flood plains, water quality and quantity, solid and hazardous waste, air quality, landslides, and noise. Field trips. Prerequisite: PUP 301 or instructor approval.

PUP 444 Preservation Planning. (3) S
History, theory, and principles of historic preservation. Emphasis on legal framework and methods practiced. Lecture, off-campus field study. Prerequisite: instructor approval.

PUP 445 Women and Environments. (3) F
Examines the role women play in shaping the built environment; ways built/natural forms affect women's lives. Focus on contemporary U.S. examples. Prerequisite: upper division or graduate status. *General Studies: C.*

PUP 452 Ethics and Professional Practice. (3) S
Ethical problems and issues in planning, professional practice, and decision making. Prerequisite: department major or instructor approval. *General Studies: L2.*

PUP 485 International Field Studies in Planning and Landscape Architecture. (1–12) F, S, SS
Organized field study of planning and landscape architecture in specified international locations. May be repeated for credit with department approval. Study abroad. Cross-listed as PLA 485.

PUP 510 Citizen Participation. (3) S
Theory and practice of citizen participation in planning. Examines and critiques participation techniques and roles of planners. Prerequisite: instructor approval.

PUP 520 Planning Theories and Processes. (3) F
Review of past and current theoretical developments related to social change perspectives, the role and ethics of planners. Prereqisite: instructor approval.

PUP 524 Planning Methods I: Planning Research Methods. (3) F
Tools useful for urban planning research; emphasis on research design and survey methods. Prerequisite: PUP 301 or instructor approval.

PUP 525 Urban Housing Analysis. (3) F
Nature, dimensions, and problems of urban housing, government policy environment, and underlying economics of the housing market.

PUP 531 Planning and Development Control Law. (3) S
Case studies on police power, eminent domain, zoning, subdivision controls, exclusion, preservation, urban redevelopment, and aesthetic and design regulation.

PUP 532 Advanced Urban Planning Law. (3) S
Advanced study on selected issues in planning law, such as urban design controls, exclusionary practices, compensable regulation, and tax policy. Prerequisite: PUP 432 or instructor approval.

PUP 544 Urban Land Use Planning. (3) F
Theory and methods of urban land use planning, including the rational planning process, comprehensive, functional, and neighborhood plans. Prerequisite: PUP 301 or instructor approval.

PUP 546 Urban Design Policy. (3) N
Advanced study of local, state, and federal urban design policy. Cross-listed as PLA 546. Prerequisite: PLA/PUP 420.

PUP 561 Urban Design Studio. (4) N
Current urban form and urban landscape design problems within the Phoenix-centered region. Studio. Prerequisite: PLA/PUP 420 or instructor approval.

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

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

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

PUP 584 Internship. (3) F, S, SS (SS1 only)
Internship under the supervision of practitioners in the Phoenix area or other locales. Credit/no credit.

PUP 622 Planning Methods II: Quantitative Planning Analysis. (3) S
Methods and models used as the basic quantitative techniques of urban, regional, and environmental planning and policy analysis. Prerequisites: PUP 424; statistics; instructor approval.

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

PUP 644 Public Sector Planning. (3) S
Urban fiscal problems and public goods provision in state and local governments. Prerequisites: instructor approval; 1 course in microeconomics.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Environmental Resources

Frederick Steiner
Director
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PROFESSORS
BRADY, BROCK

ASSOCIATE PROFESSORS
GREEN, MILLER, WHYSONG

The faculty in the School of Planning and Landscape Architecture offer a program leading to the M.S. degree in Environmental Resources. Areas of study are offered in natural resource management and range ecology.

The faculty in the school also participate in offering the Ph.D. in Environmental Design and Planning program. See pages 120–122 for information on the Ph.D. degree.

MASTER OF SCIENCE

Admission. Applicants to the program are expected to meet the minimum requirements for admission to the Graduate College. In addition, scores from the Graduate Record Examination or Miller Analogies Test are required. Applicants are expected to have completed 18 semester hours in environmental sciences or closely related courses. Applicants not meeting these requirements may be considered for admission with deficiencies.

Submit the following separate application materials to:

ENVIRONMENTAL RESOURCES PROGRAM
SCHOOL OF PLANNING AND LANDSCAPE ARCHITECTURE
ARIZONA STATE UNIVERSITY
PO BOX 872005
TEMPE AZ 85287–2005

1. a statement of intent (maximum 600 words) explaining (a) the applicant's interest in environmental resources; (b) the applicant's academic background; and (c) the applicant's educational objectives;
2. three letters of recommendation from references who are qualified to comment on the applicant's potential in the selected area of study; and
3. a résumé.

Application Deadlines. For fall enrollment, application materials are due in the School of Planning and Landscape Architecture and the Graduate College on March 15.

For spring enrollment, application materials are due in the School of Planning and Landscape Architecture and the Graduate College on October 15.

Selection Procedures and Notifications. School faculty evaluate the applications and supporting materials and recommend to the Graduate College whether the applicant should be granted regular or provisional admission or if admission should be denied. If admission is provisional, the Graduate College specifies in its letter of admission the provisions to be met to gain regular status. The school informs successful applicants of the procedures for enrollment.

Program of Study. A minimum of 30 semester hours of approved graduate course work is required. All students are required to complete a 13-semester-hour core curriculum. First-year students are expected to complete ERS 550 Vegetation Dynamics Studio, ERS 591 Environmental Resources Seminar, and ERS 594 CW: Environmental Resources Statistics. Second-year students are required to complete ERS 591 in the fall semester. Students can complete ERS 485 GIS in Natural Resources or ERS 486 Remote Sensing in Environmental Resources (or an approved substitute if the student has previously taken both ERS 485 and 486) at any time during their residence. All students are also expected to complete a minimum of three semester hours of research and three semester hours of thesis. The remaining hours (11 semester hours) are chosen to support the student's educational objectives.

Foreign Language Requirements. None.

Comprehensive Examinations. None.

Thesis Requirements. A thesis is required.

Final Examinations. A final oral examination covering the thesis and related subject matter is required.

RESEARCH ACTIVITY

Faculty and graduate students in Environmental Resources are active in a number of research programs, including applications of geographic information systems to resource management, monitoring of ecological change, wildlife habitat ecology, vegetation dynamics, fire ecology, soil ecology, and ecosystem restoration. Range ecology studies investigate various problems, from shrub control and hydrologic research in Arizona chaparral to the use of microcomputers in field data acquisition and the effects of power plant emission on vegetation. Other research has considered the relationships between both livestock and wildlife and their environments.

ENVIRONMENTAL RESOURCES (ERS)

ERS 402 Vegetation Measurement. (4) S
Vegetation sampling and inventory as related to animal-habitat relations. Lecture, lab, 1 weekend field trip. Prerequisites: CSE 180 and ERS 350 and 360 and department major *or* instructor approval.

ERS 407 Range Plants and Habitats. (4) F
The distribution, ecological characteristics, identification of key plants, and values of habitats on western rangelands. Laboratory emphasis on grass identification. Lecture, lab. Prerequisite: PLB 310 or equivalent.

ERS 410 Wildlife Habitat Relations. (4) F
Interactions among animal populations and their habitat. Systems simulation of population dynamics as influenced by competition and management strategies. Lecture, lab, 1 weekend field trip. Prerequisite: ERS 360.

ERS 420 Ecological Restoration. (3) S
Techniques of ecological restoration applied for the improvement of arid and semi-arid land and sensitive habitats. Weekend field trips. Prerequisite: ERS 360.

ERS 425 Soil Classification and Management. (3) N
Principles of soil genesis, morphology, and classification. Management and conservation practices will be presented. Prerequisite: ERS 225.

ERS 433 Riparian Ecosystem Management. (3) N
Examination of the functions and components that make up riparian ecosystems and the management of these ecosystems. Lecture, field trip. Prerequisite: ERS 225 or instructor approval.

ERS 446 Soil Fertility. (3) S
Ability of soils to retain and supply plant nutrients. Reactions of fertilizers in soils. Prerequisites: ERS 225, 226.

ERS 448 Soil Ecology. (3) N
Soils viewed in an ecosystem context, soil-plant relationships, nutrient budgets, and abiotic factors that influence soil processes. Prerequisites: BIO 320 and ERS 225 and 226 *or* instructor approval.

ERS 452 Soil, Water, and Irrigation. (3) N
Water measurement, conveyance, and conservation, with emphasis on crop production and soil-plant water relations. Prerequisite: ERS 225.

ERS 460 Applied Systems Ecology. (3) N
The systems approach applied to analysis and management of natural resource ecosystems. Use of simulation models. 2 hours lecture, 3 hours lab. Prerequisites: ERS 350 or equivalent; 1 course in ecology.

ERS 470 Land Reclamation. (3) N
Problems of reestablishing vegetation on disturbed sites. Special revegetation techniques, surface modifications, and government regulations. 1 weekend field trip. Prerequisites: ERS 407 and 420 and 446 and 448 *or* instructor approval.

ERS 475 Wildlife and Range Animal Management. (3) S
Principles and techniques for management of domestic and nondomestic animals using rangeland ecosystems. Emphasis on practical applications of management. Weekend field trips. Prerequisite: instructor approval.

ERS 480 Ecosystem Management and Planning. (3) S
Planning for management and conservation of wildland ecosystems. Ecological, economic, and social constraints on long-term sustainable resource development. Computer tools for resource planning. Lecture, 1 weekend field trip. Prerequisites: ERS 402 or equivalent; senior standing.

ERS 485 GIS in Natural Resources. (3) F
Principles of Geographic Information Systems (GIS) utilized in natural resource management. Use of computers for spatial analysis of natural resources. Lecture, lab. Prerequisite: CSE 180 or equivalent.

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

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

ERS 533 Riparian Ecology. (3) N
Review of recent literature, developments, and methods related to riparian ecology. Applications of soil and landscape ecology to riparian systems. Lecture, discussion, field trips.

ERS 540 Plant Responses to Environmental Stresses. (3) N
Reaction of plants to environmental stresses; aerial pollutants, fire, herbivores, mechanical treatments, pesticides, and soil amendments. 1 weekend field trip. Prerequisite: ERS 360 or instructor approval.

ERS 548 Plants, Soils, and Environmental Quality. (3) N
Effects of air quality on plants and soils, and their role in removing contaminants from the atmosphere. Prerequisite: ERS 225.

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

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

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

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

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Exercise Science

Doctoral Program
Interdisciplinary Faculty

Daniel M. Landers
Director, Executive Committee
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ANTHROPOLOGY
Associate Professor: Marzke

BIOLOGY
Professors: Hazel, Satterlie;
Associate Professor: Harrison

CHEMICAL, BIO, AND MATERIALS ENGINEERING
Associate Professors:
Sweeney, Yamaguchi

EXERCISE SCIENCE AND PHYSICAL EDUCATION
Regents' Professor: Landers;
Professors: Burkett, Krahenbuhl, Martin, Stelmach, Stock, Thomas;
Associate Professors: Hinrichs, Matt, Willis

FAMILY RESOURCES AND HUMAN DEVELOPMENT
Associate Professor: Manore

PSYCHOLOGY
Professors: Karoly, Linder

PSYCHOLOGY IN EDUCATION
Regents' Professor: Kulhavy;
Professor: Glass

The Committee on Exercise Science offers an interdisciplinary graduate program leading to the Ph.D. degree in Exercise Science. The committee functions in setting guidelines and supervising programs of study. One of the unique features of this interdisciplinary program is that, because it utilizes faculty research and teaching interests from a number of academic units, a student may tailor a course of study to fit individual needs and goals. The present committee is composed of members from the following academic units: Anthropology; Biology; Chemical, Bio, and Materials Engineering; Exercise Science and Physical Education; Family Resources and Human Development; Psychology; and Psychology in Education. Courses, however, are not limited to these academic units. Concentrations are available in biomechanics, motor behavior/sport psychology, and physiology of exercise.

DOCTOR OF PHILOSOPHY

The Ph.D. degree in Exercise Science is an individualized interdisciplinary degree that integrates graduate courses from a variety of academic units to provide a sound foundation for research leading to a dissertation in Exercise Science. Topics for these dissertations come from one of three research areas: biomechanics, physiology of exercise, and motor behavior/sport psychology.

Admission. In addition to meeting Graduate College requirements, students must submit a letter designating a potential area of interest, the name of a potential mentor (from the list of faculty above), and a statement of career goals to the director of the Committee on Exercise Science. Graduate Record Examination (GRE) scores (verbal and quantitative), a professional résumé, and three letters of recommendation must also be submitted. All applicants whose native language is not English must submit a Test of English as a Foreign Language score. Preference is given to applicants already holding a master's degree, although exceptional students possessing only a baccalaureate degree may apply. Admission decisions are based on the compatibility of the applicant's career goals with the purpose of the degree program, previous academic training and performance, GRE scores, recommendations, and the ability of the potential mentor to devote time to an additional student. To be considered for research or teaching assistantships, all application materials should be received before February 1.

Program of Study. The program of study consists of a minimum of 54 semester hours of graduate work beyond the master's degree (84 hours of graduate credit for applicants holding only the baccalaureate degree). Of the 54 hours, 24 are research and dissertation credit to be completed at ASU. The student should expect to devote at least one to two years to completing the dissertation. At least 30 hours of the approved Ph.D. program in which the student is enrolled, exclusive of dissertation and research hours, must be completed at ASU. An individual program of study is selected in consultation with the student's supervisory committee. The program of study reflects the interdisciplinary nature of the degree program. Students are expected to have fulfilled a majority of the foundational course work before admission. Prerequisites that have not been completed must be taken as remedial work in addition to the program of study.

First-Year Evaluation. The student must pass an examination, given during the fifth week of the first semester. The examination covers the area of concentration as well as statistics/research design and allied areas. The examination is both diagnostic and qualifying in the concentration area. If the student passes the written examination in the concentration area, the results in the allied areas serve as a guide to the supervisory committee in formulating a program of study. If the student's performance on the written examination in the area of concentration is marginal or unsatisfactory, the student must take an oral examination or another written examination within one semester. Failure to qualify on the second examination results in a recommendation to the Graduate College for dismissal.

Foreign Language Requirements. None.

Comprehensive Examinations. Upon completion of course work and before commencing dissertation research, the student is given written and oral examinations. After the student has passed the comprehensive examinations, a dissertation committee is appointed by the dean of the Graduate College. After the dissertation committee has approved the dissertation prospectus, the student is eligible to apply for admission to candidacy.

Dissertation Requirements. The dissertation must consist of a fully documented written analysis of a problem that extends the knowledge and/or theoretical framework of the field. The research should demonstrate the student's creativity and competence for independent research.

Final Examinations. A final oral examination in defense of the dissertation is required. The candidate must take the final oral examination in defense of the dissertation within five years after passing the comprehensive examinations. Any exception must be approved by the supervisory committee, the director of the Committee on Exercise Science, and the dean of the Graduate College and ordinarily involves repetition of the comprehensive examinations.

RESEARCH ACTIVITY

Faculty composing the Committee on Exercise Science are engaged in a variety of research activities. The following list includes some of the most recent research interests.

Biomechanics. Decrements in the mechanics and economy of walking in the elderly, kinematic and kinetic determinants of walking and running patterns in below knee amputees, anatomical and mechanical determinants of carpal tunnel syndrome; factors affecting throwing and vertical jumping performance; hydrodynamics of swimming propulsion and resistance, cycling biomechanics and physiology—factors influencing pedaling rates; computer simulation of locomotion in clinical and sport applications.

Physiology of Exercise. CHD risk factors; thermal adaptation; oxygen consumption; body composition; endocrine responses to exercise; cell membrane lipid metabolism; mitochondrial and cellular bioenergetics; muscle physiology; hepatic exercise metabolism; free radical production during exercise; neuromuscular fatigue; exercise and aging; physiological, biochemical, and hormonal aspects of stress; physiological aspects of the exercising female; athletic amenorrhea; effects of exercise on osteoporosis and arthritis; and nutrition in sport and exercise.

Motor Behavior/Sport Psychology. Autonomic and central nervous system mediators of behavior; exercise and mental health; affective state as a function of exercise; self-talk, self-evaluation, imagery and other processes related to competitive performance; stress and burnout; social physique anxiety; psychophysiological/cognitive/motor processes; attention; feedback; coordination; force production; neuromotor impairments; control and coordination of movement; arousal and attention in skilled performance; mental preparation strategies; coping and adaptation; aging and motor coordination; cognitive factors and motor skill performance; development of motor expertise; and development of gender differences in sport and motor behavior.

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

Exercise Science/ Physical Education

William J. Stone
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REGENTS' PROFESSOR
LANDERS

PROFESSORS
BURKETT, CORBIN, DARST, KRAHENBUHL, MARTIN, PANGRAZI, STELMACH, STOCK, STONE, THOMAS

ASSOCIATE PROFESSORS
DEZELSKY, HINRICHS, MATT, PAGLIASOTTI, WILLIS

ASSISTANT PROFESSORS
CHEN, GERRITSEN, KELLEY, SWAN

The faculty in the Department of Exercise Science and Physical Education offer graduate programs leading to the M.S. degree in Exercise Science/Physical Education, and the Master of Physical Education. Faculty also participate in two interdisciplinary Ph.D. programs: (1) Exercise Science with concentrations in biomechanics, motor behavior/sport psychology, and physiology of exercise, and (2) Curriculum and Instruction with concentrations in exercise and wellness, and physical education.

The Committee on Exercise Science offers an interdisciplinary graduate program leading to the Ph.D. degree in Exercise Science. The present committee is composed of members from several academic units. Information about this program is located under the description of the Exercise Science major, pages 203–205.

The Committee on Curriculum and Instruction offers an interdisciplinary graduate program leading to the Ph.D. degree in Curriculum and Instruction. Information about this program is located under the description of the Curriculum and Instruction major, pages 175–177.

MASTER OF SCIENCE

Applicants for the M.S. degree program in Exercise Science/Physical Education may choose from five areas of study: biomechanics, exercise physiology, exercise and wellness, physical education (elementary, secondary, and adapted), and motor behavior/sport psychology (motor learning and control, motor development, and sport psychology). All applicants are required to submit scores from the Graduate Record Examination (GRE). Admission decisions are based upon previous academic training and performance, GRE scores, recommendations, and the ability of potential mentors to devote time to an additional student. International applicants whose native language is not English must also submit a Test of English as a Foreign Language score. Applications are reviewed by department faculty only once a year. To be considered for admission in the fall semester, all application materials must be received by the department by February 1. The program requires a minimum of 30 semester hours, at least 21 of which must be EPE courses. Required courses with corresponding semester hours include EPE 500, EPE 501, and EPE 599. Remaining course work is selected by the student in consultation with an advisor and supervisory committee.

Deficiencies. All applicants recommended for admission are evaluated for deficiencies in their academic preparation. Deficiencies are divided into two areas: (1) those associated with the discipline of exercise science and physical education (human anatomy and physiology, biomechanics, exercise physiology, motor learning and development, psychosocial aspects of physical activity, and history and philosophy of sport) and (2) those associated with the area of study (a maximum of six deficiency semester hours pertinent to study in the area may be specified).

Foreign Language Requirements. None.

Thesis Requirements. A thesis is required.

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

MASTER OF PHYSICAL EDUCATION

For information concerning the Master of Physical Education degree, refer to page 110.

RESEARCH ACTIVITY

Laboratory research has been enhanced by the development of a 13,500-square-foot laboratory, the Exercise and Sport Research Institute, which is considered internationally as one of the finest facilities of its kind. The institute includes laboratories dedicated to exercise physiology, biomechanics, sport psychology, motor learning and control, and motor development. Another well-equipped facility is the Physical Education Research Laboratory. This 1,114-square-foot laboratory is dedicated to research on teaching and coaching as well as physical fitness education and programming.

The nature and scope of research activities in the various areas of study follow.

Biomechanics. Mechanical determinants of economical gait, gait impairments, and postural control of the aged; repetitive strain syndrome in computer keyboard operators; upper extremity contributions during walking and running; estimation of segment inertial properties; mechanics of swimming techniques; and mechanics of overhand throwing.

Exercise Physiology. Exercise and cardiovascular disease, thermal adaptation, exercise prescription, oxygen consumption, body composition, endocrine responses to exercise, cell membrane lipid metabolism, epithelial transport of ions, cellular enzyme activity, exercise and aging, physiological and biochemical aspects of stress, physiological aspects of the exercising female, cardiovascular and metabolic aspects of wheelchair training, and optimization of physical training programs.

Exercise and Wellness. Methods of effective exercise and health promotion, effectiveness of fitness programs, fitness testing, exercise adherence, motivation and fitness, physical self-perception, and fitness/exercise knowledge and attitudes.

Motor Behavior/Sport Psychology. Autonomic and central nervous system mediators of behavior, psychophysiological and cognitive correlates of information processing, arousal and attention in skilled performance, competitive anxiety, mental preparation strategies, interpersonal attraction and conflict, coping and adaptation, motor programming, spatial orientation, aging and motor coordination, cognitive factors and sport skill performance, and development of gender differences in sport and motor performance.

Physical Education. Analysis and measurement of teaching in the environments of elementary schools, secondary schools, and athletic coaching; attitudes and values of children and youth; curriculum models for secondary schools; effectiveness of adapted programs; preschool physical education programs; and analysis of motor patterns in young children.

EXERCISE SCIENCE/ PHYSICAL EDUCATION (EPE)

A $5.00 towel and locker fee is required each semester by students using towel and locker facilities for physical education classes and intramural activities.

EPE 413 Qualitative Analysis in Sport Biomechanics. (3) S
Developing systematic approach for detecting and correcting errors in human performance using anatomical and mechanical principles. Lecture, lab. Prerequisite: EPE 335.

EPE 414 Electromyographic Kinesiology. (3) F
Muscular contributions to human movement, muscle mechanics, electrophysiological basis, and practical application of electromyography. Lecture, discussion. Prerequisites: EPE 335, 340; instructor approval.

EPE 442 Physical Activity in Health and Disease. (3) F
The role of physical activity and physical fitness in the development of morbidity and mortality throughout the human life span. Prerequisites: BIO 201, 202; EPE 340. *General Studies: L2.*

EPE 460 Theory of Strength Training. (3) S
Research and theories on developing muscular strength; programs for developing muscular strength. Lecture, discussion. Prerequisites: EPE 335, 340. *General Studies: L2.*

EPE 500 Research Methods. (3) F
An introduction to the basic aspects of research, including problem selection, literature review, instrumentation, data handling, methodology, and the writing of research reports and articles.

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

EPE 505 Applied Exercise Physiology Techniques. (3) F 1999
Investigative techniques used in the applied exercise physiology laboratory. Emphasis on pulmonary function, body composition, and cardiorespiratory assessment. Lecture, lab. Prerequisite: EPE 340.

EPE 510 Introduction to Biomechanics Research Methods. (3) F
Application of mechanics to human movement analysis. Includes consideration of two-dimensional imaging techniques, force measurement, electromyography, and data processing methods. Lecture, discussion, some labs. Prerequisite: EPE 335 or instructor approval.

EPE 520 Sport Psychology. (4) F
Current research in sport psychology. Includes questionnaire, psychophysiological, and behavioral research techniques. Lecture, discussion. Prerequisites: EPE 448, 500.

EPE 521 Motor Development, Control, and Learning. (4) S 1999
Theory and research on motor skill acquisition, including learning/control and development (i.e., growth, children and exercise, and development learning). Lecture, discussion, some labs. Prerequisites: EPE 345, 500, 501.

EPE 522 Exercise Psychology. (3) S
Contemporary research and theory as related to human behavior and health in an exercise setting. Lecture, discussion. Prerequisite: EPE 500.

EPE 530 Exercise Physiology. (3) F
Immediate and long-term adaptations to exercise with special reference to training and the role of exercise in cardiovascular health. Prerequisite: EPE 340.

EPE 531 Physiology of Women in Sport. (3) S
Physiological aspects of women engaging in physical activity. Factors affecting performance and health throughout life are emphasized. Prerequisite: EPE 340.

EPE 534 Sports Conditioning. (3) F
Bases of sports conditioning, including aerobic and anaerobic power, strength, flexibility, and analysis of conditioning components for sports.

EPE 535 Factors Influencing Exercise Performance. (3) S
Physiological factors that can affect the ability to exercise, and the body's response to exercise. Lecture, seminar. Prerequisite: EPE 530.

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

EPE 561 Administration of Athletics. (3) N
Managing an athletic program, including financing, budget policies, staging, and promotion of athletic contests, schedules, travel insurance, and current athletic trends.

EPE 570 Programs and Special Topics in Adapted Physical Education. (3) F
Contemporary adapted, developmental, remedial, and corrective physical education programs; understanding of principles, problems, and recent developments in this area.

EPE 571 Improving Sport Skills. (3) SS
Factors in successful motor performance in skills used in individual, dual, and team sports.

EPE 572 Trends and Issues in Physical Education. (3) S
Literature, research, and practices in contemporary physical education, including finances, Title IX, teaching and coaching philosophies, school organization, and nonteaching physical education programs.

EPE 573 Curriculum and Instruction in Secondary Physical Education. (3) F
Current curriculum and instruction practices and research in secondary school physical education. Prerequisite: ESPE major or teaching experience.

EPE 574 Analysis of Teaching Behavior in Sport and Physical Education. (3) N
Use of systematic, direct observation techniques in analyzing and evaluating instruction in sport and physical education. Lecture, lab.

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

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

EPE 610 Advanced Topics in Biomechanics. (3) S
Three-dimensional imaging techniques, data analysis theory, and integration of biomechanics research tools; includes original research project. Lecture, discussion, some labs. Prerequisite: EPE 510 or instructor approval.

EPE 620 Developmental Motor Skill Acquisition. (3) S 1999
Cognitive-motor theories of learning/performance applied to children's motor skill acquisition. Study of knowledge development and research analysis/techniques. Lecture, discussion. Prerequisite: EPE 521.

EPE 621 Motor Learning/Control. (3) F 1999
Discussion of contemporary research issues in motor learning and control. Includes behavioral and neurophysiological issues. Lecture, discussion. Prerequisite: EPE 521.

EPE 642 Exercise Epidemiology. (3) S 1998
Physical activity, exercise, and physical fitness and the development of chronic disease. Not open to students who have taken EPE 442. Prerequisites: EPE 340, 500, 501.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Family Resources and Human Development

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ASSOCIATE PROFESSORS
BALCAZAR, BOULIN-JOHNSON, DUMKA, GRIFFIN, JOHNSTON, MONTE, VAUGHAN, WILSON

ASSISTANT PROFESSORS
ESTRADA, HANISH, MADDEN-DERDICH, UPDEGRAFF

LECTURERS
BODMAN, R. MARTIN, WEIGAND

The faculty in the Department of Family Resources and Human Development offer a graduate program leading to the M.S. degree in Family Resources and Human Development. Two concentrations are available: (1) family studies with areas of study in child development or family relationships and (2) general family resources and human development with an area of study in human nutrition and foods. Within the family relationships area, students may take courses in marriage and family therapy (MFT) sufficient to meet MFT certification requirements for the state of Arizona.

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

MASTER OF SCIENCE

Admission. Applications for admission, teaching assistantships, and Cowden Fellowships are accepted until January 15 preceding the fall semester to which the applicant is seeking admission.

Program of Study. Courses are selected by the student along guidelines of the specific areas, after consultation with the supervisory committee. The program of study should be completed and approved by the supervisory committee by the end of the second semester of full-time graduate study upon completion of 12 semester hours. A program of study may include more than 30 semester hours, and the exact number will be determined by program requirements and the student's supervisory committee. Acceptance of the proposed program of study must be verified by signature of the student and committee members. After approval within the department, the program of study is submitted to the Graduate College for final approval. The following requirements must be met for the two concentrations.

Family Studies. The required courses are CDE 531, FAS 500, and FAS 531; two statistics courses, one basic and one advanced, selected with the approval of the student's advisor; and six semester hours of thesis/research. A minimum of 34 semester hours is required for this degree program; however, 37 hours are recommended.

Additional requirements must be fulfilled in the chosen area of study.

Child Development. The required courses are CDE 533, six semester hours of CDE electives, and one FAS course selected in consultation with the advisor.

Family Relationships. The required courses are FAS 539, six semester hours of FAS electives, and one CDE course selected in consultation with the advisor.

Within the family relationships area of study, students may take courses in marriage and family therapy to meet certification requirements for the state of Arizona. A separate application and acceptance is required for admission to the MFT specialization which includes clinical practica and supervision. Typically, the MFT specialization is a three-year program.

General Family Resources and Human Development. As part of the program of study, 20–23 semester hours of approved graduate course work emphasizing human nutrition and foods are required. Required courses are FAS 500, a 500-level statistics course (three to six semester hours) approved by an advisor, six semester hours of thesis/research credit, and two graduate seminars selected from the following: FON 531, 532, 533, 538, and/or 598. The student may select courses from the following upon consultation with an advisor: FON 540, 541, 542, 544, 545, 546, 548, 550, 551, and 580. Other courses may be selected upon consultation with the advisor. The prerequisites for graduate work in this area are as follows: anatomy and physiology and laboratory, biochemistry and laboratory, general chemistry and laboratory, introductory statistics, microbiology and laboratory, organic chemistry and laboratory, and general nutrition.

Thesis Requirements. A thesis is required.

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

RESEARCH ACTIVITY

Recent faculty and student research include the following subjects: nutrition and public health problems of Hispanics, ethnic families; police family-work stress; gender issues, social support; premarital sexual influence strategies, sexual expression, and relationship development; prevention programs for families, process in MFT, client expectancies, sexual enhancement; social-emotional development, peer relationships, temperament; behavioral observation of marital and family interaction; women's role as caregivers to elderly mothers; cross-cultural perspectives; family relations of mid- and later life; physician counseling; vitamin C metabolism; vegetarian nutrition; lactation/infant formula research; post-divorce relationships between former spouses; coparental relationships after divorce; nutrition and exercise, energy balance and obesity; nutrition assessment (especially vitamin B6), women's health issues (amenorrhea, subclinical eating disorders, chronic dieting, female athlete triad), development of stereotypes, gender roles; employee assistance and wellness programs, work and the family; community mental health and consultation; development of nutritionally sound food products, food additive safety; parent-adolescent relationships, adolescent social competence, adolescent autonomy and connectedness, adolescent risk-taking, family theory; adolescent sexuality, pregnancy, parenting; parental influences; child development and mental health; prevention program development and evaluation; nutrition assessment of geriatric populations, and adolescent sexuality; adolescent educational aspirations.

CHILD DEVELOPMENT (CDE)

CDE 430 Infant/Toddler Development in the Family. (3) F
An examination of the development of infants/toddlers, the socialization processes of families, and the interactions of these processes. Prerequisite: CDE 232 or equivalent. *General Studies: SB.*

CDE 437 Observational and Naturalistic Methods of Studying Children. (3) N
In-depth examination of implementing observational and naturalistic studies of children in a variety of settings. 2 hours lecture, 3 hours lab. Prerequisites: CDE 430; 6 hours of psychology. *General Studies: L2/SB.*

CDE 444 Children and Poverty. (3) F
The impact that poverty has on children and their families. 2 hours lecture, 3 hours lab. Prerequisites: CDE 232 (or equivalent); 6 hours of upper-division social science credits.

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

CDE 533 Research Issues in Child Development. (3) S
An in-depth exploration and critique of research focusing on child development in a family setting. Prerequisites: CDE 531; FAS 500.

CDE 534 Applied Child Development. (3) S
Integration of child development research and theory to understand developmental problems and their relevance to intervention strategies. Prerequisites: CDE 531; FAS 500.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

FAMILY STUDIES (FAS)

FAS 431 Parent-Adolescent Relationships. (3) F
Dynamics of the relationships between parents and adolescents. Developmental characteristics of adolescence and the corresponding adult stage. Prerequisites: CDE 232; FAS 331.

FAS 432 Family Development. (3) N
Normative changes in families over time from formation until dissolution. Emphasis on the marital subsystem in middle and later years. Prerequisites: CDE 232 and FAS 331 *or* instructor approval.

FAS 435 Advanced Marriage and Family Relationships. (3) F
Recent research, issues, and trends relating to marriage and family interaction. Influence of family composition, physical environment, family patterns, and values on family dynamics. Prerequisites: FAS 331, 361. *General Studies: SB.*

FAS 436 Conceptual Frameworks in Family Studies. (3) S
Approaches to study families focusing on systems, interactional, exchange, conflict, and developmental frameworks. Applications to diverse individual and family situations. Prerequisites: CDE 232; FAS 331, 361.

FAS 440 Fundamentals of Marriage and Family Therapy. (3) S
Introduction to the fundamental orientations of marriage and family therapy.

FAS 457 Third-World Women. (3) F
Economic, sociopolitical, and demographic context for understanding the roles of third-world women in health, family, work, education, and community. Prerequisite: 6 hours of social science credit or instructor approval.

FAS 500 Research Methods. (4) F
Purposes of research. Experimental design, methods of data collection, and thesis proposal development. Includes practical application research laboratory. 3 hours lecture, 3 hours lab.

FAS 530 Introduction to Marriage and Family Therapy. (3) F
Introduction of major marriage and family therapy orientations. Review history, theory, application, and outcome research for each orientation. Prerequisite: admission to graduate program in FRHD with a concentration in family studies or instructor approval.

FAS 531 Family Theory Development. (3) S
Historical and current approaches to theory development, evaluation, and application in family studies. Prerequisite: FAS 435 or instructor approval.

FAS 536 Dysfunctional Marriage and Family Relationships. (3) N
A critical review of current theory and empirical evidence connecting marital and family interaction patterns with aberrant behavior. Prerequisite: PGS 466 or PSY 573 (or equivalent) or instructor approval.

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

FAS 538 Advanced Techniques in Marriage and Family Therapy. (3) N
An in-depth review of assumptions and advanced techniques associated with contemporary marriage and family therapy approaches. Prerequisite: a graduate-level course in marriage and family therapy or instructor approval.

FAS 539 Research Issues in Family Interaction. (3) F
Critical review of current and past research in the area of family dynamics. Emphasizes interactional processes within the family. Prerequisite: FAS 435 (or equivalent) or instructor approval.

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

FAS 580 Marriage and Family Therapy Practicum. (3) F, S
Supervised clinical experience in marriage and family therapy; includes development of assessment and outcome evaluation skills. Lecture, lab. Prerequisite: instructor approval.
(a) First semester (3)
(b) Second semester (3)
(c) Third semester (3)

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

FOOD AND NUTRITION (FON)

FON 344 Nutrition Services Management. (3) S
Organization, administration, and management of food and nutrition services in hospitals and other institutions. Field trips may be included. *General Studies: L1.*

FON 440 Advanced Human Nutrition I. (3) F
Metabolic reactions and interrelationships of vitamins, minerals, and water. CHM 332 recommended. Prerequisites: BIO 202; CHM 361; FON 241 (or equivalent).

FON 441 Advanced Human Nutrition II. (3) S
Metabolic reactions and interrelationships of carbohydrate, lipid, and protein. CHM 331 and 332 recommended. Prerequisites: BIO 202; CHM 361; FON 241 (or equivalent).

FON 442 Experimental Foods. (3) F
Food product development techniques, food evaluation and testing, and investigation of current research into food composition. 2 hours lecture, 3 hours lab. Prerequisites: CHM 231; FON 142.

FON 444 Diet Therapy. (3) S
Principles of nutritional support for prevention and treatment of disease. Prerequisites: BIO 202; FON 241 (or equivalent).

FON 445 Quantity Food Production. (3) S
Standard methods of food preparation in quantity; operation of institutional equipment and menu planning for institutions. Experience in quantity food service. 1 hour lecture, 6 hours lab. May require field trips. Prerequisites: FON 241 (or equivalent) and 344 *or* instructor approval.

FON 446 Human Nutrition Assessment Lecture/Laboratory. (3) S
Clinical and biochemical evaluation of nutritional status. 2 hours lecture, 3 hours lab. Prerequisites: CHM 367; FON 440 (or 441).

FON 448 Community Nutrition. (3) F
Food-related behaviors; community organization and delivery of nutrition services; program design, implementation, and evaluation strategies; nutritional assessment of population groups. PGS 100 and SOC 101 are recommended. Prerequisite: FON 241 or equivalent. *General Studies: L2.*

FON 450 Nutrition in the Life Cycle I. (3) F
Emphasis on nutritional needs and problems during pregnancy, lactation, infancy, and childhood. Prerequisite: FON 241 or equivalent.

FON 451 Nutrition in the Life Cycle II. (3) S
The nutritional requirements and nutrition-related disorders of adolescence, middle adulthood, and later life. Prerequisite: FON 241 or equivalent.

FON 531 Recent Developments in Nutrition. (3) N
Survey of research. Prerequisites: 1 course each in advanced nutrition and biochemistry.

FON 532 Current Research in Nutrition I. (3) S
Vitamins and minerals. Prerequisites: 1 course each in advanced nutrition and biochemistry.

FON 533 Current Research in Nutrition II. (3) F
Carbohydrates, lipids, and proteins. Prerequisites: 1 course each in advanced nutrition and biochemistry.

FON 538 Recent Developments in Foods. (3) N
Discussion and critique of current research. Prerequisite: FON 142.

FON 540 Advanced Micronutrient Metabolism. (3) F
The metabolism of vitamins and minerals, primarily as applied to humans, with research literature emphasized. Prerequisites: 1 course each in basic nutrition and biochemistry.

FON 541 Advanced Macronutrient Metabolism. (3) S
The metabolism of protein, fat, and carbohydrate, primarily as applied to humans, with research literature emphasized. Prerequisites: 1 course each in basic nutrition and biochemistry.

FON 542 Experimental Foods. (3) F
Food product development techniques, food evaluation and testing, and investigation of current research into food composition. 2 hours lecture, 3 hours lab. Prerequisites: CHM 231; FON 142.

FON 544 Therapeutic Nutrition. (3) S
Current theories of the nutritional prevention or treatment of various diseases. Prerequisites: 1 course each in basic nutrition and physiology.

FON 545 Recent Developments in Institutional Feeding. (3) S
Current practices in institutional feeding, including supervised practicum with local quantity food operation. 1 hour lecture, 6 hours lab. Prerequisites: FON 142 and 344 *or* instructor approval.

FON 546L Laboratory Techniques in Nutrition Research. (1) S
Laboratory techniques required in nutrition research, including spectroscopy, chromatography, and RIA. Lab. Prerequisites: CHM 361, 367; FON 440 (or 441).

FON 548 Nutrition Program Development. (3) F
The planning, development, implementation, and evaluation of community nutrition programs, including the process of grant applications. Prerequisites: 1 course each in basic nutrition and sociology.

FON 550 Advanced Maternal and Child Nutrition. (3) F
Metabolic characteristics and nutritional needs of the pregnant woman, lactating woman, infant, and child are reviewed in-depth. Prerequisites: 1 course each in basic nutrition, physiology, and biochemistry.

FON 551 Advanced Geriatric Nutrition. (3) S
Metabolic characteristics and nutritional requirements of the elderly are reviewed in depth. Prerequisites: 1 course each in basic nutrition and physiology and biochemistry *or* instructor approval.

FON 580 Dietetics Practicum. (3–9) F, S, SS
Structured practical experience in the Preprofessional Practice Program (AP4), supervised by practitioners with whom the student works closely. Practicum. Prerequisite: acceptance into the AP4 program.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

FAMILY RESOURCES AND HUMAN DEVELOPMENT (FRD)

FRD 451 Field Experience. (1–12) N
Supervised field placement in the area of student's concentration with a community business or agency. Students must make arrangements with instructor 1 semester in advance of enrollment. Prerequisites: completion of 60 hours; instructor approval.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Family Science

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ASSOCIATE PROFESSORS
BOULIN-JOHNSON, DUMKA, GRIFFIN, WILSON

ASSISTANT PROFESSORS
ESTRADA, HANISH, MADDEN-DERDICH, UPDEGRAFF

The faculty in the Department of Family Resources and Human Development offer a degree program leading to the Ph.D. degree in Family Science. An area of concentration is available in marriage and family therapy (MFT), with additional programs of study available in the nonclinical aspects of family studies.

DOCTOR OF PHILOSOPHY

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

The program is designed for graduates to assume leadership roles as directors or clinicians in public or privately funded mental health agencies, private practice, or government, or as researchers and academicians in universities. The MFT concentration also prepares students for state certification to practice as certified marriage and family therapists.

A description of the program, along with opportunities for assistantships and fellowships, may be obtained from the director of the program.

Admission. Admission to the Ph.D. in Family Science is determined by the following criteria:

1. official transcripts of all undergraduate and graduate course work;
2. verbal, quantitative, and analytical Graduate Record Examination scores;
3. statement of goals relevant to the Ph.D. program;
4. three letters of recommendation; and
5. an application for admission to the Graduate College.

A Test of English as a Foreign Language score of at least 600 is required of all applicants whose native language is not English.

Program of Study. Each student must prepare and submit a program of study in conjunction with the chair and members of his or her supervisory committee during the first year in the program. The program of study consists of a minimum of 105 semester hours for students entering after the bachelor's degree and 63 semester hours for students entering after the master's degree. Of the 105 semester hours for a postbaccalaureate program, six are thesis credit and 24 are research and dissertation credit. Correspondingly, the 63 semester hours of the postmaster's program includes 24 semester hours of research and dissertation credit. The additional hours in both the postbaccalaureate and postmaster's tracks involve

1. family science courses,
2. clinical approaches and clinical supervision courses (MFT),
3. statistics and research methods, and
4. a collateral area of study relating to family science taken outside the Department of Family Resources and Human Development.

Foreign Language Requirements. None.

Evaluation and Comprehensive Examinations. Progress through the program involves (1) annual evaluations of the student's performance and (2) comprehensive written examinations at the end of the student's course work.

Practicum and Internship Requirements. For the MFT concentration, a total of 14 hours (postbaccalaureate) is required in clinical supervision, practicum, and internship. Practicum is for one year, and the internship lasts nine months.

Dissertation Requirements. The doctoral dissertation must be a work of original scholarship, make a significant contribution to knowledge about families, and reflect a mastery of systemic research methods.

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

RESEARCH ACTIVITY

The Department of Family Resources and Human Development provides advanced graduate training in marital and family therapy, family science, and child development. Specific areas of faculty research include marital and family therapy approaches, evaluation of marital therapy, marital and family relationships, marital interaction, parent-child relationships, parent-adolescent relationships, prevention research on children and families, children's social and emotional development, children's gender-role development, sexuality, dating relationships, and ethnic and socioeconomic diversity in marital and family relationships. Strong emphasis is placed on the acquisition of sophisticated theoretical, methodological, and statistical skills necessary to acquire research funding, publish in professional journals, and make significant contributions to existing knowledge.

Research and Clinical Facilities. The department's clinical and research facilities include a marriage and family clinic, marital interaction laboratory, children's social development laboratory, child development laboratory, and collaborative arrangements with the ASU Prevention Intervention Research Center. The Department of Family Resources and Human Development also provides access to sophisticated microcomputing technology within the department as well as to centralized computing services at ASU. The department offers several fellowships that provide students with collaborative research experiences under the supervision of faculty members.

French

See "Languages and Literatures," pages 234–237.

Geography

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ASSOCIATE PROFESSORS
ALDRICH, BALLING, CERVENY, FALL, KUBY, McHUGH

ASSISTANT PROFESSORS
SIERRA-MALDONADO, WENTZ

The faculty in the Department of Geography offer graduate programs leading to the M.A. and Ph.D. degrees in Geography. Students interested in human geography may choose areas of study in cultural, economic, land use systems, population, or urban geography; students interested in physical geography may choose areas of study in climatology or geomorphology.

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 pages 103–104 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 service. The program has sufficient flexibility to allow for individual needs and interests of the student. A minimum of 30 semester hours beyond the bachelor's degree is required. At least 24 hours must be in geography.

Admission. Applications for the M.A. program must be accompanied by the applicant's scores on the Graduate Record Examination (verbal and quantitative) and three letters of recommendation from professors. All applications are reviewed by the Graduate Committee and the chair of the Department of Geography. In order to be considered for financial assistance for the next academic year, students must be admitted by February 15.

It is presumed that all students entering the master's program have an adequate background in geography, including course work that is the equivalent of GPH 371 Cartography and GCU 495 Quantitative Methods in Geography. Additional prerequisite course work is required of students insufficiently prepared in geography. The program of study consists of the following elements:

GCU	529	Contemporary Geographic Thought	3
		or GCU 596 History of Geographic Thought (3)	
GCU	585	Advanced Research Methods in Geography	3
GCU/GPH	591	Seminar	3
GCU/GPH	599	Thesis	6
Total			15

The remaining 15 hours are composed of a suitable combination of course work and/or research.

A student in the M.A. program is required to pass an oral and a written examination administered by the student's supervisory committee. The written examination consists of questions from the area of interest. The oral examination serves as a defense of the thesis.

DOCTOR OF PHILOSOPHY

Admission to the Ph.D. program requires a completed master's degree in Geography or equivalent preparation. At a minimum this preparation should include competence in cartography and quantitative methods and basic course work in human and physical geogra-

phy. 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 pages 120–122 for general requirements.

Program of Study. A minimum of 30 semester hours of course work at ASU beyond the master's degree is required, plus a minimum of 24 semester hours of credit in research and dissertation. All Ph.D. students are required to take GCU 585 and GCU 529 or 596.

Foreign Language Requirements. At the discretion of the student's supervisory committee, a reading proficiency in a foreign language may be required.

Field Examination. The Department of Geography requires the student to pass a two-week field problem examination before taking the comprehensive examination.

Comprehensive Examinations. Written and oral comprehensive examinations are required. These are taken at the completion of all course work. After students have passed the comprehensive examinations and satisfied the other requirements, they are eligible to apply for candidacy.

Dissertation Requirements. A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required.

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

RESEARCH ACTIVITY

The university's location in the arid Southwest provides an ideal laboratory for research into arid land processes and fluvial geomorphology. In conjunction with the department's Office of Climatology, activities pursued include past climate reconstruction, climate monitoring, climate theories and models, and environmental studies from local to global scales. The Phoenix metropolitan area, populated by 2.5 million people, is an excellent setting for the investigation of land use and transportation conflicts, diverse communities, migration patterns, immigration tourism, and other issues associated with urban development in rapidly growing sunbelt cities. The region also offers the opportunity to study historical and cultural geography associated with, for example, Hispanic populations and Native American communities. Northern Mexico is within easy reach for those interested in field studies in Latin America.

CULTURAL GEOGRAPHY (GCU)

GCU 421 Geography of Arizona and Southwestern United States. (3) F, S
Geography of the Southwest with an emphasis on Arizona. Divided into physical geography, history, people, and economy. *General Studies: C.*

GCU 423 Geography of South America. (3) S
Prerequisite: GCU 323 or instructor approval. *General Studies: SB, G.*

GCU 424 Geography of Mexico and Middle America. (3) A
Central America and Mexico. Prerequisite: GCU 323 or instructor approval. *General Studies: SB, G.*

GCU 425 Geography of the Mexican-American Borderland. (3) S
Geography of a binational and bicultural region. Examination of settlement, boundary issues, ethnic subregions, population change, industrial development, and urban growth. *General Studies: L2, G.*

GCU 426 Geography of Russia and Surroundings. (3) N
Examines the geography of Russia and other post-Soviet states. Prerequisite: GCU 121 or instructor approval. *General Studies: SB, G.*

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

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

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

GCU 444 Applied Urban Geography. (3) S
Designed to prepare the student for employment in planning agencies. Includes application of urban geographic principles to present-day planning problems. Prerequisite: GCU 361.

GCU 453 Recreational Geography. (3) N
Examination of problems surrounding the organization and use of space for recreation. Introducing geographic field survey methods of data collection and analysis. Saturday field trips may be required.

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

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

GCU 495 Quantitative Methods in Geography. (3) F, S
Statistical techniques applied to the analysis of spatial distributions and relationships. Introduction to models and theory in geography. Prerequisite: MAT 119. *General Studies: N2.*

GCU 496 Geographic Research Methods. (3) F, S
Scientific techniques used in geographic research. Prerequisites: GCU 495; GPH 371, 491. *General Studies: L2.*

GCU 515 Human Migration. (3) F
Economic, political, social, and geographic factors underlying population movements. Migration selectivity, streams and counterstreams, labor migration, and migration decision making. Lecture, seminar. Prerequisite: GCU 351 or instructor approval.

GCU 526 Spatial Land-Use Analysis. (3) N
Determination, classification, and analysis of spatial variations in land-use patterns. Examination of the processes affecting land-use change. Prerequisite: 15 hours of geography or instructor approval.

GCU 529 Contemporary Geographic Thought. (3) S 1999
Comparative evaluation of current philosophy concerning the nature and trends of geography. Prerequisites: 15 hours of geography; instructor approval.

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

GCU 591 Seminar. (1–3) F, S, SS
Selected topics in economic, political, or cultural geography. Field trips may be required.

GCU 596 History of Geographic Thought. (3) S 2000
Historical development of geographic thought from pre-Greek days to the early 20th Century.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

PHYSICAL GEOGRAPHY (GPH)

GPH 401 Topics in Physical Geography. (1–3) A
Open to students qualified to pursue independent studies. Field trips may be required. Prerequisite: instructor approval.

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

GPH 409 Synoptic Meteorology I. (4) F 1999
Diagnostic techniques and synoptic forecasting. Includes techniques of weather analysis, map interpretation, and satellite and radar analysis. Prerequisites: MAT 270; PHY 131, 132.

GPH 410 Synoptic Meteorology II. (4) S 2000
Diagnostic techniques and synoptic forecasting. Includes techniques of weather analysis, map interpretation, and satellite and radar analysis. Prerequisite: GPH 409.

GPH 411 Physical Geography. (3) A
Introduction to physiography and the physical elements of the environment. Open only to students who have not taken GPH 111. Field trips.

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

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

GPH 414 Climate Change. (3) S
Survey of three climate research areas: paleoclimatology, theories (e.g., greenhouse warming), numerical modeling. Prerequisite: GPH 212 or instructor approval.

GPH 418 Landforms of the Western United States. (3) A
Study landforms and geomorphic processes in the western United States, including lecture, topographical maps, aerial photographs, satellite imagery, and field trips. Lecture, critical inquiry, laboratory, field work. Prerequisites: GPH 211 (or equivalent); completion of L1 class. *General Studies: L2.*

GPH 425 Plant Geography. (3) F
Plant communities of the world and their interpretation, emphasizing North American plant associations. Cross-listed as PLB 422. Prerequisite: BIO 182 or GPH 111.

GPH 433 Alpine and Arctic Environments. (3) N
Regional study of advantages and limitations of the natural environment upon present and future problems involving resource distribution, human activities, and regional and interregional adjustments. Field trips are required. Prerequisite: GPH 111 or instructor approval.

GPH 471 Geographic Information Systems. (3) F, S
GIS as a basis for microcomputer spatial analysis and synthesis. Includes digitizing, database organization, spatial retrieval, and graphics. Prerequisite: instructor approval.

GPH 474 Dynamic Meteorology I. (3) F 1998
Large-scale atmospheric motion, kinematics, Newton's laws, wind equation, baroclinics, vorticity, and the midlatitude depression. Prerequisites: GPH 213, 215; MAT 271; PHY 131, 132.

GPH 475 Dynamic Meteorology II. (3) S 1999
Topics in climate dynamics. General circulation, numerical modeling, teleconnection phenomena, and surface-atmosphere interaction. Prerequisite: GPH 474 or instructor approval.

GPH 481 Environmental Geography. (3) A
Problems of environmental quality, including uses of spatial analysis, research design, and field work in urban and rural systems. Field trips are required. Prerequisite: instructor approval.

GPH 491 Geographic Field Methods. (6) S, SS 1999
Field techniques, including use of aerial photos, large-scale maps, and fractional code system of mapping; urban and rural field analysis to be done off campus. Travel fees required. Prerequisites: GCU 102, 121; GPH 111.

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

GPH 533 Snow and Ice. (3) S 1999
Processes, distribution, climatic interactions of snow/ice emphasizing mass balance, snow stratigraphy/metamorphism and glacier/snowpack climatology. Lecture, field work. Prerequisite: instructor approval.

GPH 571 Computer Mapping and Graphics. (3) N
Utilization of the digital computer in analysis and mapping of geographic data. Includes plotting, surficial display, compositing, and graphics. Field trips. Prerequisites: GPH 371; instructor approval.

GPH 575 Geographic Applications of Remote Sensing. (3) N
Use of imaging and nonimaging methods of remote acquisition of data, including satellite sensors, airborne radar, multiband scanning, conventional photographic sensors, and ground-based equipment. Field trips are required. Prerequisites: GCU 585 (or GPH 491); GPH 372.

GPH 591 Seminar. (1–3) F, S
Selected topics in physical geography. Field trips may be required.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Geology

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REGENTS' PROFESSORS
BUSECK, GREELEY, MOORE

PROFESSORS
BURT, CHRISTENSEN, FINK, HOLLOWAY, KNAUTH, LARIMER, PEACOCK, REYNOLDS, STUMP, TYBURCZY, WILLIAMS

ASSISTANT PROFESSORS
ARROWSMITH, O'DAY, SHARP, TANG

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

Students admitted to the Master of Education degree program in Secondary Education may also elect geology as the subject matter field. See pages 103–104 for information on the Master of Education degree.

The faculty also participate in the programs leading to the Master of Natural Science degree when one of the concentrations is geology. See page 110 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 February 15.

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

All Geology graduate students must have completed the equivalent of the department's six semester hours of Geology Field Camp (GLG 450). A summer field mapping course completed as part of the student's undergraduate course work may fulfill this requirement. Upon the student's admission to the graduate program, the graduate committee will evaluate previous field course work and will determine whether the student must take a field course while a graduate student at ASU. The purpose of this requirement is to ensure that all geology graduate students possess basic geological map-

ping 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.

Entrance Examination. All incoming students must take the GRE Geology Test. Course work may be assigned based on the student's performance.

Program of Study. The student, with the approval of the advisor, selects courses that make a coherent program of study. Each M.S. candidate must include on the program of study one hour of GLG 500 Geology Colloquium and six hours of GLG 592 Research and GLG 599 Thesis, at least three of which must be GLG 599 Thesis. A maximum of six hours of thesis may appear on a program of study. One-half of the credits applicable toward the degree must be in geology courses; the remainder may include work either in geology or related fields.

Thesis Requirements. A thesis based on field, laboratory, and library study is required.

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

DOCTOR OF PHILOSOPHY

The Ph.D. degree consists of a minimum of 54 semester hours of work beyond the master's degree. At least 25 hours must consist of course work other than research and dissertation. The program is designed to develop creative scholarship and to prepare the student for a professional career in geology.

See pages 120–122 for general requirements.

Entrance Examination. All incoming students must take the GRE Geology Test. Course work may be assigned based on the student's performance.

Program of Study. The program of study is selected with the recommendation of the student's supervisory committee. Each Ph.D. candidate must include on the program of study one hour of GLG 500 Geology Colloquium and at least 24 hours of a combination of GLG 792 Research and GLG 799 Dissertation.

Foreign Language Requirements. None.

Comprehensive Examinations. The student's supervisory committee must determine the content of the comprehensive examination, consisting of a written and an oral examination. Students are required to take the comprehensive examination during their third semester in residence in the Ph.D. program.

Dissertation Requirements. A dissertation based on original work demonstrating creativity in research and scholarly proficiency in the subject area is required.

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

RESEARCH ACTIVITY

Recent faculty and student research topics include the following.

Fission Track Analysis. Development of fission-track techniques; application to tectonic processes and histories; uplift studies; thermal history studies; age dating.

Geochemistry. Isotope geochemistry and the geology of authigenic silica; environmental geochemistry; paleoclimate records; thermodynamics of fluid-mineral interfaces; synchrotron-based X-ray absorbtion spectroscopy (EXAFS); analytical and theoretical chemical studies of meteorites; geochemical exploration for ore deposits; trace element partitioning between minerals, fluids, and magmas; atmospheric geochemistry.

Geomorphology. Fault zone landforms and structure; earthquake surface rupture and paleoseismology; theoretical studies of faulting and hillslope development; engineering geologic field methods.

Geophysics. Earthquake surface rupture and paleoseismology; environmental geophysics; physics and chemistry of earth and planetary interiors; high pressure experimental geophysics; thermal modeling of subduction zones.

Mineralogy. High-resolution transmission electron microscopy; order/disorder in clays and related minerals; amorphous to crystalline transitions; graphitic carbon and the structures of poorly crystalline materials; polytypism and stacking sequences in sheet silicates (micas, chlorites, clays); surface studies: scanning tunneling and atomic force microscopy of mineral surfaces; determination of oxidation states and specific site environments through electron energy-loss spectroscopy (EELS); TEM cathodoluminescence studies of defects; airborne minerals: small airborne particles, air quality, air pollution; mineral thermodynamics and spectroscopy; high pressure mineralogy; phase transformation studies.

Mineral Physics. Electrical properties of silicate minerals, melts, and partial melts; effects of shock on hydrous minerals; shock metamorphism in meteorites; grain boundary diffusion; kinetic processes and reaction mechanisms; mineral deformation and deformation microstructures.

Paleontology. Invertebrate paleontology; paleoecology; faunal evolution of western North America.

Planetary Studies. Compositional and physical properties of the terrestrial planets; comparative geomorphology of the moon, Earth, Mars, Mercury, Venus, and the outer planet satellites; Venus tectonics; thermal infrared spectroscopy of planetary materials; planetary volcanic processes; laboratory simulation of eolian processes on Venus, Mars, and Earth; impact cratering experiments; meteorite studies.

Petrology. High temperature, high pressure phase equilibrium experiments, and models for the origin of major igneous rock types; volatile diffusion in silicate melts; experimental determination of mantle minerals and melts; field and analytical studies of temperature, pressure, and fluids during metamorphism; computer modeling of heat and mass transfer at convergent plate margins; subduction zones; continental extension; mineral equilibria in ore deposits.

Remote Sensing. Geologic mapping based on integrated field and remote sensing studies; multispectral mineralogical investigations; urban environmental studies.

Structure and Tectonics. Structural and tectonic evolution of Arizona and the North American Cordillera; regional geology of the Transantarctic Mountains; Cordilleran tectonics; relation between fluid and tectonic processes; fission-track analysis applied to tectonics; 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.

Center for Solid-State Science, Materials Research Science and Engineering Center, and Affiliated Departments. Analytical equipment routinely used by Geology students includes: a JEOL JSX–8600 electron microprobe analyzer/SEM equipped with an image analysis system; 10 transmission electron microscopes specialized for high-resolution imaging (≤1.7 Å resolution), EELS and EDS chemical analysis, and surface studies, state-of-the-art scanning tunneling, and "atomic" force microscopes. Automated X-ray diffraction and fluorescence facilities are available, as is an ion microprobe. The high-pressure laboratory for experimental petrology is equipped with a complete range of vessels for investigations ranging from hydrothermal alteration to partial melting of planetary mantles.

Space Photography Laboratory. The Space Photography Laboratory contains an extensive research collection of photographs of the moon, Mars, Mercury, and outer planet satellites. A dedicated image processing facility with interactive and hardcopy capabilities is available for research utilizing spacecraft images.

Center for Meteorite Studies. The Department of Geology houses one of the largest collections of meteorites in the world. Geochemical and cosmochemical research is being undertaken in the Center for Meteorite Studies, including the following topics: trace element geochemistry, nature of asteroidal interiors, computer models of condensation in the nebula, meteorite mineralogy, organic compound investigations, chemical fractionation in meteorites, elemental partitioning in meteoritic minerals, transmission electron microscopy of chondritic meteorites.

GEOLOGY (GLG)

GLG 405 Geology of the Moon. (3) N
Current theories of the origin and evolution of the moon through photogeological analyses and consideration of geochemical and geophysical constraints. Possible weekend field trip. Prerequisite: GLG 105 or 305 or instructor approval.

GLG 406 Geology of Mars. (3) N
Geological evolution of Mars through analyses of spacecraft data, theoretical modeling, and study of terrestrial analogs; emphasis on current work. Possible weekend field trip to Northern Arizona. Prerequisite: GLG 105 or 305 or instructor approval.

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

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

GLG 418 Geophysics. (3) F
Solid earth geophysics; geomagnetism, gravity, seismology, heat flow. Emphasis on crust and upper mantle. Prerequisites: GLG 310 and MAT 272 and PHY 131 *or* instructor approval.

GLG 419 Thermal-Mechanical Processes in the Earth. (3) F
Emphasis on applied mathematical techniques, heat conduction problems in geology, thermal convection, stresses in the lithosphere, and viscoelastic processes in the Earth. Prerequisite: PHY 131.

GLG 420 Volcanology. (3) A
Distribution of past and present volcanism, types of volcanic activity, mechanism of eruption, form and structure of volcanoes, and geochemistry of volcanic activity. Possible weekend field trips. Prerequisite: GLG 424.

GLG 424 Petrology. (3) F
Origin of igneous and metamorphic rocks. Optical mineralogy, hand specimen identification, and thin-section analysis. 2 hours lecture, 3 hours lab, possible weekend field trips. Prerequisite: GLG 321.

GLG 435 Sedimentology. (3) S
Origin, transport, deposition, and diagenesis of sediments and sedimentary rocks. Physical analysis, hand specimen examination, and interpretation of rocks and sediments. 2 hours lecture, 3 hours lab, possible weekend field trips. Prerequisites: GLG 102, 321.

GLG 436 Principles of Stratigraphy. (3) N
Principles of interpreting lithostratigraphic, magnetostratigraphic, biostratigraphic, seismostratigraphic, and chronostratigraphic units; correlation and facies relationships in stratified rocks. Applied stratigraphy project(s). Lecture, possible field trips. Prerequisites: GLG 102; instructor approval.

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

GLG 450 Geology Field Camp. (6) SS
Geological mapping techniques on aerial photos and topographic maps. Field based with excursions. Prerequisites: GLG 310, 321. *General Studies: L2.*

GLG 455 Advanced Field Geology. (3–4) F, S
Geologic mapping in igneous, sedimentary, and metamorphic terrains of the Basin and Range province of Arizona. Weekend field trips. May be repeated for credit. Prerequisite: GLG 450 or instructor approval.

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

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

GLG 481 Geochemistry. (3) S
Origin and distribution of the chemical elements. Geochemical cycles operating in the earth's atmosphere, hydrosphere, and lithosphere. Cross-listed as CHM 481. Prerequisite: CHM 341 (or 441) or GLG 321.

GLG 485 Meteorites and Cosmochemistry. (3) N
Chemistry of meteorites and their relationship to the origin of the earth, solar system, and universe. Cross-listed as CHM 485.

GLG 490 Topics in Geology. (1–3) F, S, SS
Special topics in a range of fields in geology. May be repeated for credit. Prerequisite: instructor approval.

GLG 500 Geology Colloquium. (1) F, S
Presentation of recent research by faculty and invited guests. 1 semester required for all geology graduate students. May be repeated for total of 2 semesters. Research paper required. Prerequisite: instructor approval.

GLG 501 Geology of Arizona. (3) A
Basic and historical geology, fossils, mining, energy resources, environmental problems, landscape development, and meteorites, cast in examples from Arizona. Research paper required.

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

GLG 510 Advanced Structural Geology. (3) N
Mechanics of rock deformation, emphasizing relationship between field observation, theory, and experiment. Stress, strain, simple constitutive relationships, failure criteria, and the basis of continuum methods. Possible field trips. Prerequisites: GLG 310 and 424 *or* instructor approval.

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

GLG 524 Advanced Igneous Petrology. (3) N
Theoretical and practical aspects of the genesis of igneous rocks. Study of selected sites. Modern laboratory techniques. 2 hours lecture, 3 hours lab, possible weekend field trips. Prerequisite: GLG 424.

GLG 525 Advanced Metamorphic Petrology. (3) N
Theoretical and laboratory study of metamorphic rocks. Processes of contact and regional metamorphism. Advanced methods and instrumentations. 2 hours lecture, 3 hours lab, possible weekend field trips. Prerequisite: GLG 424.

GLG 562 Quaternary Geology. (3) N
Geology of the Quaternary Period in both glaciated and unglaciated areas. Stratigraphy, correlation, and environmental application of Quaternary deposits. Special reference to the Southwest. 2 hours lecture, 3 hours lab, some field trips during lab, possible weekend field trips. Prerequisite: GLG 362 or instructor approval.

GLG 581 Isotope Geochemistry. (3) N
Geochemistry and cosmochemistry of stable and radioactive isotopes; geochronology; isotope equilibria. Cross-listed as CHM 581. Prerequisite: instructor approval.

GLG 582 Physical Geochemistry. (3) N
Application of thermodynamic and kinetic principles to geochemical processes. Prerequisite: CHM 341 (or 441) or GLG 321.

GLG 583 Phase Equilibria and Geochemical Systems. (3) N
Natural reactions at high temperatures and pressures; silicate, sulfide, and oxide equilibria. Cross-listed as CHM 583. Prerequisites: GLG 582; instructor approval.

GLG 591 Seminar. (1–3) F, S, SS
Topics in a range of fields in geology. May be repeated for credit. Prerequisite: instructor approval.

GLG 598 Special Topics. (1–3) F, S, SS
Special topics in geology. May be repeated for credit. Prerequisite: instructor approval.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

German

See "Languages and Literatures," pages 234–237.

Gerontology

Interdisciplinary Faculty

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COMMUNICATION
Professor: Arnold

EXERCISE SCIENCE AND PHYSICAL EDUCATION
Professors: Landers, Stelmach; Assistant Professor: Swan

FAMILY RESOURCES AND HUMAN DEVELOPMENT
Associate Professor: Vaughan

GEOGRAPHY
Associate Professor: McHugh

HEALTH ADMINISTRATION AND POLICY
Professors: Kronenfeld, Schneller, Williams

HUMAN SERVICES
Professor: Searle

MUSIC
Professor: Crowe

NURSING
Associate Professors: Killeen, Komnenich

PSYCHOLOGY
Professors: Okun, Reich, Zautra

PSYCHOLOGY IN EDUCATION
Professor: Strom

RECREATION MANAGEMENT
Professor: Shirreffs

SOCIAL AND BEHAVIORAL SCIENCE
Lecturer: Luken

SOCIOLOGY
Associate Professors: Keith, Miller-Loessi, Sullivan

SPEECH AND HEARING SCIENCE
Professor: LaPointe

An interdisciplinary, 24-semester-hour Certificate in Gerontology may be earned by graduate students who wish to study the psychological, sociological, biological, and policy-related aspects of aging and the health, economic, and social concerns of older people. Graduate students enrolled in the certificate program simultaneously pursue a major in an academic unit offering an advanced degree, whereas 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, contact the Director, Gerontology Program, 602/965–3225.

GERONTOLOGY (GRN)

GRN 580 Graduate Practicum. (3) F, S

GRN 590 Graduate Reading and Conference. (3) F, S, SS

GRN 591 Graduate Seminar. (3) F, S

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Health Services Administration

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PROFESSORS
FORSYTH, JOHNSON, KIRKMAN-LIFF, KRONENFELD, SCHNELLER, WESBURY, WILLIAMS

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.

The faculty also participate in the programs leading concurrently to the Master of Business Administration/ Master of Health Services Administration (M.B.A./M.H.S.A.), Master of Health Services Administration/Juris Doctor (M.H.S.A./J.D.), and Master of Health Services Administration/Master

of Science in Nursing (M.H.S.A./M.S. in Nursing with a concentration in nursing administration). See pags 108–109 for information on these programs.

The faculty also offer a concentration in health services research under the Ph.D. degree in Business Administration. (Applications for the Ph.D. degree in Business Administration with a concentration in health services research are not being accepted at this time.) See pages 142–149 for information on the Ph.D. in Business Administration degree.

MASTER OF HEALTH SERVICES ADMINISTRATION

See pages 108–109 for information on the Master of Health Services Administration degree.

MASTER OF PUBLIC HEALTH

The School of Health Administration and Policy, College of Nursing, and the Department of Anthropology at ASU, in conjunction with the University of Arizona and Northern Arizona University, offer courses leading to the Master of Public Health degree. Three concentrations are offered at ASU (community health nursing, cultural and behavioral dimensions of public health, and health administration and policy). For general information, contact the MPH Program Coordinator at ASU at 602/965–6633.

Admission. Applicants must hold a bachelor's degree or equivalent from an accredited college or university, provide three letters of recommendation, and submit an official Graduate Record Examination (GRE) or Medical College Admissions Test (MCAT) score. The GRE or MCAT must be taken within five years of the application date. Applicants whose native language is not English are required to submit a score on the Test of English as a Foreign Language. Students should submit their application to the University of Arizona by February 1 for fall admission. Applications are accepted only for fall admission.

Program of Study. The program of study for *community health nursing* requires 36 semester hours: 15 semester hours of core courses, 18 semester hours of concentration courses, and three semester hours of electives. The *cultural and behavioral dimensions of public health* concentration requires 39 semester hours: 15 semester hours of core courses, 18 concentration hours, and six semester hours of electives. The *health administration and policy* concentration requires 39 semester hours: 15 semester hours of core courses, 18 concentration hours, and six semester hours of electives. All concentrations require the student to successfully complete an internship. In addition, each student will be required to produce a comprehensive, analytical, problem solving report integrating the in-class learning into the internship experience. The student will also be required to make an oral presentation before a student and faculty colloquium, reporting on activities during the internship and relating those activities to broader public health issues.

The Arizona Graduate Program in Public Health: Core Courses

EPI	596A	Epidemiology	3
HSA	598E	Health Services Administration and Policy	3
HSA	598G	Biostatistics	3
PHL	575	Environmental and Occupational Health	3
PHL	577	Social and Behavioral Aspects of Public Health	3
Total			15

RESEARCH ACTIVITY

The School of Health Administration and Policy is a major teaching and research component of the College of Business at ASU. The school is committed to an active program in research and development, promoting a deeper understanding of the delivery of health services at the local, state, and national level. Faculty at the school are frequent contributors to health services research and disciplinary journals. It is the goal of the school to serve as a focal point for addressing the problems confronting practitioners in the health care field. Faculty frequently advise policy makers in major health care organizations, state and federal governments, and corporations.

Current faculty research endeavors include assessment of Arizona's Health Care Cost Containment System, enhancing care of the elderly, assessment of organizational modeling for multihospital systems, the changes facing physicians in American society, the public policy implications of AIDS, analysis of causes and consequences of medical malpractice, discrimination against persons with disabilities, the health care costs of work injuries, and studies of behavioral factors in health care and health services utilization.

HEALTH SERVICES ADMINISTRATION (HSA)

HSA 473 Comparative Health Systems. (3) A
Comparison of health care financing and delivery in industrialized countries; covers insurance, hospital management and physician payment. Lecture, discussion. Cross-listed as HSA 573.

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

HSA 505 Community Health Care Perspectives. (3) A
Epidemiological, sociological and political perspectives, and techniques for analyzing health problems and responding to health care needs in communities. Prerequisite: HSA 502.

HSA 512 Health Care Economics. (3) A
Economics of production and distribution of health care services, with special emphasis on the impact of regulation, competition, and economic incentives. Prerequisite: HSA 502.

HSA 520 Health Care Organizational Structure and Policy. (3) A
Functional relationships among managerial elements of health care institutions with major focus on hospital governance and policy dynamics. Cross-listed as HSA 562. Prerequisite: HSA 502.

HSA 522 Health Care Management Systems. (3) A
Systems concepts, quantitative methods, and information systems applied to management problems in health institutions and community health planning. Prerequisites: HSA 505; QBA 502.

HSA 532 Financial Management of Health Services. (3) A
Acquisition, allocation, and management of financial resources within the health care enterprise. Budgeting, cost analysis, financial planning, and internal controls. Prerequisites: ACC 503; FIN 502; HSA 502.

HSA 542 Health Care Jurisprudence. (3) A
Legal aspects of health care delivery for hospital and health services administration. Legal responsibilities of the hospital administrator and staff. Prerequisites: HSA 505, 520.

HSA 560 Health Services Administration and Policy. (3) F
Introduction to organizational theory and management of complex organization within the historical and contemporary contexts of the U.S. public health. Cross-listed as HSA 498.

HSA 561 Biostatistics. (3) F
Aspects of descriptive statistics and statistical inference most relevant to health issues, including data, rates, and confidence intervals. Cross-listed as HSA 498.

HSA 562 Health Care Organization and Systems. (3) F
Functional relationships among managerial elements of health care institutions with major focus on hospital governance and policy dynamics. Cross-listed as HSA 520.

HSA 563 Health Economics. (3) S
Introduction to concepts and methods used to direct and understand production and distribution of health care services. Cross-listed as HSA 498.

HSA 564 Health Care Finance. (3) S
Overview of the acquisition, allocation, and management of financial resources by health care providers. Focuses on economic, financial, and accounting principles. Cross-listed as HSA 498.

HSA 565 Policy Issues in Health Care. (3) F
Current policy issues in health through concepts of access, cost, and quality; issues relating to disease trends and policy formulation. Cross-listed as HSA 498.

HSA 571 Ambulatory Care Management. (3) A
The evolution, planning, and management of multispecialty group practices, health maintenance organizations, and other alternative delivery systems. Prerequisite: HSA 502.

HSA 573 Comparative Health Systems. (3) A
Comparison of health care financing and delivery in industrialized countries; covers insurance, hospital management and physician payment. Lecture, discussion. Cross-listed as HSA 473.

HSA 575 Chronic Care Administration. (3) A
Management of long-term care services and facilities, including behavioral health and rehabilitation programs.

HSA 589 Integrative Seminar. (3) A
Capstone assessment of current policies, problems, and controversies across the broad spectrum of health services administration. Prerequisites: HSA 505, 520, 522, 532.

HSA 591 Seminar. (3) A
Seminar topics such as the following may be offered:
(a) Behavioral Health
(b) Chronic Care Administration
(c) Comparative Health Care Systems
(d) Cost Containment and Quality Assurance
(e) Health Care Economics
(f) Health Care Labor Law
(g) Human Resources Management
(h) Managing Physicians
(i) Multihospital Systems
(j) Topics in Health Services Research

HSA 593 Applied Project. (3) F, S, SS
Optional on-site experience in advanced development of managerial skills in health services administration and policy. Minimum of 10 weeks. Prerequisites: 18 hours of credit toward program of study; director approval.

HSA 598 Special Topics. (3) A
Special topics such as the following may be offered:
(a) Epidemiology

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

Higher and Postsecondary Education

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PROFESSORS
APPLETON, FENSKE, RENDÓN, RICHARDSON, SIMMONS

ASSOCIATE PROFESSORS
HARTWELL-HUNNICUTT, WILKINSON

The faculty in the Division of Educational Leadership and Policy Studies offer graduate programs leading to the Master of Education and Doctor of Education degrees in Higher and Postsecondary Education. The concentration currently available is in higher education.

Candidates for the M.Ed. and Ed.D. program may be required to take certain College of Education core courses depending upon previous experience and education. Pre-approval by an advisor is required. The M.Ed. program requires 33 semester hours of course work, including a practicum. Candidates for all degrees must pass a written comprehensive examination, and candidates for the Ed.D. must also pass a final oral examination in defense of the dissertation.

Students interested in the Ph.D. degree with a field of study encompassing higher education should refer to the major in Educational Leadership and Policy Studies on pages 184–185. See pages 120–122 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 information concerning the Master of Education degree, refer to pages 103–104.

DOCTOR OF EDUCATION

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

See pages 118–119 for information on the Doctor of Education degree.

RESEARCH ACTIVITY

Faculty members in higher education are conducting research on a variety of significant topics according to their areas of special research interest. These include student access and retention, student financial assistance, marketing/institutional advancement in higher education, organizational influences on community college faculty teaching practices, Hispanic studies, legal aspects of higher education, and policy analysis.

The program has access to all of the current longitudinal data produced by the federal Center for Educational Statistics. Several databases created for a national study of state and institutional influences on baccalaureate attainment by underrepresented minorities support a number of dissertations and faculty research projects.

HIGHER AND POSTSECONDARY EDUCATION (HED)

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

HED 527 Seminar: Student Affairs Administration. (3) F
Organizational models, administrative competencies and skills, and emerging challenges of student affairs administration. Lecture, discussion, group projects, written assignments.

HED 533 The Community-Junior College. (3) F, S
History, functions, organization, and current issues. Meets Arizona community college course requirement for certification.

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

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

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

HED 644 Higher Education Finance and Budgeting. (3) S
Financial planning and budgeting in higher education institutions. Issues related to financing public and private colleges and universities. Prerequisite: HED 510.

HED 649 Law of Higher Education. (3) F
Analysis of legal issues related to higher education; examination of key court decisions. Prerequisite: HED 510.

HED 679 The American College Student. (3) S
Provides overview of American college student from demographic, background characteristics and values/attitudes/perspectives. Includes access, persistence, and degree completion. Lecture, group discussion, and research projects. Cross-listed as CED 656. Prerequisite: HED 510.

HED 687 Governance, Coordination and External Influences in Higher Education. (3) S 1999
Study of governance and coordination in higher education systems and the impact of external forces on them. Lecture, discussion.

HED 688 Organizational Theory. (3) S
Major views of organizations and their influence on role definition and participant behaviors in educational organization. Seminar, discussion. Cross-listed as SPF 622.

HED 689 Leadership in Higher Education. (3) F
Theory and practice of leadership and administration in higher education institutions.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.

History

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PROFESSORS
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ASSOCIATE PROFESSORS
BARNES, CARROLL, ESCOBAR, FULLINWIDER, GRAY, HURTADO, KAHN, RUSH, SIMPSON, L. SMITH, R. SMITH, SOERGEL, STONER, VANDERMEER, WARREN-FINDLEY

ASSISTANT PROFESSORS
GULLETT, HENDRICKS, LONGLEY, McKEE, THORNTON

SENIOR INSTRUCTIONAL PROFESSIONAL
LUEY

The faculty in the Department of History offer graduate programs leading to the M.A. and Ph.D. degrees in History. M.A. candidates are offered an opportunity to develop knowledge of a specific historical field, to study comparative history, and to learn research techniques. Students with various goals benefit from this degree program, including those planning to advance to Ph.D. study, those seeking positions in academe, in the public sector, or in business, and those now holding or looking for educational posts in elementary and secondary schools or community colleges.

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

MASTER OF ARTS

See pages 97–99 for general requirements.

Admission. Applications for the master's program must be accompanied by the applicant's scores on the Graduate Record Examination (GRE) (Master of Education applicants must report scores from both the GRE aptitude and advanced history tests). Examination scores more than five years old are not accepted. Three letters of recommendation from faculty members or others who are qualified to judge the applicant's potential for advanced study in history, a writing sample, and a statement of purpose must be forwarded to the department. Forms and instructions are available from the departmental secretary.

All applications and supporting materials are reviewed by the graduate committee of the department which then recommends to the Graduate College that the student be granted regular or provisional admission or be denied admission.

Areas of Concentration. In consultation with the supervisory committee, the candidate may select a field of history from the following: Asian, British, European, Latin American, United States, and U.S. Western. Under the United States concentration, students may choose from the following four areas of study: American Indian, Chicana/Chicano, U.S. Western, or women. Candidates in any field may apply for admission to the public history concentration.

Program of Study. The candidate must complete a minimum of 30 semester hours of graduate courses, including the following program requirements:

1. A minimum of 24 hours of history courses is required. With the approval of the supervisory committee, the candidate may include within the minimum 30-hour program six semester hours of closely related graduate course work taken in another academic unit.
2. A minimum of 18 hours selected from graduate courses at the 500 level is required. If 400-level courses are included in the program of study, documented proof must be provided that they were taken for graduate credit. Please contact the department for specific details.
3. Two comparative courses are required. The comparative courses are not required of students in the public history concentration.
4. At least one research seminar (HIS 591), normally in the major field of study, is required.

Degree candidates in the public history concentration must complete HIS 502 and at least two short courses. Other core requirements specific to each emphasis are listed in the department's graduate handbook. The various emphases require the completion of a differing minimum number of hours for each program: business, 41 semester hours; community history, 40; historic preservation, 40; historical administration, 37; historical editing and publishing, up to 44; public sector, 39. Course work taken outside the department for inclusion in a program of study must be approved in advance by the appropriate program director.

Candidates for the Master of Education degree must take 15 hours of HIS courses, of which three hours must be in HIS 512 or 515 and three hours in HIS 591 or in a comparative course (HIS 551 to 555); 12 of the 15 hours must be graduate courses at the 500 level. If 400-level courses are included in the program of study, documented proof must be provided that they were taken for graduate credit. Contact the department for specific details. The candidate must maintain at least a 3.00 GPA in HIS courses.

Foreign Language Requirements. The student is expected to have a reading knowledge of one foreign language, but some other research skills may be substituted for this requirement by the supervisory committee.

Thesis Requirements. A thesis or equivalent is required.

Students must enroll in six hours of HIS 599 to prepare a thesis based on original research. The M.A. thesis must be approximately 100 pages long, prepared according to Graduate College requirements, defended and approved, bound, and placed in the university library. A copy is also kept in the history department.

In lieu of preparing a traditional thesis under HIS 599, a student may elect a two-part thesis equivalent: (1) two three-hour seminars (HIS 591) on a broad topic and (2) two three-hour research courses (HIS 592) on a topic derived from the first research course. Courses leading to the thesis equivalent give the student experience with historical research and writing in the form of historiographical essays similar to those published in a journal. The two papers must meet Graduate College thesis requirements and be bound as a single volume and placed in the University Library.

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

DOCTOR OF PHILOSOPHY

The Ph.D. degree in History offers candidates the opportunity to study past and contemporary civilizations and to learn research and writing techniques that may be used in scholarly careers at leading academic institutions, in historical societies and agencies, in the public sector, and in business.

Major emphasis is placed upon developing a disciplined and inquiring mind, expertise in a chosen subject area, and competence in research methodology. The program is composed of small classes that bring students into a close working relationship with faculty and other students and offers flexibility in designing degree programs.

The five areas of concentration are Asian history, British history, European history, Latin American history, and United States history. Students must select a minimum of three historical fields for examination. The fields must include a major geographical field of concentration (such as the British Isles, the United States, or Latin American), and a second broad geographical field outside the concentration. The third field should be in the specific area of the dissertation and be closely related to the major field. For example, typical field combinations might be U.S. history to 1877 (major), Latin America to 1820, and American Indian history; or, Modern Europe (major), Modern United States, and the history of women.

See pages 120–122 for general requirements.

Admission. Applications for the Ph.D. in History program must be accompanied by the applicant's scores on the Graduate Record Examination, three letters of recommendation from faculty members or others who are qualified to judge the applicant's potential for doctoral study, a writing sample, and a statement of purpose. GRE scores may not be more than five years old. All applications and supporting materials are reviewed by the graduate committee of the Department of History, which then recommends to the Graduate College that the student be granted regular or provisional admission or be denied admission.

Program of Study. After admission to the program, the student, in consultation with the graduate director, selects a faculty advisor in the student's area of concentration. Together the faculty advisor and student select a Ph.D. committee consisting of at least three faculty members. The committee draws up a program of study that normally includes at least 60 graduate semester hours of history, 36 of which must be in 500-level or above courses, and 24 semester hours of dissertation. If 400-level courses are included in the program of study, documented proof must be provided they were taken for graduate credit. Contact the department for specific details. Two courses selected from the graduate offerings in historiography are required. The student must take at least three research seminars, two of which must be in the primary area of study, and one comparative course.

Foreign Language Requirements. Demonstration of a satisfactory reading knowledge of two foreign languages is required before the student may take the comprehensive examinations. For the second language, the student's program committee may approve substituting the demonstration of other research capabilities, such as quantitative or statistical analysis, archival research, historical preservation, or computer skills.

Preliminary Reviews. During the first academic year of residence the student is required to schedule the department's preliminary review. Students who fail this review must withdraw from the program. It is recommended that the student have demonstrated a satisfactory reading knowledge of at least one foreign language before scheduling the review.

Comprehensive Examinations. The program committee examines the student's competence in the fields chosen. Normally these oral and written examinations are taken after the student has completed at least 60 graduate semester hours of credit.

Dissertation Committee. Upon satisfactory completion of the comprehensive examination, the supervisory committee for the dissertation is selected.

In consultation with the candidate, the director of graduate study recommends a chair; the recommended chair, after consultation with the candidate (and with approval of the director), then recommends at least two other members to the chair of the department. The dissertation committee is appointed by the dean of the Graduate College upon the recommendation of the department chair. The role of this committee is to approve the subject and title of the dissertation and advise the candidate during the completion of the research and the dissertation.

Dissertation Prospectus. Each doctoral candidate will prepare a prospectus of from four to seven pages for the dissertation. The format and design of the prospectus will be determined by the candidate and committee chair. The topic will be in one of the candidate's fields of study and should include the following:

1. a thesis statement,
2. a discussion of relevant literature,
3. a discussion of possible research material and availability of sources,
4. a secondary bibliography, and
5. a historiographical statement.

This prospectus must be presented to the committee for its review by the end of the semester following the comprehensive examination. The committee must approve the proposal before the candidate may be admitted to candidacy and proceed with the research.

Dissertation Requirements. The dissertation must be an original contribution to knowledge and demonstrate the student's proficiency in independent research.

Final Examinations. A final oral defense of the dissertation is required.

Graduate Preparation in Public History

The department offers several public history emphases preparing students to apply the skills of the historian in careers beyond the classroom. Public historians focus their historical insight, expertise, and critical abilities in the broad—that is, public—community. Six areas of emphasis are offered within public history: business, community history, scholarly publishing, historic preservation, historical administration, and the public sector. Graduate course work in public history may be included in both master's and doctoral programs of study.

The public history core combines specially designed course work and specific program requirements with traditional degree requirements. The public history area imposes additional admission requirements and includes periodic evaluations of its students' progress. (The business emphasis requires prerequisites in the business field.) Enrollment is limited to provide careful preparation and advisement. The curriculum integrates required course work in a public history component with courses in a geographic area concentration. As a special feature of the program, short courses are taught each year by visiting public historians. Each emphasis requires completion of two short courses. Courses from other disciplines, such as anthropology, business, public administration, fine arts, geography, political science, and architecture (architectural history and preservation planning) may be included in a program of study when students have the necessary prerequisites and if the courses meet particular student needs or are required within the various emphases of the concentration. Students who select the scholarly publishing option must be admitted to the Scholarly Publishing Certificate program and complete all certificate requirements. (See pages 274–275 for a description of the certificate program.)

Course work for all areas of the program *begins each fall semester* with a *required* special workshop during the fall orientation week before classes start. Students are admitted for the fall semester, though some class work outside the public history field may be started earlier. With concentrated full-time study, the master's public history component may be completed in four semesters, depending on the public history area selected for emphasis. In some instances, the mandatory internship or other program requirements must be completed during the *summer* months.

Each student in the program completes a core of courses appropriate to an area of emphasis. Basic to each core is the completion of HIS 502 Public History Methodology during the first semester of study. The work introduced in this methodology class is continued in the public history research seminar (HIS 591)—required or optional, depending on the area of emphasis.

At the satisfactory completion of the training work and upon the recommendation of the appropriate director and the department, a certificate of completion is issued by the Department of History. Assistance is provided in job placement.

Students interested in this curriculum should consult the department's graduate handbook, which provides details about public history work.

RESEARCH ACTIVITY

Recent faculty research includes the following subjects.

Women's History. The Girl Scouts in America; women in 19th-century France; women of the English Renaissance and Reformation; feminism in modern Cuba; women and death in 17th-century England; Southwestern women; women in 20th-century China.

Social and Cultural History. Social history of the elderly in America; history of sexuality; Russian religious history; Jewish, Christian, and Islamic popularism in the 20th-century; Europe since 1945; Hitler and the Third Reich; origins of modern Chinese social science; Confucianism during the Song, Jin, and Yuan periods; heroes in Chinese historical consciousness; royal courtship in Tudor England; corporate business cultures in England; social change in 20th-century Cuba; Japanese business culture; early American republic; rural history; New Deal music programs; cultural history of the Space Age.

Western United States. The development of Phoenix; American Indian policy; Indian education; Navajo history; social and family history of American Indians; Southwestern and frontier history; Arizona and Southwestern labor; trans-Appalachian West.

Political and Legal History. Roman Athens; American political history; history of the legal profession in America; Chinese politics, 1930s; 20th-century Chinese military history; 20th-century Indonesian political culture; legal and political history—20th-century Cuba; history of Chinese journalism; Civil War and reconstruction; the American presidency.

Minority History. Afro-American history; Mexican labor in the United States; Mexican immigration to the

United States; Indian history; Japanese-American experience.

International Relations. U.S./China/Japan relations; Colonial Southeast Asia; Anglo-American power and the Middle East in the 20th-century; U.S. perceptions of the Soviet Union; British Middle Eastern policy during World War I; Japan–U.S. relations; European community; Europe since 1945; U.S.–Latin American relations.

Public History. History of the book and the publishing industry; community development; a history of the accounting profession in Arizona; environmental and cultural resources; historical interpretation; preservation of Cold War artifacts.

HISTORY (HIS)

HIS 401 American Colonial History. (3) A
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. *General Studies: SB, H.*

HIS 403 Revolution and Constitution. (3) N
The causes, course, and consequences of the American Revolution culminating in the ratification of the Constitution. Prerequisite: HIS 103 or instructor approval.

HIS 404 The Early Republic, 1789–1850. (3) A
Political, social, economic, and cultural development of the United States from the Revolution to 1850. Prerequisite: HIS 103 or instructor approval. *General Studies: L2/SB, H.*

HIS 406 Civil War and Reconstruction. (3) A
Explores the causes, conduct, and consequences of the American Civil War, emphasizing politics and policy. Prerequisite: HIS 103 or instructor approval. *General Studies: L2/SB, H.*

HIS 407 The Emergence of Modern America. (3) A
The triumph of modern political, social, and economic structures and values, 1870–1918; role of region, religion, race, and ethnicity. *General Studies: SB, H.*

HIS 409 Recent American History. (3) A
The United States from 1913–1932, including Wilsonian diplomacy and the First World War, the 1920s, the origins of the Great Depression, Hoover administration. Prerequisite: HIS 104 or equivalent. *General Studies: SB, H.*

HIS 410 Recent American History. (3) A
The United States from 1932–1945, including the New Deal, society during the Depression, Second World War. Prerequisite: HIS 104 or equivalent. *General Studies: SB, H.*

HIS 411 Contemporary America. (3) A
The United States from 1945 to the present. *General Studies: SB, H.*

HIS 414 The Modern American Economy. (3) A
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 HIS 103 (or 104). *General Studies: SB, H.*

HIS 415 American Diplomatic History. (3) A
American relations with foreign powers, 1776–1898. Prerequisite: HIS 103 or instructor approval. *General Studies: SB, H.*

HIS 416 American Diplomatic History. (3) A
American relations with foreign powers from 1898 to the present. Prerequisite: HIS 104 or instructor approval. *General Studies: SB, G, H.*

HIS 417 Constitutional History of the United States. (3) N
Origin and development of the American constitutional system from Colonial origins through Reconstruction. Prerequisite: HIS 103 or instructor approval. *General Studies: SB, H.*

HIS 418 Constitutional History of the United States. (3) N
Origin and development of the American constitutional system, from Reconstruction to the present. Prerequisite: HIS 104 or instructor approval. *General Studies: SB, H.*

HIS 419 American Urban History. (3) A
The history of the city in American life from colonial times to the late 19th century. *General Studies: SB, H.*

HIS 420 American Urban History. (3) A
The history of the city in American life from the 19th century to the present. *General Studies: SB, H.*

HIS 421 History of American Labor. (3) N
American workers, from the colonial period to the present, including farmers, slaves, housewives, the skilled and unskilled, unionized and nonunionized. Prerequisite: HIS 103 (or 104) or MGT 301. *General Studies: SB, H.*

HIS 422 Rebellious Women. (3) A
Examination of the roles of rebellious women in history through the study of autobiography, biography, and theory. *General Studies: L2/SB, C, H.*

HIS 424 The Hispanic Southwest. (3) N
Development of the Southwest in the Spanish and Mexican periods to 1848. *General Studies: SB, H.*

HIS 425 The American Southwest. (3) A
Development of the Southwest from 1848 to the present. *General Studies: L2/SB, H.*

HIS 426 Indian History of the Southwest. (3) S
Comprehensive review of historical events from prehistoric peoples, the Spanish and Mexican periods, and the American period after 1846 to the present. Prerequisite: upper-division standing or instructor approval. *General Studies: SB, C, H.*

HIS 428 Arizona. (3) F, S
Emergence of the state from early times to the present. Prerequisite: upper-division standing or instructor approval. *General Studies: SB, H.*

HIS 430 20th-Century Chicano History. (3) A
Historical development of the Chicano community in the 20th century. *General Studies: SB, H.*

HIS 431 The French Revolution and the Napoleonic Era. (3) N
Conditions in France before 1789, the Revolutionary decade from 1789 to 1799, the organization of France under Napoleon, and the impact of changes in France on European society. Prerequisite: upper-division standing or instructor approval. *General Studies: SB, H.*

HIS 433 Modern France. (3) A
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. *General Studies: SB, G, H.*

HIS 434 Hitler: Man and Legend. (3) F
A biographical approach to the German Third Reich emphasizing nature of Nazi regime, World War II, and historiography. *General Studies: SB, H.*

HIS 435 Modern Germany. (3) A
Germany since 1840. *General Studies: SB, G, H.*

HIS 437 Eastern Europe and the Balkans. (3) N
Peoples and countries of eastern and southeastern Europe in the 19th and 20th centuries from 1800 to 1914, emphasizing the Hapsburg and Ottoman Empires. *General Studies: SB, H.*

HIS 438 Eastern Europe and the Balkans. (3) N
Peoples and countries of eastern and southeastern Europe in the 19th and 20th centuries, emphasizing the successor states from 1914 to the present. *General Studies: SB, G, H.*

HIS 441 Imperial Russia. (3) A
Development of Russian political, economic, social, religious, and intellectual institutions and traditions from the end of the 17th century to the collapse of the tsarist autocracy in 1917. *General Studies: SB, H.*

HIS 442 The Soviet Union. (3) A
An examination of Soviet and post-Soviet politics, economic development, and foreign relations from the 1917 Revolution to the present. *General Studies: SB, G, H.*

HIS 443 Russia and the United States. (3) A
Official and unofficial relations between Russia and the United States, from the late 18th century to the present, emphasizing period following the Bolshevik Revolution. *General Studies: SB, G, H.*

HIS 445 Tudor England. (3) A
Political, social, economic, and cultural developments in 16th-century England. *General Studies: SB, H.*

HIS 446 Stuart England. (3) N
Political, social, economic, and cultural developments in 17th-century England. *General Studies: SB, H.*

HIS 449 Modern Britain. (3) A
Factors contributing to Britain's position as the world's leading power in the 19th century and its decline from that position in the 20th century. *General Studies: SB, G, H.*

HIS 450 British Constitutional History. (3) N
Historical development of the constitutional system of Great Britain from the Middle Ages to the present, emphasizing the growth of democracy. *General Studies: SB, H.*

HIS 451 The British Empire. (3) A
British imperialism and colonialism in Africa, the Americas, Asia, and the South Pacific. Prerequisite: upper-division standing or instructor approval. *General Studies: SB, H.*

HIS 455 Intellectual History of Modern Europe. (3) N
Major developments in European thought from Karl Marx to the present. Prerequisite: upper-division standing or instructor approval. *General Studies: HU, H.*

HIS 456 History of Spain. (3) A
Cultural, economic, political, and social development of Spain from earliest days to 1700. *General Studies: HU/SB, H.*

HIS 457 History of Spain. (3) A
Cultural, economic, political, and social development of Spain from 1700 to the present. *General Studies: HU/SB, G, H.*

HIS 460 Spanish South America. (3) N
Political, economic, and social development of the Spanish-speaking nations of South America since independence. 19th-century developments. *General Studies: SB, H.*

HIS 461 Spanish South America. (3) N
Political, economic, and social development of the Spanish-speaking nations of South America. 20th-century developments. *General Studies: SB, H.*

HIS 463 Intellectual and Cultural History of Latin America. (3) N
Main currents of thought, the outstanding thinkers, and their impact on 19th- and 20th-century Latin America. Cultural and institutional basis of Latin American life. *General Studies: SB, H.*

HIS 464 The United States and Latin America. (3) A
The 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. *General Studies: SB, G, H.*

HIS 466 Mexico. (3) A
Political, economic, social, and cultural developments from earliest times to 1810. *General Studies: SB, H.*

HIS 467 Mexico. (3) S
Political, economic, social, and cultural developments from 1810 to the present. *General Studies: SB, H.*

HIS 468 Brazil. (3) N
Discovery, conquest, and settlement by the Portuguese; achievement of independence; rise and fall of the empire; problems and growth of the republic to the present. *General Studies: SB, H.*

HIS 469 Chinese Thought and Way. (3) N
China's classics in translation studied both for their intrinsic ideas and for the origins of Chinese thought. *General Studies: SB, H.*

HIS 470 Chinese Thought and Way. (3) N
Evolution of Confucian Tao (Way), its synthesis of Taoism and Buddhism, and 20th-century reactions to that Tao. *General Studies: SB, G, H.*

HIS 471 The United States and Japan. (3) A
Cultural, political, and economic relations in the 19th and 20th centuries. Emphasis on post-World War II period. *General Studies: SB, G, H.*

HIS 473 China. (3) A
Political, economic, social, and cultural history of the Chinese people from early times to the late 17th century. *General Studies: SB, H.*

HIS 474 China. (3) A
Political, economic, social, and cultural history of the Chinese people from mid-17th century to the present. *General Studies: SB, G, H.*

HIS 475 The American Experience in Vietnam, 1945–1975. (3) A
Intersection of American and Asian histories in Vietnam, viewed from as many sides as possible. *General Studies: SB, G, H.*

HIS 477 Japan. (3) A
Political, economic, social, and cultural history of the Japanese people from early times to the 19th century. *General Studies: L2/SB, H.*

HIS 478 Japan. (3) A
Political, economic, social, and cultural history of the Japanese people from 19th century to the present. *General Studies: SB, G, H.*

HIS 481 The People's Republic of China. (3) N
Analysis of major political, social, economic, and intellectual trends in China since the founding of the People's Republic in 1949. *General Studies: SB, G, H.*

HIS 488 History of Fire. (3) F
A global survey of the natural and cultural history of fire. Lecture, discussion. *General Studies: L2, H.*

HIS 495 Methods of Teaching History. (3) F
Methods in instruction, organization, and presentation of the subject matter of history and closely allied fields.

HIS 498 History Pro-Seminar. (3) F, S
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. Prerequisite: HIS 300.

HIS 502 Public History Methodology. (3) F
Introduction to historical research methodologies, techniques, and strategies used by public historians. Readings, short papers, and guest speakers. Required for students in the public history concentration.

HIS 512 Historians of Early Europe. (3) N
A study of the history of European historical writing from the Greeks to the 18th century.

HIS 513 Historians of Modern Europe. (3) N
A study of 19th- and 20th-century European historical writing.

HIS 514 Historians of the United States. (3) N
A study of the history of American historical writing from the early colonial days to the 20th century.

HIS 515 Studies in Historiography. (3) F, S
Methods and theories of writers of history. May be repeated for credit.

HIS 525 Historical Resource Management. (3) F
Identification, documentation, and interpretation of historic period buildings, sites, and districts. Emphasis on interdisciplinary efforts among historians, architects, and anthropologists.

HIS 526 Historians and Preservation. (3) S
Preparation of historians for public and private historic preservation programs. Prerequisite: HIS 525 or instructor approval.

HIS 527 Historical Administration. (3) F
Preparation of historians in administration of archives, historical sites, historical museums, historical societies, and historical offices in government agencies.

HIS 532 Community History. (3) N
Techniques and methods of community history emphasizing local resources. Required for community history option. Seminar.

HIS 551 Comparative Histories of War and Revolution. (3) A
A comparative field course of the themes of war and revolution.

HIS 552 Comparative History of Family and Community. (3) N
A comparative course with a focus on family, including minority and ethnic groups, in society.

HIS 553 Comparative History of State and Institutions. (3) N
A comparative course that explores the changing nature of central institutions and government.

HIS 554 Comparative Historical Population Studies: Ethnicity, Economy, and Migration. (3) N
A comparative course that explores the impact of social, cultural, or economic changes in the population.

HIS 555 Comparative Historical Topics. (3) N
This course analyzes a variety of specific social, political, cultural, and intellectual topics.

HIS 591 Seminar. (3) N
Topics may be selected from the following areas:
(a) British History
(b) East Asian History
(c) English History
(d) European History
(e) Latin American History
(f) U.S. History
May be repeated for credit.

Omnibus Graduate Courses: See pages 51–52 for omnibus graduate courses that may be offered.