

CS 497. Undergraduate Research Seminar (3)

Six hours of laboratory and one hour with adviser.

Prerequisites: Computer Science 560 or 570, minimum grade point average of 3.3, and consent of instructor.

Designing and carrying out independent research in one of the areas of computer science. Literature search, technical report writing, and oral presentation of results.

CS 499. Special Study (1-3) I, II

Prerequisite: Consent of instructor.

Individual study. Maximum credit six units.

**UPPER DIVISION COURSES
(Also Acceptable for Advanced Degrees)**

CS 501. Computational Software (3)

Prerequisites: Computer Science 106 and 310.

Design and implementation of software for computational science. Makefiles in UNIX environment, efficient Fortran and 00 programming, use of common application libraries, file and source code management, software documentation, construction of libraries and applications. Designed for computational science students. Computer science majors must obtain adviser approval.

CS 503. Scientific Database Techniques (3)

Prerequisites: Computer Science 205, 310, and Mathematics 245.

Fundamental data models for handling scientific data, including flat file, indexed compressed files, relational databases, and object oriented databases, and their associated query technologies; e.g. file formats, input/output libraries, string searching, structured query language, object-oriented structured query language, hypertext markup language/common gateway interface, and other specialized interfaces. Designed for computational science students. Computer science majors must obtain adviser approval. See Computer Science 514.

CS 505. Parallel Computing (3)

Prerequisite: Computer Science 310. Recommended: Computer Science 501.

Motivations and methods of high performance computing. Modern computer architecture characteristics, uniprocessor programming and tuning, shared and distributed memory programming techniques, benchmarking. Designed for computational science students. Computer science majors must obtain consent of adviser.

CS 514. Database Theory and Implementation (3)

Prerequisites: Computer Science 310 and Mathematics 245.

Database systems architecture. Storage structures and access techniques. Relational model, relational algebra and calculus, normalization of relations, hierarchical and network models. Current database systems.

CS 520. Advanced Programming Languages (3)

Prerequisites: Computer Science 237, 310, and 320.

Object oriented programming, concurrent programming, logic programming. Implementation issues.

CS 524. Compiler Construction (3)

Prerequisites: Computer Science 237, 310, and 320.

Syntactical specification of languages. Scanners and parsers. Precedence grammars. Run-time storage organization. Code generation and optimization.

CS 530. Systems Programming (3) I, II

Prerequisites: Computer Science 237 and 310.

Design and implementation of system software. Relationship between software design and machine architecture. Topics from assemblers, loaders and linkers, macro processors, compilers, debuggers, editors. Introduction to software engineering and review of programming fundamentals and object oriented concepts. Large project in object oriented programming is required. Not acceptable for the M.S. degree in computer science.

CS 532. Software Engineering (3)

Prerequisites: Computer Science 320 and 530.

Theory and methodology of programming complex computer software. Analysis, design, and implementation of programs. Team projects required.

CS 533. Component Based Software Engineering (3)

Prerequisites: Computer Science 310 and 320.

Component based (CB) software development using UML and other design methods. Development of components for use in CB systems; CB software architectures; development of CB systems; comparison of traditional and CB system development methods.

CS 534. Software Measurement (3)

Prerequisite: Computer Science 532.

Basics of software measurement and use of measurement information to ensure quality software and determine software process effectiveness. Software estimation, cost estimation models, definition of various measures, tools to support measurement collection and analysis, analysis techniques, and case studies.

CS 535. Object-Oriented Programming and Design (3)

Prerequisites: Computer Science 310 and 320.

Basic concepts of object-oriented programming; classes, objects, messages, data abstraction, inheritance, encapsulation. Object-oriented design methodology.

CS 537. Component GIS Architectures (3)

Prerequisite: Computer Science 310 or Geography 484.

Customization of Geographic Information Science application development platforms with emphasis on object oriented programming and component architecture. Prominent examples are Map Objects with Visual Basic, Map Objects with Java. Considerable programming effort required, especially in Graphical User Interface development.

CS 540. Software Internationalization (3)

Prerequisite: Computer Science 310.

Principles, techniques, and resources for design and implementation of software to multiple languages and/or cultures, including detailed examination of internationalization features provided by one or more widely used modern programming languages.

CS 541. Online Documentation and Help Systems (3)

Prerequisite: Computer Science 310.

Design, implementation, and maintenance of online documentation and help systems (ODHS), including ODHS authoring principles and standards; theory and practice of single-source content management; survey of available ODHS development tools and resources; ODHS internationalization; and ODHS project management.

CS 550. Artificial Intelligence (3)

Prerequisites: Computer Science 108 and either Mathematics 245 or 523.

Heuristic approaches to problem solving. Systematic methods of search of the problem state space. Theorem proving by machine. Resolution principle and its applications.

CS 551. User Interface Environments (3)

Prerequisites: Computer Science 310 and 320.

Design of user-machine interfaces in interactive systems. Problems faced by user of an interactive system; basic issues and principles involved in design and implementation of good and friendly user-machine graphical interfaces.

CS 552. Artificial Intelligence II (3)

Prerequisite: Computer Science 550.

Limitations of symbol-based approach to artificial intelligence from Computer Science 550. Presented alternatives are genetic and probabilistic approaches, connectionist and emergent representation and learning, natural language processing, intelligence measures and cognitive models. Seminal publications shaping these techniques.

CS 553. Neural Networks (3)

Prerequisites: Computer Science 320 and Mathematics 254.

Principles of neural networks, their theory and applications.

CS 556. Robotics: Mathematics, Programming, and Control (3)

Prerequisites: Computer Science 320, Mathematics 254, knowledge of the C programming language.

Robotic systems including manipulators, actuators, sensors, and controllers. Kinematics of planar robots. Design and implementation of robot joint controllers. Robot programming languages and environments, and robot command interfaces.

CS 558. Computer Simulation (3)

Prerequisites: Computer Science 310 and Statistics 550.

Methodology of simulation for discrete and continuous dynamic systems. State-of-the-art programming techniques and languages. Statistical aspects of simulation. Students will design, program, execute, and document a simulation of their choice.

CS 559. Computer Vision (3)

Prerequisites: Computer Science 310 and Mathematics 254.

Algorithms and computer methods for processing of images. Visual perception as a computational problem, image formation, characterization of images, feature extraction, regional and edge detection, computer architectures for machine vision.

CS 560. Algorithms and Their Analysis (3) I, II

Prerequisite: Computer Science 310.

Algorithms for solving frequently occurring problems. Analysis techniques and solutions to recurrence relations. Searching and sorting algorithms. Graph problems (shortest paths, minimal spanning trees, graph search, etc.). NP complete problems. Not acceptable for the M.S. degree in Computer Science.

CS 561. Multimedia Systems (3)

Prerequisite: Computer Science 551.

System aspects of multimedia authoring, browsing, and database subsystem; digital representation for different media; audio and video; operating system support for continuous media applications; architectures; design and implementation of multimedia support systems; use of multimedia technology in software engineering.

CS 562. Automata Theory (3)

Prerequisite: Mathematics 245 or 521A.

Definition of finite automata. Classification of finite automaton definable languages. Minimization of finite automata. Nondeterministic finite automata. Sequential machines with output. Regular sets and expressions. Introduction to grammars.

CS 566. Queuing Theory (3)

Prerequisites: Computer Science 108 and Statistics 550.

Performance prediction of computer networks and other systems (e.g., inventory control, customer service lines) via queuing theory techniques. Operational analysis.

CS 570. Operating Systems (3) I, II

Prerequisites: Computer Science 310, 370, and knowledge of the C programming language.

File systems, processes, CPU scheduling, concurrent programming, memory management, protection. Relationship between the operating system and underlying architecture. Not acceptable for the M.S. degree in Computer Science.

CS 572. Microprocessor Architecture (3)

Prerequisites: Computer Science 370 and knowledge of the C programming language.

Architecture of state-of-the-art microprocessor. Internal pipeline, internal cache, external cache, and memory management. Programming a uniprocessor. Communication among computers in a distributed environment. Architecture and programming of a multiprocessor system.

CS 574. Computer Security (3)

Prerequisites: Computer Science 310; Mathematics 245; Statistics 550; and credit or concurrent registration in Computer Science 570.

Principles of computer security and application of principles to operating systems, database systems, and computer networks. Topics include encryption techniques, access controls, and information flow controls.

CS 575. Supercomputing for the Sciences (3)

Prerequisite: Extensive programming background in Fortran or C.

Interdisciplinary course, intended for all science and engineering majors. Advanced computing techniques developed for supercomputers. Overview of architecture, software tools, scientific computing and communications. Hands-on experience with CRAY.

CS 576. Computer Networks and Distributed Systems (3)

Prerequisite: Credit or concurrent registration in Computer Science 570.

Basic networking concepts such as seven-layer reference model, transmission media, addressing, subnetting and supernetting, networking devices, LANs and WANs, internetworking, distributed processing, and client-server model. Basic concepts and protocols of TCP/IP protocol suite and basic Internet services.

CS 580. Client-Server Programming (3)

Prerequisites: Computer Science 570 and knowledge of an object-oriented programming language. Recommended: Computer Science 576.

Client-server model, networking protocols for client-server programs, algorithmic issues in client-server programs, client-server protocols, implementing client-server applications.

CS 581. Computational Linguistics (3)

(Same course as Linguistics 581.)

Prerequisites: Computer Science 320 or Linguistics 571; Linguistics 570 or Mathematics 245.

Basic concepts in computational linguistics including regular expressions, finite-state automata, finite-state transducers, weighted finite-state automata, and n-gram language models. Applications to phonology, orthography, morphology, syntax. Probabilistic models. Statistical techniques for speech recognition.

CS 582. Introduction to Speech Processing (3)

Prerequisite: Computer Science 310.

Fundamentals of speech processing and speech recognition. Physical aspects of speech production and perception. Mathematical models for speech recognition. Corpus development: data collection, processing, and evaluation. Applications of speech processing and associated research topics.

CS 596. Advanced Topics in Computer Science (1-4) I, II

Prerequisite: Consent of instructor.

Selected topics in computer science. May be repeated with the approval of the instructor. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree. Maximum credit of six units of 596 applicable to a bachelor's degree. Maximum combined credit of nine units of 596 and 696 applicable to a 30-unit master's degree.

For additional (3) courses useful to computer scientists, see:

Mathematics 541.	Introduction to Numerical Analysis and Computing
Mathematics 542.	Introduction to Numerical Solutions of Differential Equations
Mathematics 561.	Applied Graph Theory
Mathematics 579.	Combinatorics

GRADUATE COURSES
Refer to the *Graduate Bulletin*.

Construction Engineering (CON E)

*In the Department of Civil and
Environmental Engineering
In the College of Engineering*

NOTE: Proof of completion of prerequisites (copy of transcript) is required for all courses which list prerequisites.

LOWER DIVISION COURSES

CON E 101. Construction and Culture (3) [GE] I

Cultural context of construction, emphasizing its centrality in evolution and expansion of built environments as expressions of ethical and historical value systems. Relationship between culture, geography, construction materials, and built expressions of cultural legacy. Interdependence of built environment and society.

CON E 201. Construction Concepts and Building Codes (3) I

Concepts of control and information exchange in construction. Purpose and function of fundamental information flows, function, and development of construction-related codes and standards to protect public health and safety, compliance with requirements, and design using codes.

CON E 280. Construction Methods (3) II

One lecture and six hours of laboratory.

Components and methods of construction including earthwork; foundations; wood, steel, and concrete construction; roofing and cladding; interior construction. Field experience in conducting and/or observing construction operations. Concepts of production in a construction setting.

UPPER DIVISION COURSES (Intended for Undergraduates)

CON E 301. Construction Ethics, Law, and Contracts (3) I

Prerequisites: Construction Engineering 101, 201, Philosophy 101.

Legal and ethical environment of construction. Study of documents and common procedures in construction administration and their legal and ethical contexts for general contractors and subcontractors. Contract documentation, claim in various construction delivery methods.

CON E 310. Analysis and Design of Construction Operations (3) I

Prerequisite: Construction Engineering 280.

Properties and methods for use of construction equipment and integration of construction equipment into production system. Assessment of equipment needs and selection. Site utilization and layout planning, incorporating efficiency and safety of operations.

CON E 320. Construction Estimating (3) II

Two lectures and three hours of laboratory.

Prerequisite: Credit or concurrent registration in Construction Engineering 310.

Identifying and estimating time and cost requirements for construction operations based on drawings and specifications. Use computer applications for estimating.

CON E 401. Construction Planning and Scheduling (3) I

Two lectures and three hours of laboratory.

Prerequisites: Construction Engineering 320, Civil Engineering 160.

Fundamentals of scheduling logic including critical path method, deterministic and probabilistic scheduling, and impact of constraints. Development of construction plan and representation in schedule format using common computer applications used in industry.

CON E 402. Mechanical and Electrical Systems (3) I

Prerequisites: Construction Engineering 280, 301, Physics 196.

Fundamentals of heating, ventilation, electrical circuits, and distribution systems. Simple sizing and balancing operations. Construction principles and practices for mechanical and electrical work. Specialty cost estimation, material handling, and labor analysis. Subcontracts and agreements for specialty construction.

CON E 479. Construction Materials (3) II

Two lectures and three hours of laboratory.

Prerequisite: Credit or concurrent registration in Civil Engineering 462.

Selection, design and control of mixes of portland cement and asphalt concrete. Properties of these and other materials used in construction. (Formerly numbered Civil Engineering 479.)

CON E 480. Design of Temporary Structures (3) II

Prerequisites: Construction Engineering 310, Civil Engineering 301, 462.

Design of structures for temporary support of constructed work, including scaffolding and formwork, bracing, and excavations. Influence of codes and standards on the design process, selection of degrees of safety, and concepts of liability.

CON E 490. Construction Project Management and Safety (3) II

Prerequisites: Construction Engineering 401, 402.

Management and control functions for construction projects. Execution of projects based on plan, estimate and bid documentation. Fundamentals of construction safety planning, design, and requirements.

**For additional courses in the construction
engineering program, refer to "Civil
Engineering" in this section of the catalog.**

Counseling and School Psychology

(CSP)

In the College of Education

UPPER DIVISION COURSES (Intended for Undergraduates)

CSP 310. Group Leadership in Educational Settings (3)

Two lectures and two hours of activity.

Prerequisites: Anthropology 102 or Psychology 101 or Sociology 101; and completion of 60 units.

Identifying, classifying, and analyzing the components essential to development of leadership in educational settings. Simulation activities assist students in acquisition of group leadership skills.

CSP 400. Counseling and the Helping Professions (3) I, II

Serves as an introduction to the field of counseling and introduces the student to those professions considered to be helping professions.

CSP 401. Theories and Processes of Personal Integration (3) I, II

Perspectives of and strategies for developing and maintaining a functional balance among intellectual, physical, emotional, and interpersonal aspects of daily living.

CSP 420. Popular Culture and Counseling (3) [GE]

Prerequisite: Completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences

Impact of popular culture on personal functioning and well-being. Meaning and salience of popular culture, social construction of popular culture in society, and convergence of popular culture and counseling.

CSP 450. Marriage and Family Therapy (3) I, II

Prerequisites: Minimum of 15 units of coursework from Child and Family Development, Psychology, or Social Work.

Profession of family therapy. Problem formation and resolution processes that take place in families and other close relationships. Application of concepts within diverse contexts to one's own family experience.

CSP 496. Experimental Topics (1-3)

Selected topics. May be repeated with new content. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degrees.

CSP 499. Special Study (1-3) I, II

Prerequisite: Consent of instructor. Open only to senior and graduate students in education who have shown ability to work independently.

Individual study. Maximum credit six units.

UPPER DIVISION COURSE
(Also Acceptable for Advanced Degrees)

CSP 596. Selected Studies (1-3)

Prerequisite: Consent of instructor.

A series of lecture and discussion sessions centering on current problems in counseling and guidance. Designed to serve the needs of any person desiring to keep informed of developments in this area. May be repeated with new content. See Class Schedule for specific content. Maximum credit of six units of 596 applicable to a master's degree. Maximum combined credit of six units of 596 and 696 applicable to a 30-unit master's degree.

GRADUATE COURSES
Refer to the *Graduate Bulletin*.

Criminal Justice Administration (CJA)

In the School of Public Affairs

In the College of Professional Studies and Fine Arts

LOWER DIVISION COURSE**CJA 200. Introduction to Criminal Justice Administration (3) I, II**

Survey of the structure, functions and problems of controlling criminal activity while preserving individual freedoms in a democratic society.

UPPER DIVISION COURSES
(Intended for Undergraduates)

CJA 301. Social Control, Social Policy and Administration of Justice (3) I, II

Prerequisites: Criminal Justice Administration 200 with a grade of C or better and completion of all other lower division preparation for the major courses.

Interrelationship of social control, social policy and administration of criminal justice in contemporary American society.

CJA 305. Professions, Practices and Ethics in Criminal Justice Administration (3)

Prerequisite: Criminal Justice Administration 301.

Professional roles and responsibilities of practitioners and administrators in criminal justice agencies, including consideration of the ethical responsibilities of criminal justice practitioners.

CJA 310. Law Enforcement Administration (3)

Prerequisite: Criminal Justice Administration 301.

Administrative relationships within the criminal justice process with special reference to problems of courts and police and probation agencies.

CJA 320. The Administration of Criminal Law (3)

Prerequisite: Criminal Justice Administration 301.

Constitutional law principles as implemented in criminal courts with emphasis on critical analysis of factual situations and the argument of legal issues in criminal cases from both defense and prosecution perspectives.

CJA 321. Juvenile Justice Administration (3)

Prerequisite: Criminal Justice Administration 301.

Assessment of the structure and functions of agencies and institutions which comprise the juvenile justice system in America; evolution of policies and programs for prevention of delinquency and treatment of the juvenile offender.

CJA 330. Contemporary Correctional Administration (3)

Prerequisite: Criminal Justice Administration 301.

Contemporary policies and practices of local, state and federal correctional agencies, the influence of reform movements, and the interrelationship of corrections with other criminal justice system components.

CJA 333. Judicial Administration (3)

Prerequisites: Criminal Justice Administration 301 and Public Administration 301.

Review of significant developments at the state and federal levels, including court unification and financing, leadership, congestion, training, selection, tenure, discipline, removal and retirement of courtrelated personnel; and technological applications.

CJA 420. Constitutional Issues in the Administration of Justice (3)

Prerequisite: Criminal Justice Administration 301.

Constitutional legal theories and principles, especially the Fourth, Fifth, Sixth, and Eighth Amendments to the Constitution, as they affect criminal justice procedures and practices.

CJA 430. Prisons in Theory and Practice (3) Cr/NC (Offered only in Extension)

Two lectures and forty hours of supervised activity.

Prerequisites: Criminal Justice Administration 200 and consent of instructor.

Design and operation of state and federal prisons in California from the perspective of staff and inmates. Onsite study and critique of facilities.

CJA 496. Selected Topics in Criminal Justice Administration (1-3)

Selected current topics in criminal justice administration. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree. Maximum credit six units. (Formerly numbered Criminal Justice Administration 495.)

CJA 497. Senior Thesis (3) I, II

Prerequisites: Senior standing and consent of instructor.

Using library, Internet, and empirical research. Analysis of current criminal justice policy issues.

CJA 498. Internship in Criminal Justice Administration (2-6) Cr/NC I, II

Prerequisites: Consent of instructor and senior standing.

Students are assigned to various government agencies and work under joint supervision of agency heads and the course instructor. Participation in staff and internship conferences. Maximum credit six units.

CJA 499. Special Study (1-3) Cr/NC I, II

Prerequisites: Twelve units of upper division criminal justice administration and consent of instructor.

Individual study. Maximum credit six units.

UPPER DIVISION COURSES
(Also Acceptable for Advanced Degrees)

CJA 510. Contemporary Issues in Law Enforcement Administration (3)

Prerequisite: Criminal Justice Administration 310.

Assessment of problems confronting administrators of law enforcement agencies and of recent efforts to enhance the capability of agencies to control criminal activity while guarding individual liberties.

CJA 520. Prosecutorial Function in Administration of Justice (3)

Prerequisite: Criminal Justice Administration 301.

Analysis of prosecutor's function at local, state and federal levels and in selected foreign nations, including appraisal of proposed national standards and goals for prosecutors.

CJA 531. Probation and Parole (3)

Prerequisite: Criminal Justice Administration 330.

Basic concepts, history, legislation, and practices used in work with juveniles and adults who have been placed on probation or parole; criteria of selection, methods of supervision, and elements of case reporting.

CJA 540. Applied Planning, Research and Program Evaluation in Criminal Justice Administration (3) I, II

Prerequisite: Criminal Justice Administration 301.

Application of planning, research and program development and evaluation principles to the field of criminal justice.

CJA 543. Community Resources in Criminal Justice Administration (3)

Prerequisite: Criminal Justice Administration 301.

Exploration of present and probable roles of public and private agencies and volunteers in criminal justice administration.

CJA 570. Organized Crime: Domestic and International Perspectives (3)

Prerequisite: Criminal Justice Administration 301.

Interdisciplinary analysis of organized crime's impact on criminal justice administration and public policy on both domestic and international levels.

GRADUATE COURSES
Refer to the *Graduate Bulletin*.

Dance (DANCE)

In the School of Music and Dance

In the College of Professional Studies and Fine Arts

LOWER DIVISION COURSES

DANCE 100. Dance Activity (1)

Two hours of activity.

Open to all students. Provides physically skilled instruction and knowledge of ballroom, ethnic, ballet, jazz, and modern dance forms.

- A. Beginning Ballroom Dance
- C. Ethnic Dance
- E. Beginning Ballet
- F. Intermediate Ballet
- G. Beginning Jazz Dance
- H. Intermediate Jazz Dance
- I. Beginning Modern Dance
- J. Intermediate Modern Dance

DANCE 102. Elements of Dance for Non-Dance Majors (3)

Two lectures and two hours of activity.

Developing an understanding of elements of dance: time, space, dynamics, and intention. Relationship to national and state educational standards. Designed for future teachers. Not open to dance majors.

DANCE 165. University Dance Company (1-2) Cr/NC

More than three hours of activity per week.

Prerequisites: Audition and approval by dance faculty.

Performing experience in University Dance Company including concert performances of dance repertory, production of choreographic works, presentation of master classes and workshops, and participation in major production. Maximum credit four units.

DANCE 171. Dance Production I (2)

One lecture and two hours of activity.

Technical applications as applied to dance production.

DANCE 181. Introduction to Dance (3) [GE] I, II

Foundations of dance in Western civilization. Dance as art, therapy, fitness, ritual, and social discourse. Analysis of dance in film, video, and live performance with an appreciation for artistic intent, technique, and style.

DANCE 183. Rhythmic Analysis (2)

One lecture and two hours of activity.

Music as related to movement; notation and simple music forms applied to all movement activities; percussion accompaniment; writing of percussion scores, music repertoire for dance.

DANCE 210. Performance Forum (1)

Two hours of activity.

Prerequisite: Consent of instructor.

Dance master classes, workshops, as related to dance performance, style, and repertoire. Maximum credit four units.

DANCE 221. Ballet I (2)

Four hours of activity.

Ballet skills for dance majors and minors emphasizing placement, coordination, ballet terminology, and technical principles. Maximum credit four units.

DANCE 231. Jazz Dance I (2)

Four hours of activity.

Prerequisite: Consent of instructor. Dance majors and minors only.

Jazz dance technique and fundamentals in various jazz dance forms and styles. See Class Schedule for specific content. Maximum credit four units.

DANCE 241. Modern Dance I (3)

Six hours of activity.

Development of modern dance skill with emphasis on function of alignment and articulation of extremities in motion. Maximum credit 12 units.

DANCE 253. Choreography I (2)

Four hours of activity.

Prerequisites: Dance 241 (6 units) and 255.

Using concepts of space, time, and energy to investigate and explore basic elements of choreography. Studies and compositions emphasizing solo and small group works.

DANCE 255. Dance Improvisation I (2)

Four hours of activity.

Exploring improvisation through specific stimulus leading to the acquisition of basic improvisational skills.

DANCE 256. Dance Improvisation II (2)

Four hours of activity.

Prerequisite: Dance 255.

Practice in more complex arrangements of improvisation.

DANCE 285. Dance Pedagogy (2)

Four hours of activity.

Teaching theory as applied to ballet, modern, jazz, and social dance for adult populations.

DANCE 290. Body Modalities (2)

One lecture and two hours of activity.

Alternative movement theory systems for dancers and non-dancers including an introduction to body modalities of yoga, Pilates, ideokinesis, Alexander and Feldenkrais techniques, Laban movement analysis and authentic movement. Maximum credit four units.

DANCE 296. Experimental Topics (1-4)

Selected topics. May be repeated with new content. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree.

DANCE

**UPPER DIVISION COURSES
(Intended for Undergraduates)**

DANCE 302. Dance for Children (3)

Prerequisite: Upper division standing.

Development of choreographic knowledge and leadership. Production of a collection of dance teaching resources; inclusion of the arts in learning environments. Designed for future classroom teachers and elementary dance specialists.

DANCE 353. Choreography II (2)

Four hours of activity.

Prerequisite: Dance 253.

Introducing large group works, solo and small group work in organizing more complex arrangements of the basic elements of dance composition. Utilizing music and sound as aural contributions to choreography.

DANCE 354. Choreography III (2)

Four hours of activity.

Prerequisite: Upper division standing in dance.

Approaching dance as a fundamental means of communication. Recognizing the relationship between form and content.

**DANCE 365. University Dance Company:
Major Performance (1-2) Cr/NC**

More than three hours of activity per week.

Prerequisites: Open only to dance majors. Audition and approval by dance faculty.

Practical experience in University Dance Company including concert performances of dance repertory, production of choreographic works, presentation of master classes and workshops, and participation in major production. Students must enroll in a minimum of two semesters. Maximum credit six units.

DANCE 371. Dance Production II (2)

One lecture and two hours of activity.

Prerequisite: Dance 171.

Technical applications as applied to dance production. Continuation of Dance 171.

DANCE 380. Dance History: Contemporary Global Contexts (3)

Prerequisite: Dance 181.

History of dance from early twentieth century to present in a global context. Political, economic, and cultural forces that have shaped the development of contemporary dance as an art form. (Formerly numbered Dance 380B.)

DANCE 382. Dance in World Cultures (3) [GE] I, II

Prerequisite: Completion of the General Education requirement in Foundations II.C., Humanities.

Dance in selected cultures; geographic, historical, social, and aesthetic factors which have shaped development and function.

DANCE 398. Dance Internship (1-3)

Prerequisite: Upper division standing and consent of dance director. Open only to dance majors and minors.

Supervised practical experience in dance studio management and instruction. Maximum credit three units.

DANCE 410. Performance Forum (1)

Two hours of activity.

Prerequisite: Consent of instructor.

Dance master classes, workshops, as related to dance performance, style, repertoire. Maximum credit four units.

DANCE 421. Ballet II (2)

Four hours of activity.

Prerequisite: Dance 221.

Ballet skills for dance majors emphasizing turns, jumps, batterie, extended sequences, and movement quality. Maximum credit four units.

DANCE 441. Modern Dance II (3)

Six hours of activity.

Prerequisite: Dance 241.

Advanced modern dance techniques based on skills developed in Dance 241 with emphasis on performance qualities in projection, vitality, and executing. Maximum credit 12 units.

DANCE 453. Senior Project (2)

Prerequisite: Dance 354.

Choreography of solo and group works utilizing symbiotic relationship of movement, sound, lighting, costuming, and other interdisciplinary media. Presentation of a concert.

DANCE 471. Production Design for Dance (2)

One lecture and two hours of activity.

Prerequisite: Dance 371.

Lighting, set, multi-media, costume and make-up design for dance. Study of concert promotion and production for dance.

DANCE 481. Dance Aesthetics and Criticism (2)

Prerequisite: Dance 380.

Philosophy and aesthetics of dance. Historical foundations of dance criticism. Major contemporary schools of thought. Professional preparation and function of the dance critic.

DANCE 496. Experimental Topics (1-4)

Selected topics. May be repeated with new content. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree.

DANCE 499. Special Study (1-3) I, II

Prerequisite: Consent of the dance director.

Individual study. Maximum credit six units.

**GRADUATE COURSES
Refer to the *Graduate Bulletin*.**

Economics (ECON)

In the College of Arts and Letters

LOWER DIVISION COURSES

ECON 101. Principles of Economics (3) [GE] I, II, S

Principles of economic analysis, economic institutions, and issues of public policy. Emphasis on macroanalysis including national income analysis, money and banking, business cycles, and economic stabilization.

ECON 102. Principles of Economics (3) [GE] I, II, S

Principles of economic analysis, economic institutions, and issues of public policy. Emphasis on direction of production, allocation of resources, and distribution of income, through the price system (microanalysis); and international economics.

ECON 201. Statistical Methods (3) [GE] I, II

Prerequisites: Course in intermediate algebra, satisfaction of the Entry-Level Mathematics requirement, and qualification on the Mathematics Departmental Placement Exam, Part 1A.

Introduction to descriptive statistics, statistical inference, regression and correlation. Students with credit or concurrent registration in the following lower division statistics courses will be awarded a total of four units for the two (or more) courses: Economics 201; Administration, Rehabilitation and Postsecondary Education 201; Biology 215; Civil Engineering 160; Political Science 201; Psychology 270; Sociology 201; Statistics 119 or 250.

ECON 296. Experimental Topics (1-4)

Selected topics. May be repeated with new content. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree.

**UPPER DIVISION COURSES
(Intended for Undergraduates)**

ECON 301. Collection and Use of Data in Economics (3)

Prerequisites: Economics 101 and 102; Economics 201 or Statistics 119; and Information and Decision Systems 180 or Sociology 200C.

Economic data gathering via Internet and other sources, data entry into spreadsheets and graphing techniques, statistics using spreadsheets, and introduction to basic regression.

ECON 311. History of Economic Thought (3)

Prerequisites: Economics 101 and 102.

The development of economics. Contributions of schools of thought and individual writers are examined with regard to their influence on economic theory and policy.

ECON 320. Intermediate Macroeconomic Theory (3) I, II

Prerequisite: Economics 101 with approval of department. Recommended: Mathematics 120 or 121 or 150.

Determination of output, income, unemployment, and inflation. Policies for economic stabilization and growth in an open economy.

ECON 321. Intermediate Microeconomic Theory (3) I, II

Prerequisite: Economics 102 with approval of department. Recommended: Mathematics 120 or 121 or 150.

Behavior of consumers, firms and industries with respect to product and input markets. Price system and other models of economic decision making. Economic efficiency and welfare; property rights and externalities.

ECON 330. Comparative Economic Systems (3) [GE]

Prerequisites: Six units of economics to include Economics 102; and completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences. General Education prerequisite not required for Economics majors.

Current economic systems from primarily laissez-faire to state-controlled market economies with a focus on nations of Asia, Europe and Latin America; Soviet-style economic planning and transition to a market economy.

ECON 338. Economic History of the United States (3)

Prerequisite: Six units of economics to include Economics 101.

American economic development and national legislation. Studies of agriculture, industry, the labor force, and national output.

ECON 360. International Economic Problems (3)

Prerequisites: Economics 101 and 102.

International problems, economic communities, organizations, and other selected topics.

ECON 365. Economics of Underdeveloped Areas (3)

Prerequisite: Six units of economics to include Economics 101.

The nature and causes of economic underdevelopment. Problems of and policies for the economic development of underdeveloped areas of the world.

ECON 380. Labor Economics (3)

Prerequisite: Six units of economics to include Economics 102.

Labor force and mobility, human capital, labor demand, discrimination, determination of compensation and employment, productivity, impact of labor organizations, labor disputes, and social legislation.

ECON 382. Economics of Work, Marriage, and Family (3)

Prerequisite: Economics 102.

Economic analysis of marriage and labor supply; family-related changes in work behavior; gender differences in occupations and earnings; welfare, work and family policies in the U.S. and internationally; macroeconomic analysis of household structure and economy.

ECON 401. Public Finance (3)

Prerequisites: Economics 101 and 102.

Principles and practices of taxation and public expenditures. Economic effects of public spending, debts and taxation. Financing social security and other services. Fiscal policy and prosperity. Relation to inflation and deflation. Special emphasis on social problems involved.

ECON 406. Economics of Sports (3)

Prerequisite: Economics 102.

Economic issues in professional and college team sports. Emphasis on monopoly and monopsony behavior by sports leagues and teams, public subsidies for sports facilities, ticket pricing, and NCAA rules and regulations.

ECON 422. Business Cycles (3)

Prerequisites: Economics 101 and 102.

Fundamental factors in economic fluctuations. Examination of business cycle theories, and various policy proposals for economic stabilization. A consideration of current economic conditions and an examination of methods employed in preparing national economic forecasts.

ECON 441. Introduction to Econometrics (3)

Prerequisites: Economics 301; Mathematics 120 or 121 or 150; Recommended: Economics 320 or 321.

Econometric techniques with emphasis on single-equation models. Applied skills learned through computer assignments.

ECON 452. Economics of Energy Resources (3)

Prerequisite: Six units of economics.

Economic structure of energy supply in the United States: electric power, fossil fuels, nuclear energy. Economic potential of alternative energy sources. Public policy issues: oil imports and self-sufficiency; energy costs, conservation, and curtailment; energy growth and its environmental impact.

ECON 453. Environmental and Natural Resource Economics (3)

Prerequisites: Economics 101 and 102.

Relation of ecological problems to basic economic institutions. Examination of the apparent conflict between economic needs and ecological requirements. Economics of air, fresh water, ocean and land pollution, overpopulation and natural resource utilization. Investigation of possible solutions.

ECON 454. Economics of the Ocean (3)

Prerequisites: Economics 101 and 102.

Economic analysis of fisheries, seabed resources, shipping lanes, allocation of the coastal zone, and ocean pollution. Economic implications of alternative legal arrangements concerning the ocean.

ECON 458. Urban Economics (3)

Prerequisites: Economics 101 and 102.

Major influences on economic conditions of urban areas; specific urban issues including growth and housing. Discussion of San Diego issues.

ECON 464. Economic Problems of Latin America (3) [GE]

Prerequisites: Six units of economics to include Economics 101; and completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences. General Education prerequisite not required for Economics majors.

Economic development, institutions, and problems of Latin America in the context of a global economy.

ECON 465. Economic Problems of South and East Asia (3) [GE]

Prerequisites: Six units of economics to include Economics 101; and completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences. General Education prerequisite not required for Economics majors.

Economic development, institutions, and problems of China, India, and other developing countries in the region.

ECON 489. Economics and Population (3) [GE]

Prerequisites: Six units of economics to include Economics 102; and completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences. General Education prerequisite not required for Economics majors.

Relation of fertility, marriage, migration, and other dimensions of population to various economic factors affecting household behavior. Demographic measures and projections, application to product markets and to policies of developed and less developed countries.

ECON 490. Money and Banking (3) I, II

Prerequisites: Economics 101, 102, and Accountancy 201.

Money's measurement and use; monetary theory and policy; returns on financial instruments; international payments and foreign exchange; evolution of banking institutions, and global competition.

ECON 495. Economics Internship (3) Cr/NC/RP I, II, S

Prerequisite: Consent of instructor.

Internship with business firms, nonprofit organizations and government agencies. Work done under joint direction of activity supervisor and instructor. Project report and internship conferences required. Maximum credit six units.

ECON 496. Experimental Topics (1-3)

Prerequisite: Consent of instructor.

Selected topics in economics. May be repeated with approval of the instructor. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree. Maximum credit nine units.

ECON 499. Special Study (1-3) I, II

Prerequisite: Consent of instructor.

Individual study. May be repeated for a maximum of six units. Maximum credit six units.

UPPER DIVISION COURSES
(Also Acceptable for Advanced Degrees)

ECON 507. Mathematical Economics (3)

Prerequisite: Mathematics 121 or 150. Recommended: Economics 320 or 321.

Mathematical concepts as tools in understanding, developing, and illustrating economic theories. Applications of calculus and linear equations to constrained optimization, macro models, elasticity, general equilibrium, and input-output analysis.

ECON 561. International Trade (3)

Prerequisites: Economics 320 and 321.

Theory and policy of international trade with examples drawn from current issues. Models of determinants of trade. Free trade and protectionism. Trade and economic development. Trading blocs, the European community, GATT and U.S. trade policy.

ECON 565. North American Economic Relations (3)

Prerequisites: Economics 101 and 102. Recommended: Economics 360.

Socioeconomic development of U.S., Mexico, and Canada since World War II. Issues affecting the three countries' relations, including trade investment, technology, and international organizations and agreements.

ECON 592. International Monetary Theory and Policy (3)

Prerequisite: Economics 320 or 490.

International monetary spillovers from domestic macroeconomic policies. Foreign exchange markets and balance of payments. Fixed, flexible and managed exchange rates. Bretton Woods, international monetary fund, and world debt crisis.

ECON 596. Experimental Topics (3)

Prerequisite: Consent of instructor.

Intensive study in specific areas of economics. Topics to be announced in the Class Schedule. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree. Maximum credit of nine units of 596 applicable to a bachelor's degree. Maximum combined credit of six units of 596 and 696 applicable to a 30-unit master's degree.

GRADUATE COURSES
Refer to the *Graduate Bulletin*.

Education (ED)

In the College of Education

LOWER DIVISION COURSES

ED 200. Teaching as a Profession (3)

Current issues, challenges in education; explores strategies that promote professional development. Critically assesses issues related to teaching in culturally and linguistically diverse school settings. Includes guided classroom observations.

ED 201. Introduction to Literacy (3)

Two lectures and four hours of laboratory.

Intended for students in the liberal studies blended program for K-3 literary tutors. Basic processes of literacy and instructional strategies in culturally relevant reading instruction for emergent readers. Requires four hours weekly tutoring in a designated K-3 setting.

UPPER DIVISION COURSES
(Intended for Undergraduates)

ED 350. Education in American Society (3) [GE] I, II, S

(Selected sections offered as distance education.)

Prerequisite: Completion of the General Education requirement in Foundations II.B., Social and Behavioral Sciences.

Philosophical, historical and psychological roots of education in America; current models, instructional designs and strategies of education. Contemporary concerns in education.

ED 451. Introduction to Multicultural Education (3)

Overview of cultural pluralism in education, industry, business, other institutions, and society at large.

UPPER DIVISION COURSE
(Also Acceptable for Advanced Degrees)

ED 516. Foundations of Bilingual Education (1)

Prerequisite: Credit or concurrent registration in Education 451.

Overview of models of bilingual education programs for language minority students.

GRADUATE COURSES
Refer to the *Graduate Bulletin*.

Educational Leadership (EDL)

In the College of Education

UPPER DIVISION COURSES
(Intended for Undergraduates)

EDL 496. Experimental Topics (1-4)

Selected topics. May be repeated with new content. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree.

EDL 499. Special Study (1-3) I, II

Prerequisite: Consent of instructor. Open only to senior and graduate students in education who have shown ability to work independently.

Individual study. Maximum credit six units.

UPPER DIVISION COURSE
(Also Acceptable for Advanced Degrees)

EDL 596. Topics in Educational Leadership (1-3)

Selected problems in educational leadership. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree. Maximum credit of six units of 596 applicable to a bachelor's degree. Maximum combined credit of six units of 596 and 696 applicable to a 30-unit master's degree.

GRADUATE COURSES
Refer to the *Graduate Bulletin*.

Educational Technology (EDTEC)

In the College of Education

LOWER DIVISION COURSES

EDTEC 220. Learning, Technology, and Society (3)

Problem-solving at the intersection of three fundamentally human enterprises: learning, technology, and social institutions. Identifying needs, generating possible solutions in the following domains: elearning, edutainment, formal and informal learning. Projections and visions of future developments to enhance learning.

EDTEC 270A. Technologies for Teaching I (Blended) (1)

One and one-half hours of lecture and three hours of activity per week for five weeks.

Prerequisite: Admission to liberal studies program.

Application of technology to teaching. Meets part of computer literacy requirement for Level I teaching credential. Required for multiple subjects credential students who do not pass the entrance test for Educational Technology 470.

EDTEC 296. Experimental Topics (1-3) I, II

Selected topics. May be repeated with new content. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree.

UPPER DIVISION COURSES (Intended for Undergraduates)

EDTEC 470. Technologies for Teaching (1-3) I, II, S

One unit: One-half hour of lecture and one hour of activity.

Two units: One hour of lecture and two hours of activity.

Three units: One and one-half hours of lecture and three hours of activity.

Application of computer and video technologies to practice of teaching. Meets computer literacy requirement for Level I teaching credential.

EDTEC 496. Experimental Topics (1-4)

Selected topics. May be repeated with new content. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree.

EDTEC 499. Special Study (1-3) I, II

Prerequisite: Consent of instructor. Open only to senior and graduate students in education who have shown ability to work independently.

Individual study. Maximum credit six units.

UPPER DIVISION COURSES (Also Acceptable for Advanced Degrees)

Distance education courses are offered through the College of Extended Studies.

EDTEC 532. Producing Digital Learning Media for Nonmajors (1-3) I

Two hours of activity per unit.

Digital learning media production for professionals in health, law, science, business, publishing, and other settings. Use of web- and video-based technologies, presentation and data analysis tools for training and education. Not open to students in educational technology degree or certificate programs.

EDTEC 540. Educational Technology (3) I, II, S

(Selected sections offered as distance education.)

Six hours of activity.

Rationale, foundations, theories, careers, trends, and issues in educational technology. Implications of educational technology for instruction and information in schools, government, and corporations.

EDTEC 541. Web-Based Multimedia Development (3) I, II, S

(Selected sections offered as distance education.)

One lecture and six hours of laboratory.

Prerequisite: Basic computer literacy.

Systems, aesthetic, and learning theories applied to design of web-based educational multimedia. Planning and prototyping digital media. Not open to students with credit in Educational Technology 532.

EDTEC 544. Instructional Design (3) I, II

(Selected sections offered as distance education.)

One lecture and six hours of laboratory.

Prerequisites: Educational Technology 540 and 541. Meet department Writing Skills Requirement or complete Rhetoric and Writing Studies 503W with a grade of B+ or better.

Systematic design of products for education and training. Use of cognitive task analysis to determine instructional content. Development of instructional goals and product specifications. Rapid prototyping of instructional products.

EDTEC 550. Introduction to Distance Education (3) II

(Selected sections offered as distance education.)

Two lectures and three hours of laboratory.

Prerequisites: Educational Technology 540, 541, 544, or equivalent experience in the field.

Terminology, concepts, instructional strategies, and technologies of distance education. Designing, facilitating, and managing courses at a distance. Overview of social issues, historical perspectives, and current trends. Analyzing distant learner profiles, needs, and skills. Telecommunicating, instructing, interacting, and providing feedback.

EDTEC 561. Advanced Web-Based Multimedia Development (3) I, II, S

(Selected sections offered as distance education.)

Six hours of activity.

Prerequisites: Educational Technology 540 and 541.

Two- and three-dimensional graphics, visualization, animation, digital video, sound, and virtual reality techniques. Research-based guidelines, design languages applied to development of interactive web-based learning systems.

EDTEC 570. Advanced Teaching with Technologies (3) S

(Selected sections offered as distance education.)

Prerequisite: Educational Technology 470 or equivalent work experience.

Design of constructivist lessons and units using Internet resources. Use of visual organizing tools and databases for instruction and assessment. Tools for professional knowledge base organization and electronic portfolios.

EDTEC 572. Technology for Course Delivery (3) I, II, S

(Selected sections offered as distance education.)

One lecture and six hours of laboratory.

Prerequisites: Educational Technology 540 and 541.

Use of technology to support planning, presenting and managing instructor-led courses.

EDTEC 590. Evaluation Techniques for the Performance Technologist (3) I, II

(Selected sections offered as distance education.)

Two lectures and three hours of activity.

Prerequisites: Educational Technology 540 and 541. Recommended: Education 690.

Evaluation techniques and tools for performance technologists.

EDTEC 596. Topics in Educational Technology (1-3) I

(Selected sections offered as distance education.)

Selected problems in educational technology. See Class Schedule for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree. Maximum credit of six units of 596 applicable to a bachelor's degree. Maximum combined credit of six units of 596 and 696 applicable to a 30-unit master's degree.

GRADUATE COURSES Refer to the *Graduate Bulletin*.

EDTEC

Electrical Engineering (E E)

*In the Department of Electrical and Computer Engineering
In the College of Engineering*

NOTE: Prerequisites will be enforced in all undergraduate electrical engineering courses numbered 100 through 599. A copy of an official transcript will be accepted as proof. For corequisites, an enrollment confirmation form will be accepted.

Any course at the 300 level or below must be passed with a grade of C- or better in order to be used as a prerequisite for any subsequent course.

LOWER DIVISION COURSES

E E 203. Principles of Electrical Engineering (3) I

Prerequisites: Mathematics 151 and Physics 196.

Direct and alternating current analysis, phasor diagrams, single-phase and three-phase power, diodes, transistors, integrated circuits, transformers, motors, and generators. Not acceptable for electrical, aerospace, or civil engineering majors.

E E 204. Principles of Electrical Engineering (3) II

Prerequisites: Mathematics 151 and Physics 196.

Circuit analysis, phasor diagrams, single-phase and three-phase power, semiconductor devices and applications, and energy conversion devices. Not acceptable for electrical or mechanical engineering majors.

E E 210. Circuit Analysis I (3) I, II

Prerequisites: Mathematics 151 and Physics 196.

Circuit analysis by reduction methods, source transformations, mesh and nodal analysis. Operational amplifier model, transient analysis, alternating current circuits, impedance, power, phasor diagrams, and three-phase balanced networks. Computer programming and application of computer software for circuit analysis.

UPPER DIVISION COURSES (Intended for Undergraduates)

E E 300. Computational and Statistical Methods for Electrical Engineers (3) I, II

Prerequisites: Computer Engineering 160 and Mathematics 151.

Deterministic and statistical concepts and models in electrical engineering. Associated plotting and numerical techniques. Graphical representation of data and signal processing using computer-aided engineering tools.

E E 303. Electronics, Instrumentation, and Electrical Energy Conversion (3) II

Prerequisite: Electrical Engineering 203 with minimum grade of C.

Theory and application of diodes and transistors in typical electronic circuits. Instrumentation and electronic measuring devices. Fundamentals of electro-mechanical energy conversion including motors and transformers. Not open to electrical engineering majors.

E E 310. Circuit Analysis II (3) I, II

Prerequisites: Electrical Engineering 210 and either Mathematics 252 or both Engineering 280 and Mathematics 254. File an approved master plan with the Department of Electrical and Computer Engineering.

Transient and frequency response of RLC circuits. Mutual inductance, network analysis using Laplace transformations, network functions, stability, convolution integrals, Bode diagrams, two-port networks, computer analysis of circuits.

E E 330. Fundamentals of Engineering Electronics (3) I, II

Prerequisite: Electrical Engineering 210.

Application of diodes, JFETs, MOSFETs, and BJTs in typical electronic circuits. Analysis and design of rectifiers, filters, and simple amplifiers using transistors and operational amplifiers.

E E 330L. Engineering Electronics Laboratory (1) I, II

Three hours of laboratory.

Prerequisite: Credit or concurrent registration in Electrical Engineering 330.

Experimental study of laboratory instruments, diodes, rectifier circuits, filters, transistors, and operational amplifiers.

E E 340. Electric and Magnetic Fields (3) I, II

Prerequisites: Electrical Engineering 210 and Engineering 280.

Electrostatic and magnetostatic field theory using vector notation; Coulomb's Law, Gauss' Law and potential theory. Solutions to Poisson's and Laplace's equations; capacitance and inductance. Time-varying fields; Maxwell's equations.

E E 380. Electrical Energy Conversion (3) I, II

Prerequisite: Electrical Engineering 210.

Magnetic circuits, transformers and polyphase AC networks. Fundamentals of electro-mechanical energy conversion; induction motors, synchronous machines and DC machines.

E E 380L. Electrical Energy Conversion Laboratory (1) I, II

Three hours of laboratory.

Prerequisite: Credit or concurrent registration in Electrical Engineering 380.

Experimental study of DC, single and polyphase AC circuits, transformers, and machines.

E E 397. Discussion: Electrical Engineering (1) Cr/NC

Prerequisite: Concurrent registration in associated course.

Discussion and examples of problem-solving techniques in subject area. Weekly writing assignments summarizing material covered in lecture and identifying troublesome topics. Not applicable to a bachelor's degree.

E E 410. Signals and Systems (3) I, II

Prerequisites: Electrical Engineering 300 and 310.

Linear time-invariant systems, Fourier analysis, continuous and discrete signals and systems, filtering, sampling, and Z-transform techniques.

E E 420. Feedback Control Systems (3) I

Prerequisite: Electrical Engineering 410.

Control systems including servomechanisms by Laplace transform method. System performance and stability; Nyquist, Bode, and root-locus diagrams; elementary synthesis techniques. Practical components and examples of typical designs. (Formerly numbered Electrical Engineering 520.)

E E 430. Analysis and Design of Electronic Circuits (3) I, II

Prerequisites: Electrical Engineering 310, 330, and Engineering 280.

Single and multiple transistor amplifiers, power stages. Frequency response, feedback, stability, and operational amplifier circuits.

E E 430L. Electronic Circuits Laboratory (1) I, II

Three hours of laboratory.

Prerequisites: Electrical Engineering 330L and 430.

Transistor dynamic characteristics; single stage and multistage amplifier circuits including feedback, tuned amplifiers, voltage regulators, active filters, and A/D-D/A converters.

E E 434. Electronic Materials and Devices (3) I, II

Prerequisites: Electrical Engineering 330 and 340.

Crystal properties and growth of semiconductors, quantum mechanics of solids, shot noise and thermal noise, energy band and charge carriers, excess carrier in semiconductors, p-n junctions, solar cells, tunnel diodes, photodetectors.

E E 450. Transmission Lines for High Speed Electronics and Microwaves (3)

Prerequisites: Electrical Engineering 330 and 340.

Theory and applications of transmission lines. Transmission-line equations and four transmission-line parameters, pulses on transmission lines, and impedance matching techniques, scattering matrix, microstrip line, coplanar waveguides, and various microwave transmission line components.