

**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 or estimation, filtering and prediction; sequential and recursive decision schemes; applications of random process theory to system modeling.

**888. Hybrid Computation**

Spring. 3(3-0) Approval of department.

Hybrid programming techniques, applications in simulation design, control and optimization.

**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.

Optimal 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.

ecological topics, e.g., energy, water quality, food production, population dynamics. Interactive models provide opportunity for students to play decision-making role.

**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.

**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. Machine Drawing**

Fall, Winter, Spring. 3(0-6)

Advanced orthographic projection, detail, and assembly drawing, sections and conventions, tracings, illustration and other pictorial drawings of mechanical elements.

**263. Structural Drawing**

Winter. 3(0-6) An engineering graphics course.

A comprehensive study of space planning relative to residential and light-commercial interiors. Building materials, fixtures, and mechanical equipment will be studied with respect towards application and installation.

**267. Architectural Drafting I**

Fall, Winter, Spring. 3(0-6)

House construction detailing. Analysis and drawing of typical standard details.

**268. Descriptive Geometry**

Fall. 3(2-2) 160, 161.

Problems involving relations of points, lines, and planes. Intersections, developments, coplanar, and noncoplanar vectors.

**270. Computer Graphics**

Spring. 3(3-0) 160 or 161; CPS 110 or 120 or LBC 125; 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.

**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.

**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.

**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) 150, 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.

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.

†See page A-2 item 3

ENGINEERING

EGR

College of Engineering

**150. Introduction to Environmental Systems**

Fall. 3(3-0) Interdepartmental with and administered by Systems Science.

Basic systems concepts presented in a non-mathematical manner. Application to selected