

ECON 403 Industrial Organization (4)

Application of basic tools of economics to American Industry. Case studies of individual firms and industries. Performance of various business structures, such as monopoly and oligopoly. Effects of government regulation and antitrust policy. 4 lectures. Prerequisite: ECON 312.

ECON 410 Public Finance and Cost-Benefit Analysis (4)

Principles of rational decision making with respect to government revenues and spending. Measurement of costs and benefits, and criterion selection. Taxation, user fees, deficit financing, public goods, neighborhood effects and zoning. Microcomputer applications. 4 lectures. Prerequisite: ECON 312, CSC 119.

ECON 413 Labor Economics (4)

Wage determination theory, basic economic factors that affect the labor movement, economic impact of union activities on employment, output, income, wages, prices, and national economic policy. 4 lectures. Prerequisite: ECON 212 or ECON 221.

ECON 417 Development of Economic Analysis (4)

Analysis of ideas related to the development of economic theory in the Western civilization from the Greeks through the classical, neoclassical, and Keynesian to the current post-Keynesian concepts. 4 lectures. Prerequisite: ECON 211, ECON 212 or ECON 221, ECON 222.

ECON 430 Internship (2–8) (CR/NC)

Placement of student for part-time supervised work experience in a business enterprise or government agency approved by the department head. Collateral reading correlated with work assignments and periodic written progress reports required. Credit/No Credit grading. Prerequisite: Junior standing.

ECON 431 Environmental Economics (4)

Economic dimensions of environmental abuse and protection. Use of simple economic models in developing and evaluating environmental policies. Overview of current environmental problems. Issues related to the sustainability of economic growth at the national and international levels. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 221.

ECON 432 Economics of Energy and Resources (4)

Economic theory and public policies as applied to problems of natural resources and energy. Dynamic resource and energy models developed with reference to public and private sector growth. Application of the principles of capital theory emphasized. Case studies. Computer software applications in the study of natural resources and energy under uncertainty. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

ECON 433 Transportation Economics (4)

Analysis of the allocation of resources to the U.S. transport sector and specific transport modes as a result of their natural economic characteristics and public policy. 4 lectures. Prerequisite: ECON 201 or ECON 211 or ECON 222.

ECON 434 Urban Economics (4)

Application of basic tools of economic analysis to problems of urban regions. Causes and possible cures for inadequate growth rate, income levels, and the quality of life in urban regions. 4 lectures. Prerequisite: ECON 201 or ECON 212 or ECON 221.

ECON 461, 462 Senior Project (2) (2)

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

ECON 470 Selected Advanced Topics (1–4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

ECON 500 Independent Study (1–4)

Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head.

EDES–ENVIRONMENTAL DESIGN**EDES 101 Introduction to Architecture and Environmental Design (2) (CR/NC)**

Familiarization with the professional fields of architecture, landscape architecture, structural engineering, construction, and city planning. Introduction to the college's programs as they relate to individual aptitudes. The design process. Visiting speakers. Credit/No Credit grading. 2 lectures.

EDES 113 Graphic Analysis and Communication Skills (3)

Further development of freehand graphic communication skills for representation of conceptual ideas, analysis, and design concepts. Demonstrates the link between graphics, design process and communications. 3 laboratories. Prerequisite: ARCH 111.

EDES 333 Professional Presentations (4)

Skills and tools for employment acquisition or graduate school admissions. Individual resume design and production. Documentation of personal, professional and academic experience via written, oral and image based systems. Employment interview dynamics. Electronic and hardcopy portfolio production. Internet marketing. 1 lecture, 3 activities. Prerequisite: Third-year standing or permission of instructor.

EDES 406 Sustainable Environments (4)

Collaboration of interdisciplinary faculty and guest speakers/panelists. Introduction, illustration and analysis of concepts and principles for sustainability to be used in all aspects of environmental design. Integration and application of knowledge of human and natural systems with environmental, social and economic concerns, from a global-to-local perspective. 4 lectures. Prerequisite: Third or fourth year or graduate standing, or consent of instructor.

EDES 408 Implementing Sustainable Principles (3)

A primarily project-based course, intended to aid students who wish to collaborate with the purpose of implementing sustainability principles by developing tools, process or designs, for community-based projects and proposals at various scales of planning, architecture and design of the human environment to address social, environmental and economic issues. 3 lectures. Prerequisite: Third year standing or consent of instructor.

EDES 420 Historic Preservation and Adaptive Reuse in the Built Environment (4)

Historic preservation, restoration, and rehabilitation issues in the built environment. Focus on the process and issues of preserving cultural heritage through preserving environmental artifacts (i.e., structure and landscape). The importance of preserving historical districts, buildings and landscapes as well as techniques for accomplishing preservation goals within the existing regulatory environments. Total credit limited to 8 units. 2 lectures, 2 seminars. Prerequisite: Any GE Area D course or consent of instructor.

EDUC—EDUCATION**EDUC 125 Efficient Reading (2) (CR/NC)**

Development of reading efficiency required in modern business, industry, and the professions, as well as study skills in subject matter content areas. Total credit limited to 4 units. Credit/No Credit grading only. 1 lecture, 1 activity.

EDUC 300 Introduction to the Teaching Profession (3) (CR/NC)

Supervised observation and participation in cooperating schools. Discussion focuses on subject matter taught in grades observed. Separate class sections for students interested in elementary or secondary teaching—see *Class Schedule*. Total credit limited to 6 units. Credit/No Credit grading only. 2 lectures, 1 activity.

EDUC 302 Multicultural Education in the Secondary School (3)

Multicultural education in American society and schools; examination of multicultural elements which influence the learning environment in American secondary schools; review of successful programs aimed at making fundamental changes in rules, roles and relationships in schools. 2 seminars, 1 activity. Prerequisite: Any course in GE Area D.

EDUC 305 Teaching and Learning Processes in the Secondary School (3)

Learning processes: selected theories of learning related to teaching; theories of human development and learning; psychological principles involved in the teaching-learning event; self-evaluation of the prospective teacher. 3 lectures. Prerequisite: Any course in GE Area D.

EDUC 306 Introduction to Effective Teaching and Classroom Management in a Pluralistic Society (4)

Theory, knowledge and skills that serve as guidelines for effective teaching in a pluralistic society. Multicultural education, classroom management and discipline. 3 seminars, 1 activity. Prerequisite: EDUC 300 or LS 230, junior standing.

EDUC 307 Introduction to the Learner's Culture, Language and Identity (4)

Introductory knowledge and understanding of cultural concepts, first and second language development, cognitive development and how all interact and influence language acquisition, emotional development, and learning. Miscellaneous course fee may be required—see *Class Schedule*. 3 seminars, 1 activity. Prerequisite: EDUC 300 or LS 230.

EDUC 400 Special Problems for Undergraduates (1–3)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3

units per quarter. Prerequisite: Junior standing and consent of instructor.

EDUC 402 English Language Development (ELD) (4)

English as a Second Language (ESL) and bilingual methodologies. Focus on the practical aspects of teaching, organizing, and managing English language instruction for the second language learner. 4 seminars. Prerequisite: Admission to teaching credential program or possession of a basic teaching credential.

EDUC 403 Literacy in the Content Areas (5)

Application of reading comprehension strategies, instructional methods, and content area study skills for teaching in secondary schools. Includes supervised field experience, observation and instructional participation. 3 seminars, 2 activities. Prerequisite: EDUC 305, or consent of instructor.

EDUC 404 Culture and Diversity (4)

Cultural, linguistic and exceptionality issues. Theoretical and historical foundations for pedagogical practices which meet the sociocultural, cognitive and language needs of an increasingly diverse student population. 4 seminars. Prerequisite: Admission to teaching credential program or possession of a basic teaching credential.

EDUC 405 Multicultural Field Experience (1–3) (CR/NC)

Supervised advanced field experience and practical application for classroom teachers of culturally and linguistically diverse student populations. 30 hours work per quarter unit. Scheduled meetings between course instructor and student. Credit/No Credit grading only. Prerequisite: Admission to teaching credential program or possession of a basic teaching credential.

EDUC 406 Specially Designed Academic Instruction in English (SDAIE) (4)

Teaching methods appropriate for content area instruction through specially designed academic instruction delivered in English (SDAIE). Making learning strategies explicit for students. Includes alternative assessment and classroom organization. 4 seminars. Prerequisite: Admission to teaching credential program or possession of basic teaching credential.

EDUC 409 Teaching in the Secondary School (4)

Principles of effective teaching; planning for instruction; management techniques involving instruction; peer coaching. Taken immediately prior to preliminary student teaching. 3 seminars, 1 activity. Prerequisite: Admission into the Single Subject Credential program.

EDUC 410 Preliminary Student Teaching (6) (CR/NC)

Part-time assignment in a classroom (Single Subject only). Includes teaching activities under the direction of a selected cooperating teacher in consultation with a university supervisor. Assignment consists of an entire morning in the classroom (or the equivalent) for one quarter. Credit/No Credit grading only. Prerequisite: Completion of courses and requirements to preliminary student teaching and approval of campus screening committee for credential candidates.

EDUC 411 Classroom Management and Discipline in the Secondary School (3)

Principles of establishing classroom routines and procedures; maintaining classroom control; managing groups; school law; parent-teacher relations. 2 seminars, 1 activity. Prerequisite: EDUC 409. Concurrent enrollment in EDUC 410 recommended.

EDUC 420 Student Teaching (12) (CR/NC)

Full-time assignment in a classroom (Single Subject only). Includes teaching activities under the direction of a selected cooperating teacher in consultation with a university supervisor. Assignment consists of an entire teaching day in the school for one quarter. Credit/No Credit grading only. Prerequisite: Completion of all courses and requirements prerequisite to full-time student teaching and approval by campus screening committee for credential candidates.

EDUC 422 Student Teaching Practicum (Single Subjects) (3)

Practices and problems of student teaching. Current innovations in teaching procedures and materials. Taken concurrently with single subject student teaching. 2 lectures, 1 activity.

EDUC 426 Language Development in the Multilingual K-12 Classroom (4)

Patterns of classroom organization, application of reading programs, approaches, methods in English and Spanish, and supervised field experiences in elementary classrooms with bilingual students. Miscellaneous course fee required—see *Class Schedule*. 3 seminars, 1 activity. Prerequisite: EDUC 301, EDUC 303, minimal fluency in Spanish, and consent of instructor.

EDUC 427 Theories, Methods, and Assessment for First and Second Language Acquisition (4)

Theories, methods, materials and assessment involved in the instruction of limited English proficient (L.E.P.) students. Bilingual, transitional, and English only programs compared across a historical framework. An integrated language arts approach emphasized, including application of reading programs based on theories of language acquisition. 3 seminars, 1 activity. Prerequisite: Admission to teaching credential program or possession of basic teaching credential.

EDUC 430 Teaching Reading and Language Arts with a Multicultural Perspective (6)

Development of knowledge and skills for planning, implementing, and evaluating the teaching of reading and language arts in the elementary grades with attention to children of all abilities and backgrounds. State and national trends. Language development. Miscellaneous course fee may be required—see *Class Schedule*. 4 seminars, 2 activities. Prerequisite: EDUC 306, EDUC 307, and application for Multiple Subject Credential program.

EDUC 431 Teaching Social Science and the Arts with a Multicultural Perspective (4)

Development of knowledge and skills related to planning, implementing and evaluating integrated social science units of instruction; effects of culture on the selection and implementation of curriculum; knowledge and integration of physical education, art, and music. Miscellaneous course fee may be required—see *Class Schedule*. 2 seminars, 2 activities. Prerequisite: EDUC 306, EDUC 307, and application for Multiple Subject Credential program.

EDUC 432 Teaching Science and Mathematics with a Multicultural Perspective (4)

Curriculum and methods in teaching science and mathematics. Selecting, organizing, presenting science and mathematics lessons at the appropriate level throughout the curriculum. Emphasis on thinking processes, manipulative and process skills within the context of the curriculum frameworks. Miscellaneous course fee may be required—see *Class Schedule*. 2 seminars, 2 activities.

Prerequisite: EDUC 306, EDUC 307; MATH 327, MATH 328, and application for Multiple Subject Credential program.

EDUC 433 Bilingual, Crosscultural, Language and Academic Development (2)

Limited to students seeking BCLAD Certification. Theories, methods, and techniques in bilingual education. This course will be taught in Spanish. Miscellaneous course fee may be required—see *Class Schedule*. 2 seminars. Prerequisite: EDUC 306, EDUC 307, and application for Multiple Subject Credential program; pass Spanish Proficiency Exam.

EDUC 434 Student Teaching – Multiple Subject Credential (10) CR/NC

Field assignment involving observation, teaching, research and related activities in public elementary and middle school classrooms. Credit/No Credit grading only. Concurrent: EDUC 435. Prerequisite: EDUC 430, EDUC 431, EDUC 432.

EDUC 435 Issues in the K–8 Classroom (4)

Curriculum, community and school site issues related to the K–8 curriculum in multicultural settings. Teacher responsibilities, unit development, and lesson implementation. 3 seminars, 1 activity. Concurrent: EDUC 434. Prerequisite: EDUC 306, EDUC 307, EDUC 430, EDUC 431, EDUC 432.

EDUC 436 Advanced Student Teaching – Multiple Subject Credential (10) CR/NC

Observation, teaching, research and related activities in public elementary and middle school classroom and school sites. Credit/No Credit grading only. Concurrent: EDUC 437. Prerequisite: EDUC 434, EDUC 435.

EDUC 437 Inquiries into the Teaching Profession (4)

Research-based examination of contemporary issues and their impact upon elementary and middle schools. Exploration of issues which accompany the transition to the first year of teaching, including hiring practices, school politics, and professionalism. 3 seminars, 1 activity. Concurrent: EDUC 436. Prerequisite: EDUC 434, EDUC 435.

EDUC 440 Educating the Exceptional Individual (4)

Characteristics, incidence, and etiology of individuals with exceptional needs. Problems, assessment, and approaches toward accommodating exceptional students in the regular classroom. 4 seminars. Prerequisite: Any course in GE Area E1 or E2, EDUC 300, EDUC 301 or EDUC 305.

**EDUC 444 The Atypical Infant (4)
(Also listed as PSY 444)**

Exploration of issues pertinent to the development of atypical infants. Relationship of theory and research to intervention efforts with handicapped, developmentally delayed infants, and other at-risk infants. 3 seminars, 1 activity. Prerequisite: Junior standing, PSY 256 or CD 209, and EDUC 440 or consent of instructor.

EDUC 450 Behavior Disorders and Classroom Management Strategies (4)

Assessment of students with disruptive classroom performance. Basic strategies for facilitating social-emotional techniques which shift disruptive behavior to appropriate behavior. Evaluation of classroom modifications. 3 seminars, 1 activity. Prerequisite: EDUC 440 or consent of instructor.

EDUC 470 Selected Advanced Topics (1–3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

EDUC 480 Computer Based Curriculum (3)

Computer assisted instruction and computer based technology. Lesson planning and integration of technology into the K-12 curriculum. Familiarization with available educational courseware and software. Emphasis on classroom application. Miscellaneous course fee required—see *Class Schedule*. 2 seminars, 1 activity. Prerequisite: Completion of computer literacy GE F1 course, CSC 488 or CSC 416, or equivalent.

EDUC 500 Individual Study (1–3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: Consent of department head, graduate major adviser, and supervising faculty member.

EDUC 501 Problems and Practices in Curriculum Development (3)

Overview of major curriculum trends; planning and development of a comprehensive curriculum project geared to individual needs and interests. Emphasis on practicality. 3 seminars. Prerequisite: Graduate standing.

EDUC 503 Seminar in Language Arts Curriculum and Methods (4)

Language arts curriculum: objectives, methods, content, materials, evaluation, current trends, research and field work activities. 3 seminars. 1 activity. Prerequisite: Graduate standing.

EDUC 504 Seminar in Science and Mathematics Curriculum and Methods (4)

In-depth study of science and mathematics curriculum. Objectives, methods, content, materials, evaluation, current trends, and assessments. Miscellaneous course fee may be required—see *Class Schedule*. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 505 Seminar in Social Studies Curriculum and Methods (4)

In-depth study of the social studies curriculum: objectives, methods, content, materials, evaluation, current trends and field work activities. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 506 Models of Instruction (4)

Analysis of a wide variety of approaches to elementary and secondary teaching that guide instruction in the classroom and in other educational settings. In-depth analysis and implementation of selected teaching strategies. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 507 Instructional Materials and Technology (3)

Examination of commercial and teacher-made supplemental materials, software, and technological tools in curriculum, and their implementation. Systematic evaluation of the effectiveness of materials and technology. Miscellaneous course fee required—see *Class Schedule*. 2 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 510 Educational Finance and Resource Allocation (4)

Financing public schools in America: historical and current sources and types of funding. District level and site level funding and budgeting including priorities and purchasing procedures. Financial implications of personnel contracts and obligations. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

EDUC 511 Educational Law and Governance (4)

Legal aspects of school administration including unions, collective bargaining, and contract administration. Governing roles of federal, state, and local agencies including boards and district administrators. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

EDUC 512 Educational Organization and Management (4)

Principles of organization, management, and leadership and their relationship to educational effectiveness and productivity. Activity experience in the application of management theory in schools. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

EDUC 513 Educational Planning and Decision Making (4)

Concepts of planning and decision making in educational administration including administrators' responsibilities associated with decision making roles in public schools. 3 seminars, 1 activity. Prerequisite: Graduate standing and consent of instructor.

EDUC 514 School Site Administration (4)

Principles and practices of effective building level administration in multicultural/multilingual environment. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

EDUC 515 Educational Program Management and Evaluation (4)

Supervision, management, and evaluation of educational curriculum and educational programs. Current trends in program management including mapping, monitoring, alignment. 3 seminars, 1 activity. Prerequisite: EDUC 501 and graduate standing, or consent of instructor.

EDUC 516 Educational Personnel Management and Evaluation (4)

Principles and processes for the supervision and evaluation of certificated and classified staff including legal, research, and professional considerations. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

EDUC 517 Organizational Development in Education (3)

Educator's role in group processes, including fundamentals of human relations, working with formal and informal groups, and applying organizational development strategies to enhance school effectiveness. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

EDUC 518 Administrative Services Fieldwork (3) (CR/NC)

Supervised fieldwork in school administration for supervision at the elementary and secondary level. Assignments must encompass an entire school year and must involve some multicultural experience. Total credit limited to 18 units, only 9 of which may be applied toward master's degree. Credit/No Credit grading only. Prerequisite: Admittance to the Administrative Services Credential program or consent of instructor.

EDUC 525 Reading Processes, Programs and Technology (4)

Physiological, psychological and psycholinguistic components of the reading process. Applications of research findings of teaching reading, including innovative programs and the use of reading technology. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 526 Diagnosing and Remediating Reading Problems (4)

Formal and informal methods of diagnosing and remediating reading problems in classrooms and reading clinics. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 529 Bilingual Special Education and Reading Instruction (4)

Principles, procedures and materials for teaching reading to bilingual students coupled with diagnostic and prescriptive methods for understanding reading problems of the bilingual and bilingual special education student. Miscellaneous course fee required—see *Class Schedule*. 2 seminars, 2 activities. Prerequisite: Graduate standing.

EDUC 530 Secondary, College, and Adult Reading Practices (4)

Principles, procedures, and materials for improving reading in the subject matter areas with students of different backgrounds and abilities in grades 7 through college. Field experiences in teaching reading to adults, college, or secondary students. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 531 Supervision of Reading Programs (4)

Acquisition and application of the principles of supervision in a field setting by organizing, equipping and staffing classes; communicating with individuals and others employed in teaching reading; provide inservice programs and develop reading curriculum. Assessment of school reading programs. 2 seminars, 2 activities. Prerequisite: Graduate standing.

EDUC 532 Advanced Field Experiences in Education (3–12) (CR/NC)

Supervised advanced field experience and practical application of specialty for classroom teachers, reading and special education specialists, administrators and school support personnel. Total credit limited to 18 units for specialist credentials. Total credit limited to 6 units for the master's degree. 30 hours work experience per unit of credit. Credit/No Credit grading only. Prerequisite: Graduate standing, completion of basic teaching or administrative credential, or consent of instructor.

EDUC 533 Internship (3) CR/NC

Supervised experience as an employed professional. Supervision conducted cooperatively with university and employer. Setting must be approved in advance. Limited to candidates in approved internship programs. Total credit limited to 12 units. Credit/No Credit grading only. Prerequisite: EDUC 440, graduate standing.

EDUC 540 Counseling and Career Guidance of Exceptional Students (4)

Basic guidance techniques for teachers working with exceptional individuals and their families. Career selection, preparation, and counseling. Transition from school to work, and community resource utilization. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 542 Administration of Special Programs and Services (3)

Principles and practices of organizing and administering special education, reading, counseling, and other support programs. Assessment and placement procedures, middle management's role, overview of specially funded programs, historical precedents and future trends. 3 seminars. Prerequisite: Graduate standing.

EDUC 545 The Learning Handicapped: Characteristics and Teaching Strategies (4)

Characteristics of, and instructional strategies for students with learning handicaps. Organization and management of the special classroom. Evaluation of the instructional system. Individualization of instruction, and interaction in the total school environment. 3 seminars, 1 activity. Prerequisite: EDUC 440.

EDUC 546 Teaching Strategies for the Severely Handicapped (3)

Instructional strategies; current methodology and techniques of curriculum modification necessary to individualize instructional activities for the severely handicapped student. 3 seminars. Prerequisite: EDUC 551.

EDUC 547 Atypical Learning Patterns (4)

Theoretical considerations of learning patterns deviating from normal development. Educational implications of current theories of cognitive development and brain function as applied to disabled individuals. Development and application of a remedial therapy with appropriate individual(s). 3 seminars, 1 activity. Prerequisite: EDUC 440, EDUC 525, EDUC 545 or EDUC 551.

EDUC 550 Assessment of the Exceptional Individual (4)

Using norm referenced, criterion referenced, and curriculum based testing for assessing academic, behavioral, and physical status of exceptional individuals for referral purposes. Instructional and evaluation decisions regarding exceptional students in school settings. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 551 Characteristics of the Severely Handicapped (3)

Characteristics, identification procedures, causation, needs, legal issues, community attitudes, educational and social programs for severely handicapped person. 3 seminars. Prerequisite: EDUC 440.

EDUC 553 Current Issues in Special Education (3)

Consideration of assumptions and techniques of educational research regarding the educational, personal, social and vocational difficulties affecting the development of individuals with exceptional needs; emphasizing their applicability to general and specific educational programs. 3 seminars. Prerequisite: Admission to Special Education Program or consent of instructor.

EDUC 555 Counseling and Communication (4) (Also listed as PSY 555)

Overview of the counseling profession, history, philosophy, theory and ethics. Emphasis on developing interviewing, assessment and communication skills. Required practicum. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 556 Ethnic Counseling (4) (Also listed as PSY 556)

Socio-psychological and psycho-historical analysis of the visible ethnic and ethnic experience. Effects of poverty, history and the significance of oppression. Counseling techniques, assessment,

community relations and required activities. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 557 Career Development (4)

Counselor role in career decision making to include career choice theory, appraisal instruments, community referral resources, occupational information, computerized retrieval systems, and personal and social data and required activities. Miscellaneous course fee required—see *Class Schedule*. 3 seminars, 1 activity. Prerequisite: Graduate standing.

EDUC 558 Academic Counseling in Elementary Schools (4)

Effective developmental and preventative counseling in an elementary school's academic setting. 3 seminars, 1 activity. Prerequisite: Graduate standing and P.P.S. credential candidate, or consent of instructor.

EDUC 559 Academic Counseling in Secondary Schools (4)

Effective procedures in teaching and counseling in secondary schools to increase the academic and test taking performance of students. To include study skills, career planning and decision making, and application of computer software. 3 seminars, 1 activity. Prerequisite: Graduate standing and P.P.S. credential candidate, or consent of instructor.

EDUC 560 Counseling Theories and Assessment (4)

Counseling theories and concepts applied to individuals. Develop skills in interviewing, assessment intervention selection, termination and crisis intervention. Ethics and law included. 3 seminars, 1 activity. Prerequisite: EDUC 555, or consent of instructor.

EDUC 561 Group Counseling (3)
(Also listed as PSY 561)

Theory and practice of group counseling, client selection, group structure, process and termination, and application of theories to specific developmental groups. Communication and facilitation skills emphasized with relevant ethics and law. 2 seminars, 1 activity. Prerequisite: EDUC/PSY 555, EDUC 560 or consent of instructor.

EDUC 562 Student Development—Higher Education (4)

Exploration of the roles and competencies of the student development specialist in higher education. Review of relevant developmental theory with emphasis on practical implementation. Explore current issues and trends in higher education, and organizational framework. 4 seminars. Prerequisite: Graduate standing.

EDUC 563 Counseling At-Risk Students (3)

Specific counseling strategies and issues related to chronic absenteeism of public school students. Will study alienation, violence, parenting, drugs and alcohol, HIV/AIDS, and other critical current topics. 3 seminars. Prerequisite: Graduate standing.

EDUC 573 Field Experience, Counseling (1–12)

Practical application of guidance services and counseling in public schools, colleges and community settings. Seminars with university staff included. Total credit limited to 24 units. Maximum of 6 units may be applied toward Master of Arts in Education. Prerequisite: EDUC/PSY 555, EDUC/PSY 557 and consent of Counseling Coordinator Committee.

EDUC 581 Graduate Seminar in Education (1–3)

Contemporary problems in education. Trends, developments, and issues. Total credit limited to 9 units. Prerequisite: Graduate standing.

EDUC 587 Educational Foundations and Current Issues (4)

Historical, organizational, legal and philosophical characteristics of American education. Emphasis on the analysis of contemporary issues focusing on these characteristics. 4 seminars. Prerequisite: Graduate standing.

EDUC 588 Education, Culture, and Learning (4)

Cultural characteristics of educational institutions and practice. Review of theory and research relating to the social and organizational context in which learning and teaching takes place. 4 seminars. Prerequisite: Graduate standing.

EDUC 589 Research Methods and Analysis in Education (5)

Compare and contrast educational research methods to develop a plan which demonstrates a student's knowledge of basic research methodology, integration and application of descriptive and inferential statistics to research designs, computer technology. 4 seminars, 1 activity. Prerequisite: Graduate standing; completion of GE F1 computer literacy elective or equivalent, or consent of instructor.

EDUC 590 Research Applications in Education (4)

Application of research techniques to problems in education and human services. Students will be involved in applied research. 2 seminars, 2 activities. Prerequisite: Master's degree candidate, EDUC 589, and a minimum of 30 units in a master's degree curriculum.

EDUC 598 Reading and Conference (1–2) (CR/NC)

Reading and study material to be chosen with adviser. Not for degree credit. Total credit limited to 6 units. Credit/No Credit grading only. Prerequisite: 6 units of EDUC 599.

EDUC 599 Thesis or Project (3) (3)

Completion of a thesis or project pertinent to the field of education. Prerequisite: Consent of graduate committee and supervising faculty member(s).

EE—ELECTRICAL ENGINEERING

EE 110 Orientation (1)

Familiarization with the field of electrical engineering. 1 lecture.

EE 112 Electric Circuit Analysis I (2)

Introduction to basic circuit analysis. Resistive circuits, voltage and current sources, network theorems, op-amp circuits. 2 lectures. Prerequisite: MATH 142 or equivalent. Concurrent or prerequisite: PHYS 133.

EE 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

EE 201 Electric Circuit Theory (3)

Application of fundamental circuit laws and theorems to the analysis of DC, and steady-state single-phase and three-phase circuits. Not for electrical engineering majors. 3 lectures. Prerequisite: MATH 242, PHYS 133.

EE 208 Electronic Devices (3)

Internal operation, terminal characteristics, and models of diodes, transistors (bipolar and field-effect), and optical devices (LED's and phototransistors). 3 lectures. Prerequisite: EE 211, PHYS 211. Concurrent: EE 248.

EE 211 Electric Circuit Analysis II (3)

Continuation of basic circuit analysis. Energy storage elements, RC and RL circuits, and phasors. 3 lectures. Prerequisite: EE 112, MATH 143. Concurrent: EE 241.

EE 212 Electric Circuit Analysis III (3)

AC power, 3-phase circuits. Mutual inductance, series and parallel resonance and two-port networks. 3 lectures. Prerequisite: MATH 242 (or concurrent), EE 211. Concurrent: EE 242.

EE 219 Logic and Switching Circuits (3)

(Also listed as CPE 219)

Modulo-N arithmetic and digital coding techniques. Fundamentals of Boolean algebra and minimization techniques. Two-level logic realizations of SOP and POS functions, and an introduction to multi-level logic. Multiple function synthesis using PLDs and gate arrays. Combinational circuit design as it applies to computers. Sequential circuit elements, flip-flops, counters and shift-registers. 3 lectures. Prerequisite: CSC 101 or CSC 234. Concurrent: EE 259.

EE 241 Electric Circuit Analysis Laboratory II (1)

Use of electrical and electronic test equipment. Experimental verification of circuit analysis concepts including Kirchhoff's Laws, Thevenin's Theorem, maximum power transfer and superposition. 1 laboratory. Concurrent: EE 211.

EE 242 Electric Circuit Analysis Laboratory III (1)

Observation of transient and steady-state phenomena, phase-shift circuits, resonance. Use of phasor diagrams. 1 laboratory. Prerequisite: EE 241 or consent of department chair. Concurrent: EE 212.

EE 248 Electronic Devices Laboratory (1)

Experimental determination of device characteristics and models. 1 laboratory. Prerequisite: EE 241. Concurrent: EE 208.

EE 251 Electric Circuits Laboratory (1)

Techniques of measurement of DC and steady-state AC circuit parameters. Equivalent circuits, nonlinear elements, resonance. 1 laboratory. Concurrent: EE 201.

EE 259 Logic and Switching Circuits Laboratory (1)

(Also listed as CPE 259)

Laboratory synthesis of combinational logic circuits and counters. Introduction to laboratory equipment such as logic state analyzers. Use of software (both off-the-shelf and customized) for logic simulation and design. Introduction to use of PLDs and hardware description languages in combinational design and testing. 1 laboratory. Concurrent: EE 219.

EE 301 Linear Systems Analysis (3)

Fourier analysis. Fourier and Laplace analysis with applications. Transfer functions. Pole-zero locations and system response. Development and use of Bode plots. 3 lectures. Prerequisite: EE 212, MATH 317. Concurrent: EE 341.

EE 302 Linear Control Systems (3)

Automatic feedback control systems. Analysis of linear dynamic systems. 3 lectures. Prerequisite: EE 301. Concurrent: EE 342.

EE 303 Power Transmission (3)

Electrical characteristics of three-phase overhead and underground power transmission lines. Development of models for different types of lines as well as interconnected power systems. Introduction of per unit calculations. Introduction of computer simulation methods. 3 lectures. Prerequisite: EE 301.

EE 304 Random Signals and Noise (3)

Probabilistic treatment of signals and noise in electrical engineering. Topics include the concept of probability, sample space, distributions, random variables, independence, moments, covariance, random processes, time and ensemble averages, stationarity, common processes, correlation functions, spectra, shot and thermal noise, filtering. 3 lectures. Prerequisite: EE 301.

EE 307 Digital Integrated Electronics (3)

Integrated logic circuits: RTL, DTL, TTL, I^2L , ECL, MOS, CMOS, interfacing different logic families. 3 lectures. Prerequisite: EE 208, EE 219. Concurrent: EE 347.

EE 308 Electronic Circuits (3)

Analysis and design of linear small-signal amplifiers. 3 lectures. Prerequisite: EE 208, EE 301. Concurrent: EE 348.

EE 309 Integrated Electronic Circuits (3)

Analysis and design of feedback amplifiers; operational amplifier applications. Design of analog/digital and digital/analog converters. Power supply design. Emphasis on IC implementation. 3 lectures. Prerequisite: EE 302, EE 307, EE 308. Concurrent: EE 349.

EE 313 Signal Transmission (3)

Distributed-circuit concepts and traveling waves. Transmission line parameters. Lines with and without reflection. Standing waves. Smith Chart and its applications. Transmission line measurements and impedance matching techniques. 3 lectures. Prerequisite: EE 301. Concurrent: EE 353.

EE 319 Digital System Design (3)

(Also listed as CPE 319)

Introduction to the design of digital systems utilizing state-machines; analysis and synthesis of state-machines. Design of synchronous, asynchronous, and pulse mode sequential logic circuits. Practical considerations of digital system design and implementation. Emphasis on the use of PLDs and hardware description language for implementation technology. Considerations of testing of digital systems as a part of design. 3 lectures. Prerequisite: EE 219, EE 307. Concurrent: EE 359.

EE 321 Electronics (3)

Semiconductor devices and circuits. Instrumentation amplifiers, power control rectifiers, feedback, pulse circuits, digital logic circuits. Not for Electrical Engineering majors. 3 lectures. Prerequisite: EE 201.

EE 325 Energy Conversion Electromagnetics (3)

Fundamentals of electro-mechanical energy conversion. Magnetic circuits and electromagnetic devices. Theory of operation and operating characteristics of transformers, DC machines, and AC induction machines. Stepper motors. Basics of power electronics and drives. 3 lectures. Prerequisite: EE 212 and EE 208, or EE 321. Concurrent: EE 365.

EE 327 Electronic Instrumentation and Measurement (4)

Principles and characteristics of instruments and instrumentation systems; analog and digital transducers; A/D conversion; data and

signal transmission and amplification problems. Low level signal, high frequency signal, and high accuracy signal measurement problems. Automated instrumentation systems. 3 lectures, 1 laboratory. Prerequisite: EE 301, EE 308.

EE 328 Discrete Time Systems (3)

Discrete-time signals and the sampling theorem, basic systems concepts, solution of linear difference equations, Z transform. Discrete-time Fourier Transform, Discrete Fourier Transform (DFT). Cyclic convolution application of transforms to system analysis. Introduction to digital filtering. Relationships of digital filters to their continuous-time counterparts. 3 lectures. Prerequisite: EE 301.

EE 334 Electromagnetic Fields I (3)

Advanced treatment of static electric and magnetic fields and their sources. Poisson's and Laplace's equations, and boundary value problems. Time-varying electromagnetic fields and Maxwell's equations. Plane wave propagation in free space and in materials. 3 lectures. Prerequisite: PHYS 133, MATH 317.

EE 341 Linear Analysis Laboratory (1)

Fourier analysis. Two-port networks, frequency response and Bode plots. 1 laboratory. Prerequisite: EE 242. Concurrent: EE 301.

EE 342 Control Systems Laboratory (1)

Laboratory work in feedback control systems. 1 laboratory. Prerequisite: EE 341. Concurrent: EE 302.

EE 347 Digital Integrated Electronics Laboratory (1)

Experimental investigation of the characteristics of different logic families. 1 laboratory. Prerequisite: EE 248. Concurrent: EE 307.

EE 348 Electronic Circuits Laboratory (1)

Design, construction and testing of solid state amplifier to meet stated specifications. 1 laboratory. Prerequisite: EE 248, EE 341. Concurrent: EE 308.

EE 349 Integrated Electronic Circuits Laboratory (1)

Design of electronic subsystems using integrated circuits. 1 laboratory. Prerequisite: EE 342, EE 347, EE 348. Concurrent: EE 309.

EE 353 Signal Transmission Laboratory (1)

Transmission and reflection measurements. Impedance matching techniques. 1 laboratory. Prerequisite: EE 341. Concurrent: EE 313.

EE 359 Digital System Design Laboratory (1)

(Also listed as CPE 359)

Laboratory synthesis of combination and sequential logic circuits. Implementation with PLDs and hardware description language. Sequential analysis with the logic state analyzer. Fault testing and automated checkout procedures. Familiarization with the characteristics of SSI and MSI logic components. 1 laboratory. Prerequisite: EE 259, EE 347. Concurrent: EE 319.

EE 361 Electronics Laboratory (1)

Instrumentation amplifiers, feedback, rectifiers and power control, pulse and digital logic circuits. 1 laboratory. Prerequisite: EE 251. Concurrent: EE 321.

EE 365 Energy Conversion Laboratory (1)

Single-phase and three-phase transformers. Starting of rotating machines, evaluation of characteristics of rotating machines.

Stepper motor and power electronics. 1 laboratory. Prerequisite: EE 242 and EE 248, or EE 361. Concurrent: EE 325.

EE 400 Special Problems for Advanced Undergraduates (1-5)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 5 units. Prerequisite: Consent of department chair.

EE 401 Electromagnetic Fields II (3)

Reflection and transmission of normal incident plane waves at plane boundary interface(s) between two (and multiple) media. Reflection and refraction of oblique incident plane waves at a plane boundary interface between two different media. Waveguides. 3 lectures. Prerequisite: EE 334.

EE 403 Fiber Optic Communication (3)

Propagation of light in optical fibers, attenuation and bandwidth. LED and Laser Diode sources for use with optical fibers. Optical sources, detectors, and receivers. Design of optical communication systems with applications in telecommunications and local area networks (LANs). 3 lectures. Prerequisite: EE 334 or PHYS 323.

EE 405 High-frequency Amplifier Design (3)

Design of modern electronic amplifiers and amplifier systems with advanced techniques. Small signal wideband lowpass amplifier design utilizing both discrete and integrated devices. VHF, UHF amplifier design using S parameters. GaAs FET microwave distributed amplifier. Noise analysis. 3 lectures. Prerequisite: EE 313, EE 308.

EE 406 Power Systems Analysis I (4)

Introduction to electric power systems. Representation of power systems and components. One line diagrams and per unit calculations. System model representation of the synchronous machine, symmetrical faults, electrical insulation, grounding. Load flow analysis, economic operation of power systems. Solution of power system problems by microcomputer techniques and time-share methods. 4 lectures. Prerequisite: EE 303.

EE 407 Power Systems Analysis II (4)

System protection, relays and relay systems, symmetrical components, unbalanced faults, power system stability, computer solutions, power system instrumentation and measurement techniques. Solution of power system problems by microcomputer techniques and time-share methods. 4 lectures. Prerequisite: EE 406.

EE 410 Power Control I (4)

Power semiconductor devices. Theory of power diodes, SCR, Triac, MOSFET, HEXFET, Diac, Unijunction transistor, etc., modeling of diode and SCR circuits, SCR trigger circuits, analysis of SCR circuit in rectifiers, choppers and dc motor control. 3 lectures, 1 laboratory. Prerequisite: EE 309/EE 349, EE 325/EE 365.

EE 411 Power Control II (4)

Analysis of SCR circuits in inverters and cycloconverters; modeling of inverter-induction motor drive system; regenerative braking; electric propulsion; digital computer study of motor control system. Line commutated inverters and HVDC converters, phase-locked loops and microprocessor based control systems. 3 lectures, 1 laboratory. Prerequisite: EE 410.

EE 412 Advanced Analog Circuits (3)

Application of linear integrated circuits to data acquisition problems: transducer interfacing, linear and nonlinear preprocessing, phase-locked loops, and high performance quantization and recovery (A/D, D/A conversion). 3 lectures. Prerequisite: EE 309, EE 414.

EE 413 Advanced Electronic Design (4)

Advanced design of electronic circuits and subsystems. Design as a process. Implementation of specific design projects. Automated test using GPIB instruments. 3 lectures, 1 laboratory. Prerequisite: CSC 234, EE 309/EE 349.

EE 414 Introduction to Communication Systems (3)

Amplitude modulation. Frequency and phase modulation. Demodulation techniques. Bandwidth and power considerations. Noise in communication systems. 3 lectures. Prerequisite: EE 304, EE 328.

EE 415 Communication Systems Design (3)

Design of modern electronic communication and telemetry systems. Emphasis: practical implementation and comparative evaluation of various modulation systems. 3 lectures. Prerequisite: EE 309, EE 414.

EE 416 Digital Communication Systems (3)

Baseband (PCM, PAM, DM) signals and transmission. Bandpass (PSK, FSK, ASK) modulation and demodulation techniques. Digital communication signals in the presence of noise and detection of signals in Gaussian noise. Other topics such as: synchronization, quantization, multiplexing and multiple access, spread spectrum techniques. 3 lectures. Prerequisite: EE 414.

EE 417 Alternating Current Machines (4)

Alternating current machines. Generalized, operational and dynamic analysis. Steady-state and transient operation of synchronous machines and linear induction machines. 3 lectures, 1 laboratory. Prerequisite: EE 325, EE 365.

EE 418 Photonic Engineering (3)

Modern optical design with emphasis on the use of computers to design simple optical systems and to evaluate existing optical designs. Paraxial and exact ray tracing through thin and thick lenses, mirrors, and prisms. Radiometry and photometry. Electro-optic, acousto-optic, and magneto-optic modulators and their applications. Thermal detectors, semiconductor detectors, and charge coupled device (CCD) arrays. Miscellaneous course fee required—see *Class Schedule*. 3 lectures. Prerequisite: EE 334 or PHYS 323.

EE 419 Digital Signal Processing (3)

Review of Z-transform, convolution and discrete Fourier Transform. Digital filter design. Fast Fourier Transform. Theory and applications of digital signal processors. 3 lectures. Prerequisite: CSC 234, EE 328. Concurrent: EE 459.

EE 420 Direct Energy Conversion (3)

Direct energy conversion, and storage, with consideration of resources, batteries, fuel cells, thermoelectricity, thermionic generators, solar energy, cells, MHD, power generation, and related topics. 3 lectures. Recommended as a complement to ME 415. Prerequisite: ME 302.

EE 421 Solid-state Microelectronics (3)

Physical basis of solid-state microelectronics. Passive and active integrated circuit components in Bipolar, MOS, thin and thick

film systems. Diffusion, oxidation, ion implantation and other fabrication techniques. Microcircuit layout and design: system development, reliability and economic considerations. Future trends. 3 lectures. Prerequisite: EE 307.

EE 425 Analog Filter Design (3)

Approximation Theory. All pole filters. Frequency transformations. Elements of passive synthesis. Time delay filters. Theory and design of active filters. Sensitivity analysis. 3 lectures. Prerequisite: EE 309.

EE 431 Computer-Aided Design of VLSI Devices (3)

Design of VLSI circuits, design of subsystems, PLA's and finite-state machines, patterning, hand layout, and CIF programming. 3 lectures. Prerequisite: EE 319/EE 359, EE 307/EE 347 and EE 308/EE 348 or consent of instructor.

EE 432 Digital Control Systems (3)

Theory and applications of digital computers in linear control systems. Discrete time methods are used in analysis and design studies. Digital control systems are synthesized. 3 lectures. Prerequisite: EE 302, EE 328. Concurrent: EE 472.

EE 433 Computer-Aided Design in Magnetics (4)

Variational principles, integral and partial differential equation methods. Application of integral and partial differential equation methods to electromagnetic field problems. Computer-aided design of electrical devices. Use of commercially available software. 3 lectures, 1 laboratory. Prerequisite: EE 325, EE 334.

EE 436 Microprocessor System Design Methodologies and Laboratory (4) (Also listed as CPE 436)

Classification hardware/software trade-offs, system economics and functional configurations of existing microprocessor and hardware system designs. Interface design techniques utilizing programmable I/O interfaces, real-time clocks, interrupts, and DMA channels. Representative applications. Design, construction, performance evaluation and laboratory testing of microprocessor based systems. 3 lectures, 1 laboratory. Prerequisite: CPE/CSC 215, CPE/EE 319/359, or consent of instructor.

**EE 437 Digital Computer Subsystems (3)
(Also listed as CPE 437)**

Design of registers, counters, sequencers, encoders, decoders, memories, and other computer subsystems. Use of modern techniques and devices in implementation. Consideration given to cost, speed, and dependability. 3 lectures. Prerequisite: EE 319. Concurrent: EE 478.

**EE 438 Digital Computer Systems (3)
(Also listed as CPE 438)**

Design of computer ALU's, microprogram controllers, memory systems, and I/O controllers. Use of LSI components in CPU design. Microprogram and nanoprogram development. 3 lectures. Prerequisite: EE 437 or consent of instructor.

**EE 439 Computer Peripheral Interfacing (3)
(Also listed as CPE 439)**

Design of the more common computer peripherals (paper devices, floppy disks, etc.) with the emphasis on the controller and interfacing aspects. Use of microprocessors and/or LSI controller chips in the design of intelligent peripherals. 3 lectures. Prerequisite: EE 436, or consent of instructor.

EE 443 Fiber Optics Laboratory (1)

Experimental investigation of the properties of optical fibers, sources, and detectors. Measurement of fiber physical characteristics, attenuation, losses, and bandwidth. Evaluation of an analog and digital fiber optic data link. 1 laboratory. Concurrent or prerequisite: EE 403.

EE 444 Power Systems Laboratory (1)

Protective relaying, coordination, and relay calibration. Power control using transformers, parallel operation of generators, and computer simulation of power systems. 1 laboratory. Prerequisite: EE 341, EE 406.

EE 445 High Frequency Amplifier Design Laboratory (1)

Experimental investigation employing advanced techniques. Design of electronic amplifiers and amplifier systems utilizing recently developed components. 1 laboratory. Prerequisite: EE 353, EE 348. Concurrent or prerequisite: EE 405.

EE 445 Active Network Synthesis Laboratory (1)

Advanced laboratory study of sensitivity and stability of active networks prescribed for realization of transfer functions by active network synthesis techniques. Formal experiments and individual project work. 1 laboratory. Prerequisite: EE 349. Concurrent or prerequisite: EE 425.

EE 446 Communication Systems Laboratory (1)

Methods of analog and digital modulation and demodulation. Emphasis on spectral analysis, bandwidth requirements and other practical considerations of modulation and demodulation. 1 laboratory. Prerequisite: EE 341, EE 414.

EE 448 Photonic Engineering Laboratory (1)

Experimental investigation of the techniques used in processing optical signals. Formal experiments on electro-optic modulation, acousto-optic modulation. Construction of an RF spectrum analyzer. Analog processing of optical signals, and charge-coupled array devices. 1 laboratory. Prerequisite or concurrent: EE 418.

EE 449 Digital Signal Processing Laboratory (1)

Experiments in digital filter design and digital signal processing emphasizing various areas of applications (communications, audio signals, speech processing). Formal experiments and individual project work. 1 laboratory. Prerequisite: EE 341. Concurrent: EE 419.

EE 460 Senior Seminar (1) (CR/NC)

Discussion of senior project topics in electrical and computer engineering. Development of senior project proposal. Employment opportunities and professional issues are also discussed. 1 seminar. Credit/No Credit grading only. Prerequisite: EE 301/EE 341, EE 307/EE 347.

EE 461, 462 Senior Project (3) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: EE 309/EE 349, EE 319/EE 359, EE 325/EE 365, EE 334, EE 460.

EE 470 Selected Advanced Topics (1-3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Consent of instructor.

EE 471 Selected Advanced Laboratory (1-3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

EE 472 Digital Control Systems Laboratory (1)

Design and programming of microprocessor-based digital controls for electro-mechanical plants. Topics include digital control laws, translation of transfer functions into algorithms, assembly language programming, real-time software design, sample rate selection, finite word-length considerations. 1 laboratory. Prerequisite: EE 342. Concurrent: EE 432.

**EE 478 Digital Computer Systems Laboratory (1)
(Also listed as CPE 478)**

Laboratory analysis and synthesis of digital computer subsystems. Microprogramming of a simple digital computer via computer simulation. Interfacing with digital systems. 1 laboratory. Prerequisite: EE 359. Concurrent: EE 437.

EE 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

EE 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

EE 500 Individual Study (1-3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department chair, graduate adviser, and supervising faculty member.

EE 502 Microwave Engineering (4)

Application of Maxwell's equations and boundary value problems to waveguide structures. Striplines and microstrip lines. S-parameters. Microwave equivalent circuit theorem. Passive microwave devices. Charge and field interactions in oscillators and amplifiers. Transferred electron devices, avalanche transit-time devices, and microwave transistors. Circuits associated with oscillators and reflection type amplifiers. 4 seminars. Prerequisite: EE 401.

EE 511 Electric Machines Theory (3)

Advanced topics in electric machines theory. Introduction to Park's transformation. Analysis of electric machines using Kron's generalized concept. Excitation systems. 3 seminars. Prerequisite: EE 325 or equivalent, graduate standing or consent of instructor.

EE 513 Control Systems Theory (4)

State representation of dynamic systems. Mathematical models of physical devices, controllability and observability. Design of

closed-loop systems. Optimal control theory. 4 seminars.
Prerequisite: EE 302 or equivalent, graduate standing or consent of instructor.

EE 514 Advanced Topics in Automatic Control (4)

Summary course covering five selected graduate-level topics in automatic control theory and practice; implementation issues in digital control, nonlinear control theory and design, LQ and time optimal control, variable structure control, and fuzzy logic/model-free control. 4 seminars. Prerequisite: EE 513 or equivalent, EE 328 or similar course on discrete-time linear systems.

EE 515 Discrete Time Filters (4)

Analysis and design of digital filters using time-domain and transform techniques. Frequency response, aliasing problems and sampling issues. Recursive and non-recursive filters, digital filtering in numerical analysis, image processing, prediction algorithms. 4 seminars. Prerequisite: EE 414, graduate standing or consent of instructor.

EE 517 Information Theory (4)

Introduction to information theory and coding. Self and mutual information. Discrete and continuous information sources and transmission channels. Additive white Gaussian noise channel. Channel capacity. The Source- and Channel-Coding Theorems. Data compression. Huffman code. Block codes, including Hamming and linear codes. Parity and syndrome decoding. Convolutional codes. 4 seminars. Prerequisite: EE 414, EE 525, graduate standing or consent of instructor.

EE 518 Advanced Power System Analysis (3)

Symmetrical components. Unbalanced faults. Analysis by digital computer simulation. Load flow studies. Elements of power system stability. 3 seminars. Prerequisite: EE 406 or equivalent, graduate standing or consent of instructor.

EE 519 Power System Design (4)

Design studies involving aspects of an electric power system. Current industrial designs. Computer simulation techniques used extensively. 4 seminars. Prerequisite: EE 518, graduate standing or consent of instructor.

EE 520 Solar-Photovoltaic Systems Design (3)

Solar cell and storage battery theory, examination of insolation variability and optimization techniques, principles of grounding protection and control, a survey of power conditioning equipment and system integration techniques. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

EE 521 Computer Systems (4)

Organization of modern general purpose, high speed digital computer systems. Arithmetic units, control units, memories and memory subsystems. Peripheral equipment. Cost and speed trade-offs in the design of such systems. 4 seminars. Prerequisite: EE 437, or consent of instructor.

EE 522 Microprocessor-Based Digital System Design (4)

Design and implementation of microprocessor-based digital systems. Their analysis and cost effective use in system design problems. Data acquisition and control systems. Role of microperipheral controllers. Laboratory problems associated with interfacing microprocessors to various systems. 3 seminars, 1 laboratory. Prerequisite: EE 436, or consent of instructor.

EE 523 Digital Systems Design (3)

Design of asynchronous sequential machines and pulse mode logic circuits. Selected automata theory topics include state compatibility analysis, state partition analysis, threshold logic, fuzzy logic. Modern digital system design. Analysis of MOS-LSI multiphase logic structures. Comparison of digital subsystems. Microprocessor as a digital subsystem module. 3 seminars. Prerequisite: EE 319, graduate standing or consent of instructor.

EE 524 Solid State Electronics (3)

Physical theory of solid-state devices. Properties of metal-semiconductor junctions and p-n junctions. Derivation of properties of diodes, transistors, and four-layer devices from basic physical and mathematical considerations. 3 seminars. Prerequisite: PHYS 412 or equivalent, graduate standing or consent of instructor.

EE 525 Stochastic Processes for Engineers (4)

Probability and stochastic processes used in random signal analysis. Response of linear systems to random inputs. Auto-correlation and power spectral densities. Applications in signal processing using the discrete Kalman filter. 4 seminars. Prerequisite: EE 304 or equivalent, graduate standing or consent of instructor.

EE 526 Digital Communications (4)

M-ary signals. Vector space representation of signals. Optimum receiver principles. Common signal sets. Signal space dimensionality versus time-bandwidth product. 4 seminars. Prerequisite: EE 414 and EE 525, or consent of instructor.

EE 527 Advanced Topics in Power Electronics (4)

Static variable speed AC and DC drives. Phase-controlled rectifiers and choppers in DC motor control. PWM in three-phase inverters, sinusoidal modulation techniques, control strategies for AC three-phase variable speed motor control using voltage source inverters, current source inverters and speed control of AC motors. Torque and speed pulsations. HVDC converters and DC transmission. 4 seminars. Prerequisite: EE 410, EE 411 or equivalent, graduate standing or consent of instructor.

EE 528 Digital Image Processing (4)

Two-dimensional spatial frequency transforms. Image enhancement, histogram equalization. Smoothing and sharpening. Image restoration, image encoding and segmentation. Descriptors. 4 seminars. Prerequisite: EE 414, EE 525, graduate standing or consent of instructor.

EE 529 Advanced Topics in Microwave Device Electronics (3)

Emphasis on device and circuit principles of active microwave solid-state devices, their noise aspects and systems applications. 3 seminars. Prerequisite: EE 401, PHYS 412 or equivalent, graduate standing or consent of instructor.

EE 530 Photonic Systems (4)

Design of radiometric information optics and imaging systems. Remote sensing, guidance and tracking, fiber optic and laser communications. Component modeling and optimization of systems for detection of radiant flux with maximum signal to noise ratio. Modeling of source, intervening media, optical subsystem, focal plane, signal-conditioning electronics, and output and display. 4 seminars. Prerequisite: EE 401, EE 414 or equivalent, graduate standing or consent of instructor.

EE 533 Antennas (4)

Principles of antenna theory. Antenna parameters, radiation integrals. Duality and reciprocity theorems. Wire antennas. Antenna arrays. Traveling wave antennas. Broadband and frequency independent antennas. Aperture and reflector antennas. Microstrip antennas. Antenna design. 4 seminars. Prerequisite: EE 401.

EE 541 Advanced Microwave Laboratory (2)

Experimental measurement in waveguide and microstrip circuits employing the advanced Network Analyzer. Design of both passive and active microwave circuits using microstrip. Graphical and analytical design techniques as well as the use of computer-aided design codes. 2 laboratories. Prerequisite: EE 401. Concurrent or prerequisite: EE 502 or consent of instructor.

EE 563 Graduate Seminar (1) (CR/NC)

Current developments in the fields of electrical and electronic engineering. Participation by students, faculty and guest lecturers. Open to graduate students with a background in electrical or electronic engineering. Credit/No Credit grading only. Total credit limited to 3 units. 1 seminar.

EE 570 Selected Advanced Topics (1–3)

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors with electrical and electronic engineering background. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.

EE 599 Design Project (Thesis) (2) (2) (5)

Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the requirement for the degree. An appropriate experimental or analytical thesis or project may be accepted. Prerequisite: Graduate standing.

EHS—ENVIRONMENTAL HORTICULTURAL SCIENCE

EHS 110 Orientation to Environmental Horticultural Science (1) (CR/NC)

Understanding the depth and breadth of the environmental horticulture industry, the department, and the University. Student and professional organizations, equipment safety and operation. Required of all students in the major. Credit/No Credit grading only. 1 laboratory.

EHS 121 Fundamentals of Environmental Horticulture I (4)

Introduction to environmental horticulture. Plant processes, climate and the effect of the environment on plants. Controlling the plant's environment, soil and media, mineral nutrition. Introduction to disease and pest control. Field trip required. 3 lectures, 1 laboratory.

EHS 122 Fundamentals of Environmental Horticulture II (4)

Aesthetic aspects of environmental horticulture, including landscape drafting, landscape and floral design and history. Design in the use and presentation of environmental products. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: EHS 110, EHS 121.

EHS 123 Landscape Installation and Maintenance (4)

Planting and maintenance of trees, shrubs, ground covers, and small turf areas. Site selection, cultural requirements, scheduling

of maintenance activities, pruning and fertilizing. Equipment maintenance, safety and operation. Speakers from industry. 3 lectures, 1 laboratory. Prerequisite: EHS 110, EHS 121.

EHS 124 Plant Propagation (4)

Plant propagation practices with emphasis on understanding why practices are used, how they work, and how applied in commercial horticulture. 3 lectures, 1 laboratory. Prerequisite: EHS 110, EHS 121.

EHS 125 Florist Practices I (3)

Fundamentals of theory, techniques and skills currently practiced in the florist industry. Intended as consumer education for non-majors as well as initial preparation for pre-professionals. Includes applied art principles, post-harvest care and handling practices, and proper use of florist tools and materials in crafting basic designs. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories.

EHS 126 Environmental Horticulture Construction (2)

Design, construction and repair of structures and facilities unique to the environmental horticulture industry. Materials, tools, equipment, and machinery used. 2 laboratories.

EHS 200 Special Problems for Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total graduation credit limited to 4 units, with a maximum of 4 units per quarter. Report required. Prerequisite: Consent of department head.

EHS 210 Enterprise Project I (1–4)

Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to two units. Credit/No Credit grading only. Prerequisite: EHS 110, EHS 121, EHS 124.

EHS 221 Water Issues and Delivery Systems (3)

Water issues as they relate to the environmental horticulture industry. Water management, conservation, and quality. Methods and evaluation of water delivery. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisites: EHS 121, EHS 122, EHS 123, EHS 124, CHEM 111.

EHS 225 Florist Practices II (3)

Expanded exploration and application of design theory to commercial products and services in the retail florist industry. Appropriate utilization of current sales and business practices in a florist setting. Advanced techniques and skills for construction of wedding, sympathy, holiday and gift floral designs. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: EHS 125.

EHS 230 Environmental Horticulture (4) GE F2

Technical information and recommendations for the residential horticulturist. Propagation, pruning, planting, media, fertilizers, pest and weed control, landscaping, maintenance, identification and care of ornamental plants. Being a wise horticultural consumer. For non-horticulture majors. 3 lectures, 1 laboratory.

EHS 231, 232 Plant Materials (4) (4)

Identification, habits of growth, cultural requirements, and use of ornamental plants in the landscape. Field trip required. 3 lectures, 1 laboratory. Prerequisite: BOT 121. EHS 231 prerequisite for EHS 232.

EHS 243 Turf Management (4)

Turf propagation, irrigation, fertilizer and pest control methods and procedures. Turf grass varieties and uses. Turf equipment. 3 lectures, 1 laboratory. Prerequisite: EHS 123, SS 221.

EHS 301 Principles of Landscape Design (4)

Introduction to basic principles and elements of single-family residential landscape design, design theory, plant composition; creative problem solving, functional and aesthetic uses of landscape materials, client and maintenance criteria, xeriscape concepts, and perspective drawing. Expansion of EHS 122 drafting and CADD skills. Miscellaneous course fee may be required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: EHS 122, EHS 123, EHS 126, EHS 231 and one computer course (computer literacy).

EHS 310 Enterprise Project II (2–4) (CR/NC)

Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to two units. Maximum degree credit for EHS 210 and EHS 310 limited to four units. Credit/No Credit grading only. Prerequisite: EHS 210 or consent of instructor.

EHS 315 Advanced Plant Materials (4)

Researching information about horticultural plants and presenting it verbally, in writing, and photographically. Systematic learning and identification of a selected group of horticultural plants. Field trip required. Miscellaneous course fee required—see *Class Schedule*. 4 lectures. Prerequisite: EHS 232.

EHS 320 Horticultural Presentation Techniques (4)

Computer Assisted Design Drafting (CADD) applications for horticultural business. Exposure to various media essential to horticultural presentations. Expanded computer applications for plan, elevation, and perspective drawings. Exposure to estimating, plant materials database and plant selection programs. Required field trip. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: Computer literacy course; EHS 122.

EHS 321 Residential Landscape Design (4)

Principles of landscape design for single-family residential properties. Project involvement includes actual client contact. Application of xeriscape concepts. Computer assisted design applications emphasized. Required field trips. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: EHS 231, EHS 232, EHS 301. Recommended: EHS 320, EHS 381, BRAE 237.

EHS 324 Foliage Plant Culture (4)

Identification, propagation, production, marketing, utilization and maintenance of plants intended for interior plantscaping. 3 lectures, 1 laboratory. Prerequisite: EHS 121, EHS 124, SS 121.

EHS 325 Floriculture Grades and Standards (3)

Grades and standards for fresh flowers, and blooming and foliage plants. Score cards in evaluating florist crops. Comparative evaluation used to develop both verbal skills and appreciation of commercially grown floriculture crops. 1 activity, 2 laboratories. Prerequisite: EHS 121, or consent of instructor.

EHS 327 Abiotic Plant Problems (3)

Diagnosis of physiological disorders associated with environmental and nutritional factors. Particular emphasis on the systematic inquiry process. Case histories, multimedia use. 2 lectures, 1 laboratory. Prerequisite: EHS 122, EHS 123, EHS 124, BOT 121, CHEM 111, SS 121.

EHS 331 Landscape Contracting (4)

Practices in supervising personnel and applying standard techniques in landscape construction. Cost finding and estimating for landscape trades. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: EHS 122, EHS 126, EHS 301.

EHS 332 Landscape Contracting (4)

Practices in supervising personnel and applying standard techniques in landscape construction cost finding and estimating for landscape trades. Rules, regulations, and licensing laws, set forth by the State of California, governing landscape contractors. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: EHS 331.

EHS 333 Sport and Recreational Turf (4)

Maintenance and operation of large areas such as golf greens, athletic fields, and park areas. Systems of management and maintenance, business aspects, and turf industry. 3 lectures, 1 laboratory. Prerequisite: EHS 243.

EHS 337 Park Planning and Management (4)

Overview of the management and maintenance of private and public parks and recreational areas. Field trips required. 3 lectures, 1 laboratory. Prerequisite: Junior standing or consent of instructor.

EHS 339 Internship in Ornamental Horticulture (1–12) (CR/NC)

Selected Ornamental Horticulture students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only. Prerequisite: Consent of internship instructor.

EHS 340 Principles of Greenhouse Environment (4)

Analysis of problems and practices affecting the contemporary commercial horticulturist. Analysis and operation of greenhouses and related equipment stressing the effect of environment on plant growth. Field trip required. 3 lectures, 1 laboratory. Prerequisite: EHS 121, or consent of instructor.

EHS 341 Cut Flower Production (4)

Production of cut flowers and other fresh florists' commodities in greenhouses and outdoors. Preparation and scheduling of such commodities for major markets. Field trip required. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: EHS 340 or consent of instructor.

EHS 342 Potted Plant Production (4)

Production of major commercial flowering potted plants in greenhouses and outdoors. Preparation and scheduling of potted flowering greenhouse crops for major markets. Field trip required. 3 lectures, 1 laboratory. Prerequisite: EHS 340 or consent of instructor.

EHS 381 Native Plants for California Landscapes (4)

Horticultural investigation of the California flora with emphasis on landscape use and potential. Plant recognition, identification, propagation and culture. Utilization of native plants in landscape design and habitat restoration. Field trips required. 3 lectures, 1 laboratory. Prerequisite: BOT 121, junior standing or consent of instructor.

EHS 400 Special Problems for Advanced Undergraduates (1–4)

Individual investigation, research, studies, or surveys of selected problems. Total degree credit limited to 4 units, with a maximum of 4 units per quarter. Report required. Prerequisite: Consent of department head.

EHS 401 Field Studies in Ornamental Horticulture (1)

Field trips to ornamental horticulture outlets and the industry businesses that supply them. Garden centers, flower shops and garden center flower shop combinations. Foundation and display gardens with retail outlets and public educational facilities. Required field trip includes wholesalers, jobbers, display houses, advertising agency and others working with the retailers. 1 activity. Prerequisite: EHS 121.

EHS 402 Retailing Horticultural Products (4)

Economics of operating and managing retail horticulture outlets. Location, selection, layout, and demographic studies. Personnel management, merchandising, advertising, pricing strategies and selling techniques, cooperative buying and industry contributions. 3 lectures, 1 laboratory. Field trip required. Prerequisite: EHS 121, EHS 122, ECON 201 or ECON 211, junior standing or consent of instructor. Recommended: BUS 271.

EHS 421 Arboriculture (4)

Care and management of large ornamental trees. Use of ropes and other safety equipment in tree climbing. Cavity work, bracing, cabling, and pruning. 3 lectures, 1 laboratory. Prerequisite: EHS 123, EHS 231, EHS 232, or consent of instructor.

EHS 422 Advanced Arboriculture (2)

Theory and practices utilized in the management of ornamental trees found in landscaped urban settings. Scheduling of cultural practices and safe usage of hand and power equipment, as specified by professional arborists, and other safety regulations. 2 activities. Prerequisite: EHS 421 or consent of instructor.

EHS 424 Nursery Crop Production (4)

History and overview of the nursery industry. Types of wholesale nurseries and their products. Plant production systems, scheduling, marketing. Emphasis on the wholesale nursery industry in the western U.S. Field trip required. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: EHS 124, EHS 221, EHS 222, SS 221, senior standing, or consent of instructor.

EHS 425 Tissue Culture Propagation (3)

Principles of tissue culture applied to the propagation of ornamental plants. Systems applicable to commercial crops, laboratory organization, media, and current research. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: EHS 124 and BOT 322 or CRSC 410.

EHS 427 Disease and Pest Control Systems for Ornamental Plants (4)

Recognition, prevention and control of diseases, insect/mite pests and weeds that impact commercial ornamental plantings. Integrated pest management strategies presented including biological, cultural, and safe and proper pesticidal controls. Laboratory emphasizes hands-on approach to disease, pest and weed control procedures. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: EHS 121, CRSC 311, BOT 324 and senior standing.

EHS 434 Landscape Management (4)

Maintenance procedures and operations. Operating a landscape management business. Estimating, scheduling, recordkeeping and implementation of landscape maintenance projects. Interior landscape maintenance. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: EHS 123, EHS 126, or permission of instructor.

EHS 435 Interiorscaping (4)

Systematic presentation and critique of current aspects of interior landscaping. Elements of design, environmental influences and measurements, plant materials selection, specifications, procurement and installation, and subsequent maintenance of finished interiorscape. 3 lectures, 1 laboratory. Prerequisite: EHS 301 and EHS 324 or consent of instructor.

EHS 443 Greenhouse Management (4)

Problems and practices in the management of greenhouses. Scheduling greenhouse crops, planning crop rotation, cost accounting for floricultural crops, management decisions in production costs and personnel matters. Field trips required. 3 lectures, 1 laboratory. Prerequisite: EHS 342 or consent of instructor.

EHS 461 Senior Project (2)

Selection of a project under faculty adviser approval. Initial research and data gathering period for project information. Projects typical of problems which graduates must solve in their fields of study or employment. Project results are presented in a formal written report completed in EHS 462. Contract drawn up with approval of adviser. Minimum 60 hours. Prerequisite: All 100–200 level courses in EHS curriculum; 135 units; ENGL 114, ENGL 215 or ENGL 218.

EHS 462 Senior Project (2)

Continuation of Senior Project development. Write-up of rough draft and formal draft of project. Completion of formal written report under adviser supervision. Minimum 60 hours. Prerequisite: Completion of EHS 461 with a grade of C or better.

EHS 463 Senior Seminar (1)

Open forum for senior students presenting information and developing skills necessary for career planning in professional horticulture. Exposure to current employment trends in the EHS industry. 1 seminar. Prerequisite: EHS 461.

EHS 470 Selected Advanced Topics (1–3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

EHS 471 Selected Advanced Laboratory (1–3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

EHS 581 Graduate Seminar in Ornamental Horticulture (3)

Group study of current problems of the ornamental horticulture industry; current experimental and research findings as applied to production and to the teaching of horticulture. Service course for, and topics chosen by, Agriculture Education Department. Not available for credit for EHS majors. Repeatable for credit up to 9 units. 3 seminars.

ENGL–ENGLISH**ENGL 101 Basic Writing I (4) (CR/NC)**

Practice in writing expository prose with attention paid to sentence variety, fluency, and editing skills. Emphasis on reading and the writing process. Directed readings of exemplary writings. Not for baccalaureate credit. Credit/No Credit grading only. Repeatable. 4 lectures.

ENGL 102 Basic Writing II (4) (CR/NC)

Instruction in the writing process. Practice in the strategies of writing, revising, and editing paragraphs and essays with attention paid to focus, support, and organization. Directed readings of exemplary prose. Not for baccalaureate credit. Credit/No Credit grading only. Repeatable. 4 lectures.

ENGL 104 Writing Lab Tutorial (1) (CR/NC)

Individual tutorials of at least three hours a week in the University Writing Lab. Practice in various essay writing strategies based on a student's needs and at a student's own pace. Preparation for freshman composition. Not for baccalaureate credit. Credit/No Credit grading only. Repeatable. 1 laboratory. Prerequisite: At least one quarter of basic writing.

ENGL 111 English Sentence Structure for ESL/EFL Students (4) (CR/NC)

Focus on the fundamentals of sentence patterns, sentence construction, and sentence combining within the context of the paragraph and story. Practice in writing a variety of effective sentences; practice in linking sentences in a unified paragraph controlled by a topic sentence. Not for baccalaureate credit. Credit/No Credit grading only. 4 lectures. Prerequisite: Non-native English speakers who need to develop skill in writing English sentences.

ENGL 112 English Paragraph Development for ESL/EFL Students (4) (CR/NC)

Focus on the fundamentals of paragraph development within the context of the essay and story. Writing paragraphs with strong topic sentences that control paragraph unity; linking paragraphs for a unified essay through transitions and the control of the thesis statement. Not for baccalaureate credit. Credit/No Credit grading only. 4 lectures.

ENGL 113 Essay Writing/ESL (4) (CR/NC)

Practice in essay writing with special attention paid to the writing process. Focus on using details and examples for effective development. Review of grammar problems specific to ESL students. Journal writing to enhance fluency. Directed readings of essays and fiction. Not for baccalaureate credit. Credit/No Credit

grading only. 4 lectures. Prerequisite: ENGL 111 or ENGL 112, or consent of instructor.

ENGL 114 Writing: Exposition (4)**GE A1**

Writing and stylistic analysis of expository papers. Study and application of techniques of exposition. Critical reading of model essays. 4 lectures.

ENGL 125 Critical Thinking (Also listed as PHIL 125 and SPC 125)**GE A2**

Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the composing of arguments in English. 3 lectures. Prerequisite: ENGL 114 or equivalent.

ENGL 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems at the lower division level. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

ENGL 203 Core I: Old English/Medieval (4)

Representative canonical and non-canonical readings in the literature of the period. Selections will include *Beowulf*, Dante, the Pearl Poet, Chaucer, Medieval theater, and others, as chosen by the instructor. 4 lectures. Prerequisite: ENGL 114 and ENGL 215 or ENGL 218, and ENGL 251; for English majors only.

ENGL 204 Core II: Renaissance (4)

Representative canonical and non-canonical readings in the literature of the period. Selections will include Shakespeare, Spenser, Milton, Donne, Jonson, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 203; for English majors only.

ENGL 205 Core III: 1660–1798 (4)

Representative canonical and non-canonical readings in the literature of the period. Selections will include Pope, Swift, Austen, representative American Colonial writers, one playwright, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 204; for English majors only.

**ENGL 215 Writing: Argumentation (4)
(also listed as HNRS 215)****GE A4**

Instruction in the drafting, revising, editing and proofreading of effective argumentative prose; techniques of discovery, evaluation, and the incorporation of secondary sources in effective arguments. Discussion of the elements of argument in written prose. Critical reading of modes of effective argument. Not open for A4 credit to students with credit in ENGL 218. 4 lectures. Prerequisite: ENGL 114 and ENGL 125 or PHIL 125 or SPC 125.

ENGL 218 Professional Writing: Argumentation and Reports (4)**GE A4**

Extensive writing in professional situations. Composing and conveying technical information using both traditional methods and electronic media. Work in business situations. Graphic design and layout. Not open for A4 credit to students with credit in ENGL 215. 4 lectures. Prerequisite: ENGL 114 and ENGL 125 or PHIL 125 or SPC 125.

**ENGL 230 Masterworks of British Literature:
Through the Eighteenth Century (4)****GE C1**

Selected readings in British literature from its beginnings through the Eighteenth Century. Includes works by such authors as Chaucer, Shakespeare, Spenser, Donne, Milton, Swift, Pope, and

Johnson. 4 lectures. Prerequisite: ENGL 114 and ENGL 215 or ENGL 218, or consent of instructor.

ENGL 231 Masterworks of British Literature: Romantic Period to the Present (4) GE C1

Selected readings in British literature from the Romantic period to the present. Includes works by such authors as Wordsworth, Keats, Tennyson, Shaw, Yeats, Woolf, and Eliot. 4 lectures. Prerequisite: ENGL 114 and ENGL 215 or ENGL 218, or consent of instructor.

ENGL 240 American Tradition in Literature (4) GE C1

Selected readings in American literature from the Colonial period to the Twentieth Century. Literary expression of such philosophies as Puritanism, Deism, Transcendentalism, Naturalism and Modernism. Works by such authors as Franklin, Emerson, Poe, Whitman, Dickinson, Twain, Frost, and Faulkner. 4 lectures. Prerequisite: ENGL 114 and ENGL 215 or ENGL 218, or consent of instructor.

ENGL 251 Great Books of World Literature: Classical and Ancient World (3) GE C1

Selected readings from the earliest epics through the literature of Greece and Rome. Includes such works as *Gilgamesh*, and such authors as Homer, Aeschylus, Sophocles, Euripedes, Virgil and Ovid. 3 lectures. Prerequisite: ENGL 114 and ENGL 215 or ENGL 218, or consent of instructor.

ENGL 252 Great Books of World Literature: Middle Ages, Renaissance and Enlightenment (3) GE C1

Selected readings from the fall of the Roman Empire to the Eighteenth Century. Includes such authors as Hsiyu Chi, Chrétien de Troyes, Chaucer, Dante, Cervantes, Shakespeare, Molière, Voltaire and Swift. 3 lectures. Prerequisite: ENGL 114 and ENGL 215 or ENGL 218, or consent of instructor.

ENGL 253 Great Books of World Literature: Romanticism and the Modern World (3) GE C1

Selected works from Romanticism up to the present. Literary expression of movements such as Realism, Naturalism, and Existentialism. Includes such authors as Goethe, Hugo, Wordsworth, Keats, Flaubert, Balzac, Dostoevsky, Woolf, Joyce, Beckett, and Achebe. 3 lectures. Prerequisite: ENGL 114 and ENGL 215 or ENGL 218, or consent of instructor.

ENGL 260 Children's Literature (3)

Analysis and evaluation of realism, traditional fantasy, modern fantasy, and poetry for children in multiple subject classroom grades K–8. 3 lectures. Prerequisite: ENGL 114 and ENGL 215 or ENGL 218, or consent of instructor.

ENGL 290 Introduction to Linguistics (4)

Introduction to the nature of language; concepts and methods of linguistic science. 4 lectures. Prerequisite: ENGL 114 and ENGL 215 or ENGL 218, or consent of instructor.

ENGL 301 Advanced Composition – ESL (4)

Writing and critical analysis of expository and argumentative papers. Emphasis on rhetorical, stylistic, and grammatical problems specific to non-native speakers. Critical reading of essays and/or fiction. Practice in revision and editing of papers. Journal writing to promote fluency. 4 lectures. Prerequisite: ENGL 215 or ENGL 218 or completion of Area A.

ENGL 302 Writing: Advanced Composition (4)

Writing and analysis of expository and argumentative papers at an advanced level. Special attention paid to issues of style and voice. Critical reading of models of effective writing. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

ENGL 303 Core IV: 1798–1865 (4)

Representative canonical and non-canonical readings in the literature of the period. Selections will include Wordsworth, Coleridge, Keats, Emerson, Hawthorne, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 205; for English majors only.

ENGL 304 Core V: 1865–1914 (4)

Representative canonical and non-canonical readings in the literature of the period. Selections will include Dickinson, Whitman, Arnold, James, Hardy, and others, as chosen by the instructor. 4 lecture. Prerequisite or concurrent: ENGL 303; for English majors only.

ENGL 305 Core VI: 1914–Present (4)

Representative canonical and non-canonical readings in the literature of the period. Selections will include Yeats, Joyce, Woolf, Eliot, Faulkner, and others, as chosen by the instructor. 4 lectures. Prerequisite or concurrent: ENGL 304; for English majors only.

ENGL 310 Corporate Communication (4)

Instruction and practice in forms of communication characteristic of business and industry. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

ENGL 318 Advanced Professional Writing (4)

Professional writing as produced in industry and government. Analytic reports, manuals, instructions, specifications. Trade journal articles. Editing skills. Orientation to professional communication careers. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

ENGL 326 Literary Theory (4)

Theory and practice from the various perspectives common in current criticism covering fundamental issues about literature and its contexts, including the nature of literary "truth," the autonomy of texts, relationships between literature and history and the role of ideology, among others. 4 lectures. Prerequisite: ENGL 215 or ENGL 218, or consent of instructor.

ENGL 327 Creative Writing: Fiction (4)

Instruction and practice in writing, revising, and evaluating fiction. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 215 or ENGL 218, or consent of instructor.

ENGL 328 Creative Writing: Poetry (4)

Instruction and practice in writing, revising, and evaluating poetry. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 215 or ENGL 218, or consent of instructor.

ENGL 329 Creative Writing: Drama (4)

Instruction and practice in writing, revising, and evaluating drama. Total credit limited to 8 units. 4 lectures. Prerequisite: ENGL 215 or ENGL 218, or consent of instructor.

ENGL 330 British Literature: Medieval Period (4) GE C3

Major works of the Old and Middle English periods in modern translation, including epic and lyric poetry, early religious writings, romance cycles and mystery and morality plays. Representative

works include *Beowulf*, the Arthurian legends, *Everyman* and Chaucer's *Canterbury Tales*. 4 lectures. Prerequisite: One of the following: ENGL 203, 230, 231, 251, 252, or 253, or consent of instructor.

ENGL 331 British Literature: The Renaissance (4) GE C3

Major works of Elizabethan and Jacobean prose, poetry and drama. Literary responses to the foundations of humanism, individualism, nationalism and other forces of change leading from the medieval to the modern world. Representative writers include Spenser, Sidney, Donne, Jonson, Bacon and Milton. 4 lectures. Prerequisite: One of the following: ENGL 204, 230, 231, 251, 252, or 253, or consent of instructor.

ENGL 332 British Literature: The Enlightenment (4) GE C3

Major prose, poetry, and drama from 1660 to 1800, emphasizing the period's interest in order, reason, rules and decorum in both life and literature. Representative writers include Dryden, Swift, Pope, Johnson, Boswell and Defoe. 4 lectures. Prerequisite: One of the following: ENGL 205, 230, 231, 240, 251, 252, or 253, or consent of instructor.

ENGL 333 British Literature: Romanticism (4) GE C3

Major works of the Romantic period. Romantic concepts of imagination, individualism, nature and the organic qualities of art. Representative writers include Blake, Wordsworth, Coleridge, Byron, Shelley and Keats. 4 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, 303, or consent of instructor.

ENGL 334 British Literature: The Victorians (4) GE C3

Major prose and poetry of the Nineteenth Century. Victorian concerns such as progress, belief, alienation and threats to the sense of personal identity in a technological age. Representative writers include Carlyle, Ruskin, Tennyson, Browning and Arnold. 4 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, 304, or consent of instructor.

ENGL 335 British Literature: Twentieth Century (4) GE C3

Selected prose, poetry, and drama reflecting major movements of British literature from Modernism through Postmodernism. Representative writers include Conrad, Joyce, Woolf, Waugh, Drabble, Yeats, Eliot, Smith, and Stoppard. 4 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, 305, or consent of instructor.

ENGL 338 Shakespeare in London (4) GE C3

Readings from such works as *Hamlet*, *King Lear*, *A Midsummer Night's Dream*, and the sonnets. Attendance at performances of these plays in or near London. Miscellaneous course fee may be required—see *Class Schedule*. Not open for C3 credit to students with credit in ENGL 339. 3 lectures, 1 activity. Prerequisite: One of the following: ENGL 204, 230, 231, 251, 252, or 253, or consent of instructor.

ENGL 339 Introduction to Shakespeare (4) GE C3

Readings from such works as *Hamlet*, *King Lear*, *A Midsummer Night's Dream* and the sonnets. Not open for C3 credit to students with credit in ENGL 338. 4 lectures. Prerequisite: One of the following: ENGL 204, 230, 231, 251, 252, or 253, or consent of instructor.

ENGL 340 American Literature to 1860 (4) GE C3

Selected prose and poetry by American writers to 1860, showing the Puritan foundation of our national literature, developments of the Enlightenment, and achievements of the Romantic age. Representative writers include Bradstreet, Edwards, Franklin, Paine, Emerson, Poe, Hawthorne, Thoreau and Melville. 4 lectures. Prerequisite: One of the following: ENGL 205, 230, 231, 240, 251, 252, 303, or 253, or consent of instructor.

ENGL 341 American Literature: 1860–1914 (4) GE C3

Selected prose and poetry by American writers from the Civil War to World War I with the focus on local-color fiction and on literary Realism and Naturalism. Representative writers include Whitman, Dickinson, Twain, James, Howell, Chopin and Crane. 4 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, 304, or consent of instructor.

ENGL 342 American Literature: 1914 to the Present (4) GE C3

Selected prose, poetry and drama by American writers from World War I to the present, depicting the social and psychological complexities of the Twentieth Century. Representative authors include Frost, Eliot, Stevens, Fitzgerald, Hemingway, Faulkner and O'Neill. 4 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, 305, or consent of instructor.

ENGL 345 Women Writers (4) GE C3 USCP

Literature by women with attention to the woman artist and the creative process. Women writers and the dominant literary tradition with consideration of the existence of a women's literary tradition. Special emphasis upon the intersections of race, gender, and class as they affect the creative process. 4 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, or consent of instructor.

ENGL 346 Ethnic American Literature (4) GE C3 USCP

Literature by African American, Asian American, and Native American writers, and American writers of Mexican descent. Socio-cultural impact on the creative process. Historical contexts which served as a background to particular literary trends. Relationships of such writers to the American canon and a revised canon. 4 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, or consent of instructor.

ENGL 350 Modern Novel (3) GE C3

Readings in representative Twentieth Century novels with special emphasis on form and ideas. 3 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, or consent of instructor.

ENGL 351 Modern Poetry (3) GE C3

Readings in representative Twentieth Century poetry with special emphasis on form and ideas. 3 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, or consent of instructor.

ENGL 352 Modern Drama (3) GE C3

Readings in representative Twentieth Century drama with special emphasis on form and ideas. 3 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, or consent of instructor.

ENGL 353 Drama in London (4) GE C3

Reading in drama of the Twentieth Century and/or earlier periods, exclusive of Shakespeare, with special emphasis on form and ideas.

Attendance at play performances required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 activity. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, or consent of instructor.

ENGL 355 The Bible as Literature (4)

Old and New Testaments with historical background. Literary forms and characteristics of Hebraic writing. Appreciation of the far-reaching use of Biblical narrative and reference in literature, speeches, art, drama, and modern film. 4 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, or consent of instructor.

ENGL 360 Literature for Adolescents (3)

Readings in literature suitable for use in secondary schools. 3 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, or consent of instructor.

ENGL 370 World Cinema (4)

GE C3

Major works of international cinema with emphasis on critical interpretation, on the ways film communicates visually and verbally, and on the historical and cultural contexts in which films are created. Contains films by directors such as Howard Hawks, Orson Welles, Ingmar Bergman and Akira Kurosawa. 3 lectures, 1 laboratory. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, or consent of instructor.

ENGL 372 Film Directors (4)

GE C3

Significant film directors from the Western world and non-Western world, and their cinematic and technical achievements. Demonstrates relationships of Twentieth Century modes of thought. *Class Schedule* will list topic selected. Repeatable to 12 units. 3 lectures, 1 laboratory. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, or consent of instructor.

ENGL 380 Contemporary Literary Ideas (4)

GE C3

Literature of the modern period. Significant writers, both from the Western world and the non-Western world, and their literary achievements. Demonstrates relationships of prevailing Twentieth Century modes of thought. *Class Schedule* will list topic selected. Total credit limited to 12 units. 4 lectures. Prerequisite: One of the following: ENGL 230, 231, 240, 251, 252, or 253, or consent of instructor.

ENGL 390 The Linguistic Structure of Modern English (4)

Linguistic analysis of the English language, including phonology, morphology, syntax, and style and dialect variation. 4 lectures. Prerequisite: ENGL 215 or ENGL 218, or consent of instructor.

ENGL 391 Topics in Applied Linguistics (4)

Topics in applied linguistics including sociolinguistics, first and second language acquisition, literacy, bilingualism, and dialectology. Applications to teaching the English language. *Class Schedule* will list topic selected. Repeatable to 8 units. 4 lectures. Prerequisite: ENGL 215 or ENGL 218, or consent of instructor.

ENGL 395 History of the English Language (4)

Linguistic approach to the history of the English language: evolution of phonology, morphology, lexicon, syntax, and semantics within the changing cultural context of the last 2000 years. 4 lectures. Prerequisite: ENGL 215 or ENGL 218, or consent of instructor.

ENGL 399 Tutor Training (2) (CR/NC)

Studies of approaches to tutoring one-on-one. Practice in tutoring, with supervision, in the University Writing Lab. Two hours of lecture per week which reviews the special needs of ESL, dialect-different, dyslexic, and remedial students. Overview of Writing Lab administration and design. Credit/No Credit grading only. 1 lecture, 1 laboratory. Prerequisite: ENGL 114, ENGL 215, and ENGL 315.

ENGL 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: consent of the department chair.

ENGL 408 Internship (2–12) CR/NC

Advanced study and part-time work experience; current innovation, practices, and problems in administration, supervision, and organization. Must be able to do independent work in career field. Weekly reports and evaluation by work supervisor required. Repeatable to 12 units. Credit/No Credit grading only. Prerequisite: Consent of instructor.

ENGL 411 Writing Interactive Documents (4)

Computer-based writing in theory and practice: hypertext, e-mail, online documentation, multimedia, networked group editing; compound electronic documents, interdocument linking. Technical, business, scholarly, pedagogical and creative applications. Repeatable to 8 units. 4 lectures. Prerequisite: Appropriate background: advanced skills in writing and/or graphics, and/or computer programming; upper-division standing.

ENGL 416 New Media Study (4)

Theoretical, critical, or applied study of new electronic communication media. *Class Schedule* will list topic selected. Total credit limited to 8 units. 4 seminars. Prerequisite: HUM 250 or equivalent; upper division standing.

ENGL 418 Technical Communication Practicum (2–4) (CR/NC)

Supervised work experience in government, corporate, or volunteer setting, as approved by department chair. Placement may be student or employer initiated, or through Cooperative Education. Proposal, progress reports, and final report. Total credit limited to 8 units, with a maximum of 4 units per quarter. Credit/No Credit grading only. Prerequisite: Senior standing and two technical writing courses.

ENGL 419 Multimedia Projects (2) (CR/NC)

Supervised independent projects creating computer-based multimedia documents for academic, professional, or popular audiences. Students are paired with teachers, business people, service organizations, or others who need multimedia, web, or hypertext documents designed for specific uses. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: ENGL 411 or ENGL 519 or equivalent and consent of instructor.

ENGL 423 Writing in Secondary Schools (4)

Methods of teaching writing in secondary schools, with emphasis on how writing may be integrated into the overall English curriculum. 4 lectures. Prerequisite: ENGL 215 or ENGL 218, admission to the teaching credential program, or consent of instructor.

ENGL 424 Teaching English in Secondary Schools (4)

Methods of teaching English in secondary schools, with emphasis on practical approaches in a literature centered curriculum. 4 lectures. Prerequisite: ENGL 215 or ENGL 218, admission to teacher education program, or consent of instructor.

ENGL 427 Advanced Creative Writing: Fiction (4)

Instruction and practice in advanced writing, revising and evaluating of fiction. Repeatable to 8 units. 4 lectures. Prerequisite: ENGL 327 or consent of instructor.

ENGL 428 Advanced Creative Writing: Poetry (4)

Instruction and practice in advanced writing, revising and evaluating of poetry. Repeatable to 8 units. 4 lectures. Prerequisite: ENGL 328 or consent of instructor.

ENGL 429 Advanced Creative Writing: Drama (4)

Instruction and practice in advanced writing, revising and evaluating of drama. Repeatable to 8 units. 4 lectures. Prerequisite: ENGL 329 or consent of instructor.

ENGL 430 Chaucer (4)

Selected readings from Canterbury Tales and Chaucer's other major poems. 4 seminars. Prerequisite: One of the following: ENGL 330, 331, 332, 333, 334, or 335, or consent of instructor. English majors must have completed ENGL 203.

ENGL 431 Shakespeare (4)

Representative comedies, tragedies, and histories. 4 seminars. Prerequisite: One of the following: ENGL 330, 331, 332, 333, 334, or 335, or consent of instructor. English majors must have completed ENGL 204.

ENGL 432 Milton (4)

Paradise Lost, *Paradise Regained*, and *Samson Agonistes*, with some attention to the minor poems. 4 seminars. Prerequisite: One of the following: ENGL 330, 331, 332, 333, 334, or 335, or consent of instructor. English majors must have completed ENGL 204.

ENGL 439 Significant British Writers (4)

Selected British writers, as individual writers or in groups. *Class Schedule* will list topics selected. Repeatable to 12 units. 4 seminars. Prerequisite: One of the following: ENGL 330, 331, 332, 333, 334, or 345, or consent of instructor. English majors must also have completed the MAJOR CORE in the relevant period.

ENGL 449 Significant American Writers (4)

Selected American writers, as individual writers or in groups. *Class Schedule* will list topic selected. Repeatable to 12 units. 4 seminars. Prerequisite: One of the following: ENGL 340, ENGL 341, or ENGL 342, or consent of instructor. English majors must also have completed the MAJOR CORE in the relevant period.

ENGL 459 Significant World Writers (4)

Selected world writers, as individual writers or in groups. *Class Schedule* will list topic selected. Repeatable to 12 units. 4 seminars. Prerequisite: 12 units of literature courses, and consent of instructor. English majors must also have completed the MAJOR CORE in relevant period.

ENGL 461 Senior Project (1)

One-unit adjunct course which must be taken concurrently with one of the following: ENGL 411, ENGL 418, ENGL 427, ENGL 428, ENGL 429, ENGL 430, ENGL 431, ENGL 432, ENGL 439,

ENGL 449 or ENGL 459, ENGL 495, ENGL 497, or ENGL 498 during the last two quarters of the student's undergraduate career. English majors only.

ENGL 465 Computer Resources for English Teachers (4)

Computer as problem-solving, teaching, research, communication, and administrative tool in English education. Lesson planning and integration of technology into the secondary English classroom, including networked communication, the World-Wide Web, educational software and appropriate hardware. Attention to ethical, rhetorical, and phenomenological implications of the use of technology in English education. 3 seminars, 1 laboratory. Prerequisite: Completion of computer literacy requirement GE F1

ENGL 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Repeatable to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ENGL 486 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ENGL 495 Topics in Applied Language Study (4)

Application of linguistics to human communications, human relations, and language policy and planning, or literature. *Class Schedule* will list topic selected. Repeatable to 12 units. 4 seminars. Prerequisite: ENGL 290, ENGL 390 or consent of instructor.

ENGL 497 Theories of Language Learning and Teaching (4)

Theories of first and second language learning and acquisition in the context of teaching English as a second language/dialect. 4 lectures. Prerequisite: Eight units of linguistics courses or consent of instructor.

ENGL 498 Approaches to Teaching English as a Second Language/Dialect (4)

Approaches to teaching English as a second language. Attention to materials development and testing. 4 lectures. Prerequisite: ENGL 497.

ENGL 499 Practicum in Teaching English as a Second Language/Dialect (2) (CR/NC)

Practical experience in the English as a second language classroom under supervision of a cooperating teacher. Teaching materials development and curriculum design. Credit/No Credit grading only. 1 seminar, 1 supervision. Prerequisite: ENGL 497 and ENGL 498.

ENGL 501 Techniques of Literary Research (4) (CR/NC)

Purposes and methods of literary research in literature. Acquaintance with printed and on-line materials of research and practical experience in collecting material, weighing evidence, reaching conclusions, and writing scholarly articles. Analysis of dissemination of scholarly information. Discussion of ethics of

scholarship. Credit/No Credit grading only. 4 seminars. Prerequisite: Graduate standing in English.

ENGL 502 Seminar in Critical Analysis (4)

Basic approaches used by critics. Multiple points of view. Application to literary works. *Class Schedule* will list topic selected. Repeatable to 8 units. 4 seminars. Prerequisite: Graduate standing in English.

ENGL 503 Graduate Introduction to Linguistics (4)

Introduction to linguistics for graduate students. Phonology, morphology lexicon, syntax, and variation within language; application of linguistics to real-world issues. 4 seminars. Prerequisite: Graduate standing in English.

ENGL 504 Seminar in English Linguistics (4)

Examination of varying theoretical approaches to the structure of English, or applications of linguistic methods in the study of literature, dialectology, language acquisition, literacy, bilingualism, or discourse analysis. *Class Schedule* will list topic selected. Repeatable to 12 units. 4 seminars. Prerequisite: Graduate standing in English, ENGL 290, ENGL 390, or ENGL 503, or consent of instructor.

ENGL 505 Seminar in Composition Theory (4)

Special problems in composition. Direct application of composition and rhetorical theory to composition instruction. 4 seminars. Prerequisite: Graduate standing in English, or consent of instructor.

ENGL 506 Pedagogical Approaches to Composition (4) (CR/NC)

Practical problems in the teaching of English composition. Application and study of practical approaches. Discussion of classroom organization and management. Discussion of research into the nature and resolution of student writing problems. Required of all new teaching assistants in English. Credit/No Credit grading only. 4 seminars. Prerequisite: Graduate standing in English and ENGL 505, or consent of instructor.

ENGL 510 Seminar in Authors (4)

Intensive study of major British and American literary figures, singly, doubly or in small groups. Written and oral reports of individual investigation. *Class Schedule* will list topic selected. Repeatable to 16 units. 4 seminars. Prerequisite: Graduate standing in English. ENGL 501 strongly advised.

ENGL 511 Seminar in American Literary Periods (4)

American periods. Written and oral reports of individual investigation. *Class Schedule* will list topic selected. Repeatable to 20 units. 4 seminars. Prerequisite: Graduate standing in English. ENGL 501 strongly advised.

ENGL 512 Seminar in British Literary Periods (4)

British periods. Written and oral reports of individual investigation. *Class Schedule* will list topic selected. Repeatable to 20 units. 4 seminars. Prerequisite: Graduate standing in English. ENGL 501 strongly advised.

ENGL 513 Seminar in Special Topics (4)

Themes and ideas in language and literature not ordinarily covered in the routine graduate course offerings. Written and oral reports of individual investigation. *Class Schedule* will list topic selected. Repeatable to 16 units. 4 seminars. Prerequisite: Graduate standing in English. ENGL 501 strongly advised.

ENGL 515 Apprenticeship in Teaching Literature or Linguistics at College Level (2) (CR/NC)

Supervised experience in planning, teaching, and evaluating a 200- or 300-level linguistics or literature class taught by English faculty member. Planning, selecting texts, conferring with students, discussing and constructing assignments, lecturing, leading small group discussions. Credit/No Credit grading only. Repeatable to 8 units. Prerequisite: Graduate standing in English and 8 units of successful graduate work.

ENGL 518 Technical Communication Theory (4)

Theory of technical communication for teachers, managers, advanced writers, and editors. Applications to science, agriculture, engineering. Evolving concepts and uses of literacy in a technological age: e.g., readability, information retrieval, document design. 4 seminars. Prerequisite: Graduate standing in English and ENGL 318, or consent of instructor.

ENGL 519 Advanced Web Authoring (4)

Writing and publishing for the World Wide Web and/or other network based communication media. Rhetorical theory of computer-based communication and hypertext. Review of HTML and network delivery. Advanced supplementary technologies. Integration of text, graphics, multimedia, interactivity. Site construction, maintenance, and management. Total credit limited to 8 units. 4 seminars. Prerequisite: HUM 250 or equivalent; graduate standing or consent of instructor.

ENGL 527 Graduate Seminar in Creative Writing: Fiction (4)

Graduate instruction in writing, revising, and evaluating fiction. Repeatable to 8 units. 4 seminars Prerequisite: Graduate standing in English and ENGL 427, or consent of instructor.

ENGL 528 Graduate Seminar in Creative Writing: Poetry (4)

Graduate instruction in writing, revising, and evaluating poetry. Repeatable to 8 units. 4 seminars. Prerequisite: Graduate standing in English and ENGL 428, or consent of instructor.

ENGL 590 Directed Study (2-4)

Supervised independent or group study of special problems in selected areas of language, composition, or literature. Repeatable to 12 units. Prerequisite: Graduate standing in English and the permission of the graduate adviser.

ENGR-ENGINEERING

ENGR 110 Engineering Science I (3)

Introduction to engineering and computer science. Graphical communication and visualization as well as engineering orientation. Cultural pluralism and gender issues. 3 lectures.

ENGR 111 Engineering Science II (3)

Introduction to engineering and computer science. Computer-aided design (CAD) and manufacturing (CAM), and fabrication, as well as engineering orientation. Cultural pluralism and gender issues. 3 lectures.

ENGR 112 Engineering Science III (3)

Introduction to engineering and computer science. Computer science and engineering orientation. Cultural pluralism and gender issues. 3 lectures.

ENGR 141 Engineering Orientation–Freshman Seminar (2) (CR/NC)

College success skills for the technical student, including group study, time management, technical project, identification of campus resources. Academic, career and personal assessment as it relates to the educational process. Specifically for students enrolled through Student Academic Services and the Minority Engineering Program. Credit/No Credit grading only. 1 lecture, 1 activity.

ENGR 142 Engineering Careers (2) (CR/NC)

Career investigation, resume writing, job search and interview skills, speakers from industry and time management. Specifically for students enrolled through Student Academic Services and the Minority Engineering Program. Credit/No Credit grading only. 1 lecture, 1 activity.

ENGR 210 Technical Group Study Training (2) (CR/NC)

Approaches to facilitated small group study. Practice facilitating under supervision in the MEP Technical Study Center. Review academic and interactive group communication skills. Minimum two hour facilitated group lab. CRLA International Tutor Program Certification. Total credit limited to 6 units. Credit/No Credit grading only. 1 lecture, 1 laboratory. Prerequisite: Grade of B or better at Cal Poly in course student will be facilitating.

ENGR 240 Additional Engineering Laboratory (2)

Special assignments undertaken by students who need or wish to acquire abilities supplementary to their standard pattern of courses. Assignments must be primarily shop or laboratory in nature. Work is done by the student with faculty supervision. Total credit limited to 4 units. 2 laboratories. Prerequisite: Consent of department head.

ENGR 301 Technology in the 20th Century (4) GE F2

Role of science, engineering and technology in the Twentieth Century. Effects of technological change, the function of the scientist-engineer in society. Computer as a tool, case studies of systems to compare alternative approaches to problem solving. 4 lectures. Prerequisite: Junior standing or consent of instructor.

ENGR 303 Professional Development (2) (CR/NC)

Integration of principles of Engineering with industrial realities via professional problem solving modules. Research and field investigation at cooperating industry sites. Advanced learning systems. Specifically designed for transfer students. Credit/No Credit grading only. 2 lectures. Prerequisite: Junior standing or consent of instructor.

ENGR 400 Special Problems for Advanced Undergraduates (2–4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units. Prerequisite: ME 212 or consent of department head.

ENGR 450 Special Topics in Bioengineering (4)

Current topics in bioengineering, including medical applications and industrial applications. Total credit limited to 8 units, with a maximum of 4 units per quarter. See *Class Schedule* for topic selected. 3 lectures, 1 activity. Prerequisite: MATH 242, ME 313 or consent of instructor.

ENGR 462 Senior Project (4)

Selection and completion of project under faculty supervision. Projects typical of problems which graduates must solve in their

fields of employment. Project results presented in a formal report. Minimum commitment of 150 hours. Prerequisite: ME 212, junior standing, and consent of instructor.

ENGR 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ENGR 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 16 units. Credit/No Credit grading only. Prerequisite: Sophomore standing and consent of instructor.

ENGR 500 Individual Study (2–4)

Advanced study planned and completed under the direction of faculty. Open to graduate students who have demonstrated the ability to do independent work. Total credit limited to 8 units. Prerequisite: Graduate standing and consent of Program Director.

ENGR 550 Advanced Topics in Bioengineering (4)

Current topic in bioengineering research/application in detail, including medical applications and industrial applications. Takes advantage of capabilities of resident or visiting faculty. 3 lectures, 1 activity. Prerequisite: ENGR 450 or consent of instructor.

ENGR 581 Biochemical Engineering I (4)

Fundamentals of Biotechnology. Types of organisms and their structure. Unstructured and structured models for microbial growth. Theory of microbial competition. Stoichiometric and thermodynamic principles. Material and energy balances for aerobic and anaerobic growth. Kinetics of enzyme catalyzed reactions. 3 seminars, 1 laboratory. Prerequisite: BACT 221 and CHEM 371, or consent of instructor.

ENGR 582 Biochemical Engineering II (4)

Kinetics of growth, product formation and cell death. Continuous culture. Cell recycle and immobilization. Air sterilization. Transport processes in bioreactors. Scale-up of bioprocesses. Biochemical processes. Biocatalysis. Recombinant DNA and non-microbial processes. 3 seminars, 1 laboratory. Prerequisite: ENGR 581 or consent of instructor.

ENGR 583 Biochemical Engineering III (4)

Biochemical separations. Biological materials. Removal of insoluble-centrifugation, filtration, cell disruption. Primary product isolation: extraction, ultrafiltration, adsorption, ion exchange, fixed and fluidized bed operation. Production purification: gel filtration, affinity chromatography, salt fractionation. Final isolation: drying, crystallization. Quality control. 3 seminars, 1 laboratory. Prerequisite: ENGR 582 or consent of instructor.

ENGR 595 Cooperative Education Experience (12) (CR/NC)

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry,

and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only. Prerequisite: Graduate standing and consent of instructor.

ENGR 599 Design Project (Thesis) (2) (2) (5)

Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the degree requirement. An appropriate experimental or analytical thesis or project may be accepted. Prerequisite: Graduate standing.

ENVE—ENVIRONMENTAL ENGINEERING

ENVE 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

ENVE 304 Thermodynamics of Processes (3)

Material and energy balances, liquids and mixtures, vapor-liquid equilibria, solubility and absorption, equilibrium in chemical reactions. 3 lectures. Prerequisite: ME 302, CHEM 125; prerequisite or co-requisite: ENVE 331.

ENVE 309 Noise and Vibration Control (3)

Behavior of sound waves, selection of instrumentation, practical measurements, criteria for noise and vibration control. Assessment of noise produced by transportation and other engineering facilities. 2 lectures, 1 laboratory. Prerequisite: CE 114, MATH 241, PHYS 133, and CSC 234 or CSC 231.

ENVE 316 Automatic Process Control (2)

Introduction to automatic control instrumentation. Methods of analysis of control systems. Analytical determination of control response. 2 lectures. Prerequisite: MATH 242, ME 302, ME 313, ME 341.

ENVE 324 Introduction to Air Pollution (3) GE F2

Causes and effects of air pollution on the individual, the community and industry. Legal and economic aspects. For non-majors. 3 lectures. Prerequisite: Junior standing.

ENVE 325 Environmental Air Quality (3)

Consideration of ambient air contamination inside and outside. Factors included in establishing, monitoring and maintaining air quality standards. 3 lectures. Prerequisite: CHEM 125.

ENVE 330 Environmental Quality Control (3) GE F2

Application of scientific and engineering principles to control the development and use of air, water and land resources. Control of pollution of the environment. Disposal of wastes. Administrative and legal aspects. For non-Engineering majors. 3 lectures. Prerequisite: Junior standing.

ENVE 331 Introduction to Environmental Engineering (4)

Description and quantification of water quality characteristics important for water and wastewater treatment, and local and global water quality standards. Introduction to the modeling of constituent fate and transport, and to the use of flowsheets describing processes that modify water quality. 4 lectures. Prerequisite: CHEM 125, MATH 242.

ENVE 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

ENVE 411 Air Pollution Control (3)

Theory, principles and practices related to the control of particulate emissions. Mechanical separations. Cost and design of control systems. 3 lectures. Prerequisite: ENVE 304, ME 341 ENVE 325, and ENVE 331.

ENVE 421 Mass Transfer Operations (3)

Theory and practices related to using mass transfer principles to solve environmental problems. Design principles dealing with air and water pollution control and hazardous waste management. Computer simulation. 3 lectures. Prerequisite: ENVE 304, ENVE 325, ENVE 331, ME 313, and ME 341.

ENVE 426 Air Quality Measurements (3)

Planning and conducting air quality measurements in the atmosphere, indoors and at the source. Topics include both particulates, gases and meteorological measurements. 2 lectures, 1 laboratory. Prerequisite: ENVE 325, CHEM 212, ME 341, STAT 312, and ENGL 218.

ENVE 434 Water Quality Measurements (2)

Methods employed in the qualitative and quantitative determination of water and waste water constituents. Physical, chemical and biological procedures used in determining water quality. Testing of effluents from industrial and municipal treatment plants. 1 lecture, 1 laboratory. Prerequisites: CHEM 129, CHEM 212, and ENVE 330 or ENVE 331. FNR majors should consult instructor regarding this prerequisite.

ENVE 436 Introduction to Hazardous Waste Management (3)

Overview of industrial processes that produce hazardous wastes. Principles of toxicology and review of state federal regulations for hazardous wastes, including RCRA, TSCA, and superfund laws. Storage, handling, and transport of hazardous wastes. Unit operations and processes treatment and reduction. Ultimate disposal including incineration and secure landfills. 3 lectures. Prerequisite: ENVE 325 and ENVE 331, or equivalent.

ENVE 437 Industrial and Hazardous Waste Treatment Technologies (4)

Theory and experiments for innovative physical/chemical industrial and hazardous waste treatment processes. Advanced Oxidation Processes, membrane separation units, catalytic and non-catalytic reactions. Computer simulations. Analytical chemistry instrumentation. 3 lectures, 1 laboratory. Prerequisite: ENVE 304, ENVE 436, ENVE 438, STAT 312.

ENVE 438 Water and Wastewater Treatment Design (3)

Design of facilities for physical and chemical treatment of water and wastewater, biological treatment of wastewater, and treatment and disposal of sludge. Design of land treatment systems and septic tanks. Use of computers for design problems. 3 lectures. Prerequisite: ENVE 331 and ME 341.

ENVE 439 Solid Waste Management (3)

Chemical and physical properties of municipal and industrial refuse. Landfill disposal, incineration, composting. Industrial and commercial solid waste disposal problems and treatment methods. Pyrolysis. Salvage and recycle operations. Economics of disposal

methods. Interrelationship between water quality and landfill operations. 3 lectures. Prerequisite: ENVE 330 or ENVE 331, and senior standing.

ENVE 442 Advanced System Design (3)

Individual and team project work in designing environmental systems including air and water pollution control, solid waste disposal and hazardous waste management. 2 lectures, 1 laboratory. Prerequisite: ENVE 331, ENVE 411, ENVE 421, and ENVE 438. Prerequisite or co-requisite: ME 456.

ENVE 443 Bioenvironmental Engineering I (4)

Biologically mediated environmental remediation and pollution prevention is an emerging field. Introduction to the engineering aspect of the new technology, such as various in-site remediation technologies and state-of-the-art pollution prevention technologies. 3 lectures, 1 laboratory. Prerequisite: ENVE 421.

ENVE 461, 462 Senior Project (2) (2)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum of 120 hours total time. Prerequisite: Senior standing.

ENVE 465 Environmental Management and Urban Systems (2)

Interdisciplinary study of urban pollution sources and control. Political, economic, and technological interrelationships. Participation in METRO-APEX, assuming roles of several urban decision makers. 1 lecture, 1 activity. Prerequisite: Senior standing.

ENVE 470 Selected Advanced Topics (1–3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

ENVE 471 Selected Advanced Laboratory (1–3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

ENVE 485 Cooperative Education Experience (6) (CR/NC)

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

ENVE 495 Cooperative Education Experience (12) (CR/NC)

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. Total credit limited to 16 units. Prerequisite: Sophomore standing and consent of instructor.

ENVE 500 Individual Study (1–3)

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students

who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department chair.

ENVE 534 Advanced Design of Pollution Control Systems (3)

Comprehensive problems in pollution control. Methods of analysis, design of unit operations and processes for environmental engineering facilities. 1 seminar, 2 laboratories. Prerequisite: ENVE 411, and graduate standing.

ENVE 535 Advanced Wastewater Treatment (3)

Operations and processes used in tertiary treatment. Chemical coagulation, flocculation, sedimentation, filtration, absorption. Methods for removal of phosphorous, nitrogen, solids and organics. Integration of advanced wastewater treatment processes. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

ENVE 536 Biological Wastewater Treatment Processes Engineering (3)

Fundamentals of reactor engineering. Biochemical and microbiological background. Modeling and design of biochemical reactors. 3 lectures. Prerequisite: ENVE 535, and graduate standing or consent of instructor.

ENVE 541 Resource and Energy Recovery (3)

In-depth evaluation of physical and biological processes for the recovery of resources and energy from solid waste. Preparation of an engineering design report. Use of computer models for process engineering and cost estimation of resource recovery facilities. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

ENVE 551 Environmental Unit Operations (4)

In-depth laboratory study of unit operations and processes used in environmental engineering. Performance tests on laboratory scale equipment. Computer simulations. 2 lectures, 2 laboratories. Prerequisite: ENVE 421 and graduate standing or consent of instructor.

ENVE 570 Selected Advanced Topics (1–3)

Directed group study of selected topics for advanced students. Open to graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.

ENVE 571 Selected Advanced Laboratory (1–3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

ENVE 599 Design Project (Thesis) (2) (2) (5)

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

ES–ETHNIC STUDIES

ES 110 Introduction to Ethnic Studies (3) GE D4a USCP

Introduction to comparative approaches involved in the interdisciplinary study of United States and international ethnic groups, and how they relate to linguistic, institutional, gender and racial struggles of influence and power. 3 lectures.

ES 114 Racism in American Culture (4) USCP

Survey and analysis of racism in the development of American institutions and its effect upon ethnic groups, women, and society. 4 lectures.

ES 200 Special Problems for Undergraduates (1–2)

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

ES 210 United States Cultural Heritage (3) GE D4a USCP

History and culture of selected ethnic groups (American Indian, Asian American, African American, Latino/Chicano/a), their comparative roles in and contributions to the American cultural heritage and to the processes and struggles for ethnic and gender equality. 3 lectures.

**ES 215 Planning for and with Multiple Publics (4)
(Also listed as CRP 215) USCP**

Understanding social/cultural factors that influence how people interact at neighborhood, community and city scale. Exploring how race, gender, ethnicity and age influence use and adaptation of urban spaces, and how understanding these factors can improve the way we design cities and human settlements. 4 lectures.

ES 300 Chicano/a Literature (4) GE C3 USCP

Overview of contemporary Chicano/a literature since 1848. Aztlán as literary myth, thematic concerns, literary techniques, historical and socio-economic factors shaping Chicano/a poetry, short stories, novels, drama, and non-fiction narrative and essay as literary forms. Instructor reserves option to focus upon one or more genres per course. 4 lectures. Prerequisite: ES 110, ENGL 240, or consent of instructor.

ES 320 American Cultural Images (3) GE D4a USCP

Comparative study of stereotypical and archetypal impressions, images, and projections of American cultural/ethnic minority/majority groups in American popular opinion and consciousness, with emphasis on African Americans, Asian Americans, and Mexican Americans/Latinos. *Class Schedule* will list topic selected. Total credit limited to 8 units. 3 lectures. Prerequisite: ES 110.

**ES 321 American Cultural Images:
American Indians (3) GE C3 USCP**

Comparative study of stereotypical and archetypal impressions, images, and projections of American Indian cultural/ethnic minority/majority groups in American popular opinion and consciousness. 3 lectures. Prerequisite: ES 110.

ES 325 African American Women's Experiences (3) USCP

Examination of the experiences of African American women, from their arrival in the United States through contemporary times. Ordinary as well as extraordinary Black women and their lives will occupy the center of inquiry, with the following themes in mind: economics, gender roles, race and socio-political movements. Experiences of African American females as both integral to and a unique aspect of the past, present and future of the United States. 3 lectures. Prerequisite: ES 110.

**ES 330 The Chinese American
Experience (3) GE D4b USCP**

History and current status of Chinese Americans, with emphasis on international contexts, organizations and institutions of Chinese

America, demographic compositions, spatial patterns, and cultural, socioeconomic and political adaptation experience. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**ES 350 Asian American and African American
Environments (3) USCP**

Historical and cultural factors shaping various Asian American and African American environments, emphasizing the understanding of the physical settings in relation to the intentions and social situations of these different groups. 3 lectures. Prerequisite: ENGL 114, POLS 110, HIST 204, junior standing.

**ES 360 Ethnicity and the Land (4)
(Also listed as FNR 360) GE C3 USCP**

A comparative study of the ethnic, cultural and gender influences that shape people's perceptions, attitudes and behavior toward terrestrial and aquatic resource values and uses. 4 seminars. Prerequisite: Junior standing or consent of instructor (ES 110 and FNR 101 recommended, but not required).

**ES 400 Special Problems for Advanced
Undergraduates (1–2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**FNR–FORESTRY AND NATURAL
RESOURCES****FNR 101 Natural Resources Management and
Society (3) GE F2**

Integrated development, utilization and management of the nation's and world's natural resources for the continuous benefit of humankind and the conservation of the resources. Discussion of natural resources management practices and technologies which may provide a more flexible range of societal benefits for the wise use of our natural resources. 3 lectures.

FNR 112 Parks and Outdoor Recreation (3)

Introduction to national, state, county, city and private park systems. History, philosophy, policy and principles of the formation, administration and functioning of wildland recreational units at the park, county, regional, national, and international levels. 3 lectures.

**FNR 140 Career Development and Planning in Natural
Resources Management (1) (CR/NC)**

Analysis and development of career goals in natural resources. Acquainting students with potential career options and assisting them in planning and implementation phases of an academic career program at Cal Poly. Credit/No Credit grading. 1 activity. Prerequisite: Consent of instructor.

**FNR 201 Introduction to Forest Ecosystem
Management (3) GE F2**

Fundamentals of forestry including basic silviculture, forest protection, measurement and policy. Integrated resource management of forest lands for water production, forage, recreation, wildlife, and timber. 3 lectures.

FNR 202 Environmental Management (3) GE F2

Environmental management as a process within functioning societies seeking a harmonious balance between human activities and intrinsic behavior of the natural environment. Major

components of the natural environment and the political and social activities that impact that environment. 3 lectures.

FNR 203 Resource Law Enforcement (3)
(Also listed as REC 203)

Law enforcement applied to natural resource conservation on public and private lands. Examination of state and federal laws related to fish and wildlife management. Problems associated with implementation of resource laws examined. 3 lectures.

FNR 204 Resource Fire Control (3)

Fire control techniques used on various wildland fuels. Elementary fire physics, fuels, weather, fire behavior, tactics and fire suppression techniques, line construction, "mop-up", fire line safety, air operations and fire organization. Meets basic wildland fire fighter certification requirements for the USDA Forest Service. Partially meets California Department of Forestry Firefighter I requirements. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory.

FNR 208 Dendrology (4)

Identification, classification, silvical characteristics, distribution, environmental requirements and economic importance of trees and shrubs in parks, forest and wildlife areas of the United States. Emphasis on Pacific Coast species. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: BOT 121 or BIO 152.

FNR 220 Forest Resources Enterprise Project (1–4) (CR/NC)

Selection and completion of a forest management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 8 units. Credit/No Credit grading only. Prerequisite: FNR 201 or equivalent.

FNR 247 Forest Surveying (2) (Also listed as BRAE 247)

Use and care of tapes, staff compass, abney levels, theodolites, and GPS receivers. Keeping field notes, measurements by tape. Closed and open traverse by compass and theodolite. Turning angles and determining directions of lines. Map reading and public land description. GPS measurements. 1 lecture, 1 laboratory. Prerequisite: MATH 119.

FNR 260 Forest Harvesting and Utilization (3)

Relationships between forest ecosystem management, harvesting methods, timber harvest planning, components of forest harvesting, harvesting effects; cost analysis of harvesting methods; safety management; value-added forest utilization; and road location. Miscellaneous course fee may be required—see *Class Schedule*. Overnight or weekend field trips required. 2 lectures, 1 laboratory.

FNR 290 Intercollegiate Forestry Activities (1) (CR–NC)

Beginning through advanced skills in the event areas of college forestry activities. Instruction in use of specialized equipment and safety. Minimum of 4 hours of laboratory per week. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Enrollment limited to those qualified to compete in intercollegiate forestry activities and consent of instructor.

FNR 300 Computer Applications in Resource Management (2) (Also listed as REC 300)

Resource management applications of microcomputers. Software programs include forest and natural resource management planning, forecasting, analysis of systems, and resource data base

management for multiple use objectives. Forestry and natural resource examples will be used. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: AG 250 or CSC 113, junior standing or consent of instructor.

FNR 306 Natural Resource Ecology and Habitat Management (4)

Resource ecology and management implications in the major ecosystems of North America. Importance of maintaining the natural dynamics of energy flow and nutrient cycles at the community and ecosystem level for the benefit of man. Humanity's role as a principal factor of change of the resources in natural systems. 3 lectures, 1 laboratory. Prerequisite: One course in biological sciences.

FNR 307 Fire Ecology (3)

Effects of wildland fires on shrub, woodland, and forest environments to include fuels, plants, soil, water, wildlife, and air. Emphasis is on western U.S., worldwide forest and shrub ecosystem. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: FNR 306 or ecology course, and FNR 204 or consent of instructor.

FNR 311 Environmental Interpretation (4)
(Also listed as REC 311)

Interpretation of the biological, physical and aesthetic values of the natural elements of our environment; organization and presentation of interpretive materials by oral, written, and display methods of communication. 3 lectures, 1 laboratory. Prerequisite: SPC 201 or SPC 202.

FNR 315 Forest Mensuration and Sampling (4)

Principles and methods of sampling and measurement for forest and natural resource quantities and qualities. Modeling and estimation for tree volumes, stand structure and composition, and related forest vegetation. Applications in sampling, statistical and inventory techniques. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Overnight field laboratories required. Prerequisite: MATH 120, STAT 218, BRAE/FNR 247.

FNR 318 Applications of GIS in Natural Resources (3)
(Also listed as LA 318)

ARC/INFO and ArcView Geographic Information System (GIS) computer software to explore natural resources, social and business issues, using spatial data. Develop data base, use software and apply with relevant natural systems. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: Junior standing, and AG 250 or CSC 113 or consent of instructor.

FNR 326 Natural Resources Economics and Valuation (4)

Principles of efficient use of renewable and nonrenewable natural resources, including methods for attaching value to marketable and non-market natural resources. Key resource sectors treated in detail: timber, water resources, wildlife/fisheries, and wildland recreation. 3 lectures, 1 laboratory. Prerequisite: MATH 118, AGB 212, FNR 201.

FNR 335 Human Resources and Conflict Management in Natural Resources (4)

Application of behavioral science principles and techniques in the management of natural resource systems. Management of internal and external human resource issues and concerns in natural

resources organizations is emphasized. 3 lectures, 1 laboratory. Prerequisite: FNR 201, PSY 201 or PSY 202.

FNR 339 Internship in Forest and Natural Resources (1–12) (CR/NC)

Selected students will spend up to 12 weeks with an approved firm or agency engaged in forest or natural resources management. Applying and developing managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Credit/No Credit grading. Prerequisite: Consent of instructor.

FNR 340 Resource Fire Management (2)

Wildland fuels, fire weather, fire behavior, and fire danger ratings in the chaparral, grassland, and wooded areas of forests, parks, and wildlands. Management implications, policy and objectives of fire management organizations. Saturday field trips may be required. 2 lectures. Prerequisite: FNR 204 or consent of instructor.

FNR 350 Urban Forestry (3)

Establishment and management of city forests, small forest holdings, shelter belts, and plantings for erosion control, wildlife enhancement, and pollution abatement. Management of forest areas requiring special attention because of heavy recreational use, fire hazard, watershed, and societal values. Weekend or full-day field trips required. 2 lectures, 1 laboratory. Prerequisite: FNR 208, FNR 355 or consent of instructor.

FNR 355 Hardwood and Woodlot Management (4)

Regeneration, management and improvement of farm and urban interface forest holdings. Design and production of wood biomass for wood fiber, fuel and Christmas trees, etc. Emphasis on hardwood/oak woodland management, biodiversity, and land ethics. Integration with range, wildlife and recreation values. Weekend or full-day field trips required. 3 lectures, 1 laboratory. Prerequisite: FNR 201, FNR 208, FNR 315.

FNR 360 Ethnicity and the Land (4) GE C3 USCP (Also listed as ES 360)

A comparative study of the ethnic, cultural and gender influences that shape people's perceptions, attitudes and behavior toward terrestrial and aquatic resource values and uses. 4 seminars. Prerequisite: Junior standing or consent of instructor (ES 110 and FNR 101 recommended, but not required).

FNR 362 Survey and Management of Mediterranean Ecosystems (4)

Woody vegetation found in worldwide Mediterranean ecosystems. Distribution, historical development and uses of these ecosystems. Emphasis on chaparral management techniques and effects of management on fire, water production, biomass potential. 3 lectures, 1 laboratory. Prerequisite: FNR 306 or equivalent.

FNR 365 Silviculture and Vegetation Management (3)

Integrating ecological science and communication as the primary means of implementing ecosystem management. Growth and development of individual plants and plant communities and their interaction with the environment. Vegetation manipulation and reforestation methods; effects and outcomes of silvicultural prescriptions. Miscellaneous course fee required—see *Class Schedule*. Overnight and/or weekend field trips required. 2 lectures, 1 laboratory. Prerequisite: FNR 208, FNR 306, FNR 315.

FNR 400 Special Problems for Advanced Undergraduates (2–4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Consent of department head.

FNR 402 Forest Health (4)

Impact and losses to forested areas caused by physical and biotic agents (such as insects and diseases) other than fire; relation of direct and indirect control practices to forest management. Saturday field trips required. Course offered at Swanton Pacific ranch beginning Fall Quarter 2000 contingent on facilities. 3 lectures, 1 laboratory. Prerequisite: FNR 208, FNR 306 and department head approval.

FNR 404 Environmental Law (3) (Also listed as CRP 404)

Detailed examination of the law governing use and protection of natural resources with focus on the legal institutions entrusted with the public duty of protecting the environment. 3 lectures. Prerequisite: Senior standing, POLS 206, or consent of instructor.

FNR 408 Water Resource Law and Policy (3) (Also listed as CRP 408)

Detailed examination of the various legal systems of water use, regulation and management in California and the United States. Discussion on the key concepts and principles of state, federal and interstate water quantity and quality control; focusing on issues and problems, why conflicts occur and how solutions evolve. 3 lectures. Prerequisite: FNR 302 or instructor approval, senior standing.

FNR 410 Resource Recreation Management (4) (Also listed as REC 410)

Practices of management of resource recreation on private and public lands. Consideration of the following management systems: biophysical, user/visitor, facilities, equipment, fiscal, personnel will be made in the provision of resource recreation services. Case studies in mass recreation and wilderness areas will be examined. 3 lectures, 1 laboratory. Some weekend labs necessary. Prerequisite: FNR 112 or consent of instructor.

FNR 412 Forest and Natural Resources Senior Assessment Project (4)

Principles and practices of integrated sampling and inventory of resource values in forested ecosystems. Comprehensive timber harvest planning to address multiple forest values: silvicultural prescriptions for watershed and wildlife management culminating in a student project report. Course offered at Swanton Pacific ranch beginning Fall 2000 contingent on facilities. 2 lectures, 2 laboratories. Prerequisite: FNR 326, FNR 365 and department head approval.

FNR 414 Timber Management (4)

Physical, biological, economic, social and political influences on optimal forest management for purposes of producing wood products. Growth and yield modeling; timber investment analysis; sustainable timber production; harvest schedule modeling. 3 lectures, 1 laboratory. Prerequisite: FNR 326, FNR 365, FNR 412.

FNR 416 Environmental Impact Analysis and Management (4)

National Environmental Policy and California Environmental Quality Acts as applied to natural resource management processes.

Intent, purpose and history of the laws; differences between laws identified. Request for proposals and preparation of environmental documents covered. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: FNR 306 or equivalent.

FNR 417 Resource Recreation Planning (3)
(Also listed as REC 417)

Development and analysis of resource recreation plans. Planning theory, types of plans, scheduling techniques, projecting supply and demand, application of models, and economic evaluations. Basic recreation planning skills examined. Examples emphasize planning for parks and recreation. Miscellaneous course fee may be required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: FNR 112 or consent of instructor.

FNR 419 Watershed Management (4)

Hydrologic cycle concepts and measurement. Analysis and measurement of watershed processes. Watershed management and protection including rehabilitation, erosion, sedimentation, cumulative watershed effects, stream habitat assessment. Saturday and weekend field trip required. 3 lectures, 1 laboratory. Prerequisite: SS 121, FNR 306, FNR 318.

FNR 420 Advanced Watershed Hydrology (4)

Sources of streamflow and processes by which watersheds undergo change from natural and anthropogenic processes. Fluvial processes, sediment transport and channel restoration techniques. Influences of forest and range management on water resources including water quality and analytical techniques. Weekend field trips required. 3 lectures, 1 laboratory. Prerequisite: FNR 419.

FNR 425 Applied Resource Analysis (4)

Environmental impacts in responses to resource management programs and activities. Preparation, implementation, and coordination of environmental activities. Criteria for measurements, interpretation, and evaluation. Resource inventories, analysis, synthesis, evaluation, environmental assessment writing and preparation. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: FNR 416 or senior standing.

FNR 434 Wood Properties and Products (5)

Principles of wood properties and efficient use of renewable wood resources including methods for using wood as an energy source. Weekend or full-day field trips required. 3 lectures, 2 laboratories. Prerequisite: FNR 201 and FNR 260 or consent of instructor.

FNR 435 Natural Resources Policy Analysis (4)

Policy process approach to understanding the efforts to resolve natural resource problems in the public and private sector. Principles and techniques used to analyze the effects of policy changes on natural resources management. 3 lectures, 1 laboratory. Prerequisite: FNR 326, FNR 335.

FNR 450 Community Forestry (3)

Development and management of the urban/wildland interface. Socio-economic problems related to forest tree establishment, care, and harvest utilization. International implications also covered. Weekend or full-day field trips required. 2 seminars, 1 laboratory. Prerequisite: FNR 350 or consent of instructor.

FNR 460 Advanced Applications of GIS in Natural Resources (2)

Acquisition, organization and analysis of geographic data from diverse sources to develop coverages using Geographic Information System (GIS) software. Advanced GIS modeling applications and validation techniques. 2 laboratories. Prerequisite: FNR/LA 318.

FNR 461, 462 Senior Project (3) (3)

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 180 hours total time.

FNR 463 Undergraduate Seminar (1)

Study and oral presentation of current developments and problems in the subject field. Discussion of recent findings and research and their application. 1 seminar.

FNR 465 Ecosystem Management (4)

Applied integration of forestry and natural resources management knowledge. Principles, concepts and techniques designed to utilize resources while sustaining forest health and habitat within acceptable limits of change. Ecosystem management planning project. 3 lectures, 1 laboratory. Prerequisite: FNR 416, FNR 414, FNR 419.

FNR 470 Selected Advanced Topics (1–3)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 lectures. Prerequisite: Consent of instructor.

FNR 471 Selected Advanced Laboratory (1–3)

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1–3 laboratories. Prerequisite: Consent of instructor.

FNR 472 Leadership Practice (1)
(Also listed as REC 472)

Leadership styles used in the natural resources management and recreation administration professions. Study and practice in setting goals and objectives; developing, evaluating and implementing an entrepreneurial project plan; decision making and problem-solving. 1 laboratory. Prerequisite: Junior standing or consent of instructor.

FNR 500 Individual Study (1–3)

Advanced independent study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department head.

FNR 502 Resource Conservation (3)

Conservation, planning and administration for broad treatment of land, water, mineral, forest, range, and wildlife resources. 3 seminars. Prerequisite: Graduate standing and consent of instructor.

FNR 503 Tropical Forest Ecosystem Management (3)

Tropical forest ecosystem classification, function and limitations. Applied tropical forest management systems; tropical problems, management, and political strategies; over-grazing and

desertification; overcutting and fuelwood shortages. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

FNR 504 Agroforestry Systems (2)

Principles and practical applications of tree crop systems which are managed to provide fuel, fiber, fodder, and food. Tree crop identification and tree product uses. Plantation design, establishment, and cultural practices. Soil management. Integration of forest, and range management practices and values. Special applications to tropical forest ecosystems. 2 lectures. Prerequisite: Graduate standing or consent of instructor.

FNR 521 Natural Resources Management for Educators (3)

Philosophy (theoretical and applied) of natural resource management strategies functioning in today's environment. Ecological principles applicable to specific resource components as they relate to the present perception of today's resource base, use demands and projected utilization. 3 seminars. Prerequisite: Graduate standing.

FNR 530 Social Systems in Forest Resources Management (3)

Theories and methods for incorporating community in the management of forest resources. Approaches to conflict resolution between resource owners and community stakeholders using tools such as GIS. 2 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

FNR 532 Forestry Applications in Biometrics and Econometrics (4)

Quantitative methods in modeling biological and economic processes associated with managing forested ecosystems. Biometric modeling of stand growth and inventory. Econometric modeling of market and non-market natural resource values. 3 lectures, 1 laboratory. Prerequisite: Graduate standing, and consent of instructor.

FNR 534 Forest Ecosystem Management and Modeling (3)

Methods and modeling approaches used in quantifying ecological processes and conditions associated with forested ecosystems, such as fire behavior, hydrologic processes, terrestrial and aquatic habitat condition using GIS and other models. 2 lectures, 1 laboratory. Prerequisite: Graduate standing, and consent of instructor.

FNR 570 Selected Topics in Forest Resources (1–3)

Directed group study of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 9 units. 1–3 seminars. Prerequisite: Graduate standing or consent of instructor.

FNR 571 Selected Topics in Forest Resources Laboratory (1–3)

Directed group laboratory of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 9 units. 1–3 laboratories. Prerequisite: Graduate standing and consent of instructor.

FNR 581 Graduate Seminar in Forest Resources (3)

Group study of selected developments, trends and problems in the field of forest and natural resources. 3 seminars. Prerequisite: Graduate standing.

FNR 599 Thesis (1–9)

Individual research in forest or natural resources management under the general supervision of faculty, leading to a graduate thesis. Prerequisite: Graduate standing and consent of instructor.