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.

847. Communication Engineering
Fall, 4(4-0) E E 458 or approval of instructor. Interdepartmental with and administered by Electrical Engineering.

848. Communication Theory
Spring, 3(3-0) E E 847, E E 880, F E 863. Interdepartmental with and administered by Electrical Engineering.

851. Modeling of Engineering Systems I
Fall, 3(3-0) M E 458 or E E 415, Interdepartmental with and administered by the Department of Mechanical Engineering.
Modeling of engineering components and dynamic systems; mechanical, electrical, fluid, thermal, and transducer effects. Linear state-space responses, impedance methods. Simulation of linear models. Design project.

852. Modeling of Engineering Systems II
Winter, 3(3-0) M E 851. Interdepartmental with and administered by the Department of Mechanical Engineering.

853. Analysis of Stochastic Systems
Winter, 3(3-0) E E 415, E E 458. Interdepartmental with Electrical Engineering.
Analysis and modeling of stochastic signals and systems. Topics include stochastic models, description of processes, stationarity, ergodicity, correlation and power spectrum, linear stochastic systems, harmonic analysis, Markov processes, Poisson processes.

880. Signal Analysis
Winter, 3(3-0) Approval of department. Interdepartmental with and administered by Electrical Engineering.

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

961. Optimal Control Theory
Fall, 3(3-0) SYS 827, MTH 425.
Optimal control, performance measures, principle of optimality, dynamic programming. Hamilton-Jacobi-Bellman equation, variational approach, constrained extrema, Pontryagin principles, necessary conditions, solution techniques, singular cases.

962. Computational Techniques for Optimal Control
Winter of odd-numbered years, 3(3-0) SYS 861.
Computational methods of optimal controls, steepest descent, variation of extremals, quasilinearization, gradient projection, dynamic programming, convexity techniques, support functions for reachable sets, current literature.

963. Dynamic System Identification and Control
Spring of odd-numbered years, 3(3-0) SYS 863, SYS 829.
System identification; dynamic programming; stochastic and adaptive control. Topics under identification include review of statistics background, dynamic system models, identification methods, recursive algorithms, input design, and structure discrimination.

964. Large Scale Dynamic Systems
Winter of even-numbered years, 3(3-0) SYS 861.
Model simplification; stability of large scale systems; decentralized control; optimization by decomposition and coordination; multilevel hierarchical control; applications.

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

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.

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.

344. Engineering Cooperative Education
Fall, Winter, Spring, Summer. Zero credits. [3 credits—See page A-1, item 2.] May reenroll for a maximum of 6 credits of different topics taken. Experimental course developments or special topics appropriate for freshmen and sophomores.

401. Engineering and Public Policy
Spring, 3(3-0) Seniors or approval of department. Interdepartmental with the Department of Natural Science.
Socio-technical assessment of impact of technology on society, with analysis of the role of engineering and natural science in contributing to public policy formulation.

ENGLISH

College of Arts and Letters

091. English for Foreign Students—Structure
Fall, Winter, Spring, Summer. Zero credits. (3 credits—See page A-1, 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 credits—See page A-1, 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 credits—See page A-1, 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.