

**801. Special Problems**  
Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 8 credits. Approval of department.

**810. Introduction to Linear System Theory**  
(812.) Fall. 3(3-0) MTH 214. Interdepartmental with Computer Science Department and Social Science (College of).  
A first course in system theory for students from a range of disciplines. Mathematical representation of system variables, transform and state space method of analysis, introduction to control theory, applications to physical, economic and social systems.

**811. System Methodology and Simulation**  
Winter. 3(3-0) 810, STT 441. Interdepartmental with the Computer Science Department and Social Science (College of).  
Problem definition, design of abstract models for system design and control, simulation of systems described by differential and difference equations, generation of random variables, simulation of discrete object stochastic systems, simulation languages, applications to physical, economic and social systems.

**813. System Project**  
Spring. 3(1-6) 811. Interdepartmental with the Computer Science Department and Social Science (College of).  
Individual or team application of simulation methods to system design and/or management.

**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)  
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) 826.  
Existence, uniqueness and stability; autonomous systems and the phase space; linearization, perturbation, describing functions and harmonic balance procedures; numerical solutions.

**828. Optimization of Static Nonlinear Systems**  
Summer. 4(4-0) Students may not receive credit for both SYS 828 and MGT 835. CHE 465 or knowledge of linear programming. Interdepartmental with the Department of Chemical Engineering.

Problem formulation, classification, convexity and applications; Kuhn-Tucker theory in nonlinear programming; constrained and unconstrained problems; techniques for quadratic, integer and geometric programming; gradient and search techniques.

**841. Optimization of Urban Traffic Flow**  
Fall. 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) 442 or ZOL 404. Interdepartmental with the Zoology Department.

Groups of students from various biological and non-biological disciplines will synthesize and analyze models of selected biological systems. Projects should yield information relevant to solution of contemporary ecological problems.

**847. Analysis of Stochastic Systems**  
Spring. 3(3-0) E E 846.

Equilibrium properties of non-stationary random processes; problems of estimation, filtering and prediction; sequential and recursive decision schemes; applications of random process theory to system modeling.

**899. Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

**961. Optimal Control Theory I**  
Fall. 3(3-0) 827, 828 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) 961.

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 Control Theory III**  
Spring. 3(3-0) 962 or approval of department.

Topics selected among: computational methods for optimal controls (solution of selected two-point boundary value problems); stochastic control theory; state estimation, Kalman filtering and related statistical methods; differential game theory.

**965. Special Topics in Optimal Process Theory**  
Spring of odd-numbered years. 3(3-0) 828 or approval of department. Interdepartmental with and administered by the Chemical Engineering Department.

Continuation of 828 and special topics from the literature in non-linear, stochastic, and dynamic programming.

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

## ENGINEERING EGR

### College of Engineering

**144. Orientation for Engineering Cooperative Education**  
Winter. 1(1-0) Applicants for the College of Engineering Cooperative Education program.

Engineering careers, philosophy of cooperative education, rights and responsibilities of engineers.

**160. Engineering Communications**  
Fall, Winter, Spring. 4(1-6) MTH 108 or 111 or concurrently.

Engineering graphics, a means used by engineers to communicate their ideas to others. Freehand sketching, descriptive geometry, and graphical, numerical and computer problem solutions.

**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) 160 or 161.

Continuation of 161 with emphasis on freehand lettering and sketching, advanced working drawings.

**200. Technology and Society**  
Winter. 3(3-0) One term of American Thought and Language. Interdepartmental with the Natural Science Department.

An attempt to describe and analyze portions of current technology and its desired and undesired consequences; an exploration of avenues for assessing such consequences for future technologies.

**IDC. Introduction to Environmental Systems**  
For course description, see Interdisciplinary Courses.

**201. Introduction to Engineering Mechanics**  
Winter. 4(4-0) PHY 237. Interdepartmental with and administered by the Metallurgy, Mechanics and Materials Science Department.

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) 160 or 161; CPS 110 or 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 Mechanical Engineering Department.

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.

**364. Architectural Drafting II**  
Winter. 3(0-6) 267.

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

**Descriptions — Engineering  
of  
Courses**

**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. 4(3-2) M E 280.  
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. Technology Assessment**  
Spring. 3(3-0) Seniors or approval of department. Interdepartmental with the Natural Science Department.  
Sociotechnical evaluation of impact of proposed technologies on economic, political, and cultural aspects of society. Identification of technical strategies and social goals. Techniques of assessment.

**410. Systems Methodology**  
Winter. 3(3-0) IDC 201, MTH 113, CPS 110 or 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) 410. Interdepartmental with and administered by Systems Science.  
Completion of a systems study initiated in 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) 364 or 365.  
Traditional and modern elevations. One- and two-point rendered perspective. Functional plans drawn in 364 or 365 required.

**480. Special Problems**  
Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 8 credits. Approval of department.

**092A. English for Foreign Students—Low Intermediate**  
(092.) Fall, Winter, Spring, Summer. Zero credit. [3(5-0) to 15(25-0)]†. English language proficiency examination.  
Spoken structures, pattern practice, reading, writing and laboratory in the English language for foreign students on the low-intermediate level.

**092B. English for Foreign Students—High Intermediate**  
(092.) Fall, Winter, Spring, Summer. Zero credit. [3(5-0) to 15(25-0)]†. English language proficiency examination.  
Spoken structures, pattern practice, reading, writing and laboratory in the English language for foreign students on the high-intermediate level.

**093. English for Foreign Students—Advanced**  
Fall, Winter, Spring, Summer. Zero credit. [3(5-0) to 15(25-0)]†. English language proficiency examination.  
Spoken structures, pattern practice, reading, writing and laboratory in the English language for foreign students on the advanced level.

**094. English for Foreign Students—Supplementary**  
Fall, Winter, Spring, Summer. Zero credit. [3(5-0) to 6(10-0)]†. English language proficiency examination.  
Composition in the English language for foreign students on the supplementary level.

**101. Responses Through Writing**  
Fall. 4(4-0) Arts and Letters Freshmen only. Students must enroll in and complete 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) 101; Arts and Letters Freshmen only.  
A continuation of 101 that develops the emphases of 101 and encourages students to write in more public and objective forms—narrative, critical analysis, and issue-oriented essays.

**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) Required of majors and minors. 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.

†See page A-2 item 3.

**207. Forms of Literature: Drama**  
Fall, Winter, Spring, Summer. 3(3-0) Required of majors and minors. 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) Required of majors and minors. 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.

**211. Introduction to the Study of Literature II**  
Winter, Spring. 4(4-0) 210.  
A continuation of 210.

**213. Writing Workshop**  
Fall, Winter, Spring, Summer. 3(3-0)  
A writing workshop designed to help students improve their writing abilities. The course provides opportunities for students to write with different purposes in a variety of modes.

**214. Composition for Secondary English Teachers**  
Fall, Winter, Spring. 4(3-4) Sophomore English Education majors or written approval of department.  
Writing practice in various modes such as personal narrative and description, the familiar essay, drama, poetry, and fiction. Exercises in creative dramatics. Discussion of the process of composing and the teaching of oral and written composition in junior and senior high schools. Will participate in field experience.

**228A. Fiction Writing**  
Fall, Winter, Spring, Summer. 4(4-0) Written approval of instructor.  
The writing of short fiction. Classes and individual conferences. Approval to enroll requires a conference with the instructor and will usually be on the basis of manuscripts submitted to him.

**228B. Fiction Writing**  
Fall, Winter, Spring, Summer. 4(4-0) Written approval of instructor.  
The writing of fiction. Classes and individual conferences. Approval to enroll requires a conference with the instructor and will usually be on the basis of manuscripts submitted to him.

**229. Poetry Writing**  
Fall, Winter, Spring. 4(4-0) Written approval of instructor.  
The writing of poetry. Classes and individual conferences. Approval to enroll requires a conference with the instructor and will usually be on the basis of manuscripts submitted to him.

**230. Non-fictional Imaginative Prose Writing**  
Fall, Winter, Spring. 4(4-0) Written approval of instructor.  
The writing of biography, autobiography, and personal essays. Classes and individual conferences.

**241. Introduction to Popular Culture**  
Fall, Winter, Spring. 3(3-0) Freshmen or Sophomores.  
Generic and thematic study of the arts and artifacts of popular culture with particular emphasis on writing about the popular culture of contemporary American society.

ENGLISH ENG

**College of Arts and Letters**

**091. English for Foreign Students—Elementary**  
Fall, Winter, Spring, Summer. Zero credit. [3(3-0) to 15(25-0)]†. English language proficiency examination.  
Spoken structures, pattern practice, reading, writing and laboratory in the English language for foreign students on the elementary level.