

820. System Dynamics and Control
Spring. 4(4-0) MTH 215; knowledge of matrices and Laplace transforms.
Fundamentals of continuous and discrete dynamic control systems; feedback principles; transform and state variable design techniques; introduction to optimal control design.

826. Linear Concepts in Systems Science
Fall. 4(4-0) Approval of department.
State-space and frequency domain models of interconnected systems; solution of continuous and discrete-time linear systems; response characteristics; stability.

827. Nonlinear Concepts in Systems Science
Winter. 4(4-0) SYS 826.
Existence, uniqueness and stability in nonlinear systems; autonomous systems and the phase space; linearization, perturbation, describing functions and harmonic balance procedures; numerical solutions.

835. Nonlinear Optimization Models
(828.) Winter, Summer. 4(4-0) Students may not receive credit for both SYS 835 and MGT 835. CHE 465 or MGT 834 or knowledge of linear programming. Interdepartmental and jointly administered with the Department of Management. Interdepartmental with the Department of Chemical Engineering.
Nonlinear optimization-examples and applications. Kuhn-Tucker Theory. Saddle point optimality conditions. Algorithms for problems with constraints. Unconstrained optimization; introduction to search methods.

838. Feasibility Analysis of Energy Systems
Winter. 3(3-0) STT 441.
Methods for selecting energy conversion and transmission facilities with emphasis on electric utilities. Demand forecasting system reliability; selection of size, type and location of conversion facilities; cost analysis.

841. Optimization of Urban Traffic Flow
Fall of odd-numbered years. 3(3-0) Approval of department. Interdepartmental with Civil Engineering.
Traffic flow models used in design of computerized traffic control systems. Optimal freeway ramp metering algorithms. Offline and online optimization of traffic signal timing.

843. Ecosystem Analysis, Design and Management
Spring. 3(3-0) SYS 442 or ZOL 404. Interdepartmental with the Department of Zoology.
Groups of students from various biological and nonbiological disciplines will synthesize and analyze models of selected biological systems. Project should yield information relevant to solution of contemporary ecological problems.

851. Modeling of Engineering Systems
Fall. 4(4-0) ME 458 or EE 415. Interdepartmental with and administered by the Department of Mechanical Engineering.
Modeling of engineering devices and components; assembly into systems; bond graph representation; prediction of dynamic behavior by linear, nonlinear and simulation methods; applications to mechanical, electrical, fluid, thermal systems.

899. Master's Thesis Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

961. Optimal Control Theory I
Fall. 3(3-0) SYS 827, SYS 835 or approval of department; MTH 426.
Formulation of the general control problem; controllability, observability and normality in discrete-state and continuous-state systems; performance functionals; typical control problems.

962. Optimal Control Theory II
Winter. 3(3-0) SYS 961 or approval of department.
Optimum control theory in continuous-state and discrete-state systems; necessary and sufficient conditions for optimal solutions, geometric interpretations relation to calculus of variations; typical applications.

963. Optimal Estimation and Control Theory
Spring. 3(3-0) SYS 962 or EE 847 or approval of department.
Techniques of optimal control and communication theory; development of stochastic control and detection models, state estimation, Kalman filtering, stochastic control, computational methods.

999. Doctoral Dissertation Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

ENGINEERING EGR
College of Engineering

1255. Orientation to Engineering Careers
Winter. 2(2-0) Credits earned in this course are included in computation of GPA and MAPS but are not included in the 180 credits required for graduation.
Engineering careers, history and philosophy of engineering profession, present and future challenges, industrial job functions, employment trends.

160. Engineering Communications
Fall, Winter, Spring. 4(3-4) MTH 108 or MTH 111 or concurrently.
Engineering graphics, descriptive geometry, freehand sketching, graphical, numerical and computer problem solutions. Written technical reports and oral technical presentations.

161. Mechanical Drawing
Fall, Winter, Spring. 2(0-4)
Lettering and use and care of instruments. Orthographic projection, working drawings, machine sketching and isometric drawing.

162. Mechanical Drawing
Fall, Winter, Spring. 2(0-4) EGR 160 or EGR 161.
Continuation of EGR 161 with emphasis on freehand lettering and sketching, advanced working drawings.

200. Technology, Society and Public Policy
Winter. 3(3-0) Twelve credits from natural science or engineering. Interdepartmental with the Department of Natural Science.
Description and analysis of certain current technologies and their consequences; exploration of avenues for assessing such consequences as an aid to formulation of public policy.

201. Introduction to Engineering Mechanics
Winter. 4(4-0) PHY 237. Interdepartmental with and administered by the Department of Metallurgy, Mechanics and Materials Science.
Laws of mechanics governing the behavior of rigid and deformable bodies emphasizing how these laws influence engineering design. Extensive use of demonstrations.

260. Engineering Drawing
Fall, Winter, Spring. 3(0-6)
The development of the ability to communicate graphically, pictorially, and orally. Orthographic projection, freehand sketching, oral reports and creative problem solving techniques are employed to enhance learning.

267. Architectural Drafting I
Fall, Winter, Spring. 3(0-6)
House construction detailing. Analysis and drawing of typical standard details.

270. Computer Graphics
Spring. 3(3-0) EGR 160 or EGR 161; CPS 110 or CPS 120; or approval of department.
Use of computer controlled display systems for the solution of multidimensional problems.

300. Technology and Utilization of Energy
Winter. 3(3-0) Initial course in any sequence of courses in the Department of Natural Science. Interdepartmental with and administered by the Department of Mechanical Engineering.
Problems of energy technology and its impact: energy sources, conversions, waste and environmental effects, future outlook for mankind.

322. Interior Lighting Design
Fall, Spring. 3(2-2) HED 213; approval of department. Interdepartmental with and administered by the Department of Human Environment and Design.
The basic principles and practices of interior design lighting, light control, distribution, quality and quantity of light as it affects man's near environment.

344. Engineering Cooperative Education
Fall, Winter, Spring, Summer. Zero credits. (3 credits-See page A-1, item 3.) May reenroll for a maximum of six terms. Employment assignment approved by College of Engineering.
Pre-professional employment in industry and government related to student's major.

Descriptions - ENGINEERING

of

Courses

364. Architectural Drafting II
Winter. 3(0-6) EGR 267 or approval of department.

Functional and standard procedure in the layout of floor plans in traditional and modern houses. Rendered plot plan and required details.

365. House Planning
Fall, Winter, Spring. 3(1-4)

Elementary house architecture. Drawing plans from sketches. Kitchen planning, house styles, elements of design, financing, heating, lighting.

366. Architectural Perspective Drawing

Fall. 3(0-6) Any engineering graphics course.

One-point and two-point perspective, revolved plan and measuring line methods. Pencil rendering, problems in shade and shadows. House model to scale, optional.

390. Value Engineering

Fall, Winter, Spring. 4(4-0) MMM 280 or approval of department.

The basis of value engineering is function, value, and a group of special techniques developed to aid in isolating and identifying problems created by our complex society and technology.

401. Engineering and Public Policy

Spring. 3(3-0) Seniors or approval of department. Interdepartmental with the Department of Natural Science.

Sociotechnical assessment of impact of technology on society, with analysis of the role of engineering and natural science in contributing to public policy formulation.

410. Systems Methodology

Winter. 3(3-0) IDC 201, MTH 113, CPS 110 or CPS 120. Interdepartmental with and administered by Systems Science.

The systems approach in multidisciplinary large scale problem solving. The development of useful systems analysis tools; systems design; feasibility study; computer simulation for feasibility evaluation.

411. Systems Project

Spring. 2(3-0) SYS 410. Interdepartmental with and administered by Systems Science.

Completion of a system study initiated in SYS 410. The project may involve the design of hardware, simulation of a solution to an interdisciplinary problem, or development of a solution concept.

463. Architectural Drafting III

Spring. 3(0-6) EGR 364, or EGR 365.

Traditional and modern elevations. One- and two-point rendered perspective. Functional plans drawn in EGR 364 or EGR 365 required.

480. Special Problems

Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 8 credits. Approval of department.

ENGLISH

ENG

College of Arts and Letters

091. English for Foreign Students—Structures

Fall, Winter, Spring, Summer. Zero credits. (3(5-0) See page A-2 item 3.) English language proficiency examination.

Explanation and intensive practice of basic grammatical structures of English. Students are tested and then placed in small groups, from beginning to advanced, depending on their need.

092. English for Foreign Students—Speaking and Listening

Fall, Winter, Spring, Summer. Zero credits. (3(5-0) See page A-2 item 3.) English language proficiency examination.

Intensive speaking and listening practice of spoken English in small groups (determined by proficiency). For beginners, practice is largely drill. Advanced groups use drill, films, discussion, and practical conversations.

093. English for Foreign Students—Language Laboratory

Fall, Winter, Spring, Summer. Zero credits. (3(5-0) See page A-2 item 3.) English language proficiency examination.

Language laboratory practice in small groups (determined by proficiency). Beginnings review and supplement ENG 091, ENG 092. Advanced groups use carefully prepared lectures, speeches, and presentations to practice structures and vocabulary.

094. English for Foreign Students—Reading

Fall, Winter, Spring, Summer. Zero credits. (3(5-0) See page A-2 item 3.) English language proficiency examination.

Intensive and extensive reading in small groups (determined by proficiency). Beginners emphasize vocabulary development and practice in basic structures. Advanced classes include reading skills, wider reading, and specialized vocabulary.

095. English for Foreign Students—Writing

Fall, Winter, Spring, Summer. Zero credits. (3(5-0) See page A-2 item 3.) English language proficiency examination.

Frequent controlled and free writing in small groups to reduce errors and practice using structures and vocabulary to express ideas. Advanced classes include writing styles used in academic course work.

101. Responses Through Writing

Fall. 4(4-0) Arts and Letters Freshmen only. Students must enroll in and complete ENG 102 satisfactorily to make a substitution for the American Thought and Language requirement. A writing workshop that concentrates on the student's personal writing voice and on his responses to the things, people, and institutions central to his experience.

102. Writing and Composing

Winter. 5(5-0) ENG 101; Arts and Letters Freshmen only.

A continuation of ENG 101 that develops the emphases of ENG 101 and encourages students to write in more public and objective forms—narrative, critical analysis, and issue-oriented essays.

104. Writing for Science Majors

Fall. 3(3-0) Satisfactory grade in English proficiency exam or in Comprehensive English; College of Natural Science majors.

Writing workshop for science students that develops and refines composition ability. Approved through Summer 1982.

105. The Scientist as Writer

Winter. 3(3-0) ENG 104.

Study of various types of writing by scientists—fiction, poetry, and autobiography as well as professional papers and books. Students will write frequently about the readings. Approved through Fall 1982.

106. Introductory Scientific Writing

Spring. 3(3-0) ENG 105.

Writing of popular essays, scientific papers and reports, and other papers related to science. Approved through Winter 1983-6

126. The Writer and Literature

Fall, Winter, Spring. 3(3-0) The first term of ATL 121 or above or ENG 101.

Modern literature from the writer's perspective. Students also write their own critical and creative work, using journal method.

200H. Honors Work

Fall, Winter, Spring. 1 to 16 credits. Approval of department.

201. Nature of Language

Fall, Winter, Spring, Summer. 3(3-0)

Various aspects of language—phonology and orthography; morphology, semantics and the lexicon; syntax; and dialects—with special reference to American English.

205. Introduction to Shakespeare

Fall, Winter, Spring. 3(3-0) Not applicable to major or minor requirements.

A study of selected plays illustrating the powers of England's greatest writer.

206. Forms of Literature: Fiction

Fall, Winter, Spring, Summer. 3(3-0) Open to Freshmen.

Major forms of prose fiction, designed to reveal artistic problems met and solved by these forms. Prepares students for advanced literary study by acquainting them with the conventions of various literary forms, by providing a critical vocabulary and by furnishing experience in reading and writing critical evaluations of outstanding literary works from all historical periods.

207. Forms of Literature: Drama

Fall, Winter, Spring, Summer. 3(3-0) Open to Freshmen.

Major forms of drama, designed to reveal artistic problems met and solved by these forms.

208. Forms of Literature: Poetry

Fall, Winter, Spring, Summer. 3(3-0) Open to Freshmen.

Major forms of poetry, designed to reveal artistic problems met and solved by these forms.

210. Introduction to the Study of Literature I

Fall, Winter. 4(4-0) English majors or prospective English majors.

Exploration of the major forms of literature, the aims and process of literary study, the cultural and personal functions of literature, and the role of literary study in the University.