**Department of Industrial & Enterprise Systems Engineering**

*Elective GE & IE Course Offerings*
Fall 2006

For more detail, see posted notices, contact instructor, or consult *http://courses.uiuc.edu/cis/index.html.*

+ Course is a Design Elective in the 131-hr GE Undergraduate curriculum
* Course is a Human Factors Elective in the 132-hr IE Undergraduate curriculum
# Course is a Manufacturing Elective in the 132-hr IE Undergraduate curriculum
^ Course is an OR Elective in the 132-hr IE Undergraduate curriculum

**GE UNDERGRADUATE ELECTIVES**

**GE 199, X**: *Creative Mechatronics*
First year Discovery Program Course. Registration restricted to freshmen. Students should enroll in only one Discovery Course.

CRN: 42847 Credit: 3 hrs Meets: 1:00 – 1:50 MWF 112 TB Instr. S. Burns

**GE 361, RLP**: *Interper Skills & Emot Intel*
Through innovative experiences both in and out of the classroom, *Engineering Emotional Intelligence* will help you determine your own EQ (Emotional Quotient), and show you how to develop the interpersonal, communications and leadership skills crucial for personal and professional success.

CRN: 30288 Credit: 3 hrs Meets: 4:00-5:15 MW TBA
Lab to meet Saturday TBA

Prerequisite: Sophomore Standing in the College of Engineering

**GE 398, RLP**: *Engaging Leaders*

CRN: 39684 Credit: 1 hr Meets: 12:00-12:50 T 103 TB Instr. R. Price

Prerequisite: Junior standing

**GE 410, E**: *Component Design* +
Design of basic engineering components: structural members, machine parts, and connections. Principles applied include: material failure (yield, fracture, fatigue); buckling and other instabilities; design reliability; analytical simulation.

CRN: 30294 Credit: 3 hrs Meets: 1:00-1:50 MWF 114 TB

Prerequisite: GE 311 and GE 320

**GE 420, AE1**: *Digital Control of Dynm System* +
Examines theory and techniques for control of dynamic processes by digital computer; linear discrete systems, digital filters, sampling signal reconstruction, digital design, state space methods, computers, state estimator, laboratory techniques.

CRN: 32187 (AE1-Lec) Credit: 4 hrs Meets: 10:00-10:50 MWF 101 TB
32180 (AB1-Lab) ARR
32182 (AB2-Lab) ARR
32184 (AB3-Lab) ARR

Prerequisite: GE 320 or equivalent

**GE 421, AL1**: *Introduction to Robotics*
Fundamentals of robotics, rigid motions, homogeneous transformations, forward and inverse kinematics, velocity kinematics, motion planning, trajectory generation, sensing, vision, and control. *Same as ECE 470.*

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| CRN: 36965 (AL1-Lec) | Credit: 4 hrs | Meets: 11:30-12:50 TR | 260 Everitt Lab | Instr: S. Hutchinson |
| 36931 (AB1-Lab) | | 1:00-2:50 T | 316 Trans. Bldg. | Instr: J. Holm |
| 36951 (AB2-Lab) | | 1:00-2:50 R | 316 Trans. Bldg | Instr: J. Holm |
| 41575 (AB3-Lab) | | 3:00-4:50 T | 316 Trans. Bldg. | Instr: J. Holm |

Prerequisite: MATH 415 or 418; ECE 210 or GE 320; or consent of instructor.

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**GE UNDERGRADUATE – GRADUATE ELECTIVES**

**GE 411, U & G1**: *Intro to Reliability Eng*
An introduction to concepts in engineering design, testing, and management for highly reliable components and systems. *Same as IE 435.*

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| U: CRN: 37669 | Credit: 3 hrs | Meets: 2-3:20 TR | 101 TB |
| G1: CRN: 37670 | Credit: 4 hrs | Meets: 2-3:20 TR | 101 TB |

Prerequisite: GE 331 or IE 300, or equivalent; or consent of instructor.

**GE 498, AA & AEA**: *Decision Analysis I*
Decision Analysis I is the first course in the sequence of decision analysis classes. Throughout the course, we will develop rules of thought that will transform complex decisions into simpler decision situations where the course of action is clear. We will create powerful distinctions that will improve your personal decision making and enable you to help others with their own decisions.

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| AA: CRN: 41445 | Credit: 3 hrs | Meets: 9:00-10:20 MW | 114 TB |
| AEA: CRN: 42751 | Credit: 4 hrs | Meets: 9:00-10:20 MW | 114 TB |

**GE 498, LLH**: *Entrepreneurship Discovery Lecture Series*
This one-credit-hour introductory course is open to undergraduates in all fields who are interested in learning about starting their own businesses. It consists of a weekly series of lectures given by successful entrepreneurs. Topics will include: evaluation of your business idea, obtaining financing for your company, legal and business issues, and product development. In addition to lecture attendance, students will be responsible for some outside reading materials and two or three writing assignments over the course of the semester.

CRN: 41178 Credit: 1 hr Meets: 5-6:15 T 1404 Siebel Center

**GE 498, TE1**: *Technology Entrepreneurship I*
The course covers a broad range of topics that critically affect technology based companies and technology based start-up businesses. Primary emphasis is placed on the marketing concerns, intellectual property issues, and business plan preparation for these technology based businesses. The students will apply this information by preparing a business plan for a high-tech company and through the examination of 12 case studies from the Harvard Business School collection. Prerequisite: Junior standing in engineering or science.

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| CRN: 41177 | Credit: 3 hrs | Meets: 4:00-4:50 T | 101 TB |
| | | 4:00-5:40 R | 101 TB |

Prerequisite: Junior standing in engineering or science.

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**IE UNDERGRADUATE-GRADUATE ELECTIVES**

**IE 400, X**: *Des and Anlys of Experiments*
Concepts and methods of design of experiments for quality design, improvement and control; simple comparative experiments, including concepts of randomization and blocking, and analysis of variance techniques; factorial and fractional factorial designs; Taguchi's concepts and methods; second-order designs, response surface methodology. All topics are treated through engineering applications and case studies.

CRN: 30400 Credit: 3 UG hrs; 3 or 4 Grad hrs Meets: 12:00-1:20 MW 243 MEB

Prerequisite: One of IE 300, CEE 202, ECE 413, GE 331, STAT 400, MATH 463 or equivalent or consent of instructor.

**IE 410, E**: *Stochastic Proc and App* ^
Modeling and analysis of stochastic processes. Familiarity with discrete-time Markov chains, Poisson processes, and birth-and-death processes is assumed. Topics include the transient and steady-state behavior of continuous-time Markov chains; renewal processes; models of queuing systems (birth-and-death models, embedded-Markov-chain models, queuing networks); reliability models; and inventory models.

CRN: 30396 Credit: 3 UG hrs; 3 or 4 Grad hrs Meets: 3:00-4:15 MW 243 MEB

Prerequisite: IE 310 or equivalent

**IE 412, D**: *OR Models for Mfg Systems* ^
Provides an introduction to the use of operations research techniques to problems in manufacturing and distribution. Topics covered include single and multi-stage lot sizing problems, scheduling and sequencing problems, and performance evaluation of manufacturing systems.

CRN: 30397 Credit: 3 UG hrs; 3 or 4 Grad hrs Meets: 11:30-12:45 MW 153 MEB

Prerequisite: IE 310 or equivalent or consent of instructor.

**IE 435, U & G1**: *Intro to Reliability Eng*
An introduction to concepts in engineering design, testing, and management for highly reliable components and systems. *Same as GE 411.*

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| U: | CRN: 37671 | Credit: 3 hrs | Meets: | 2-3:20 TR | 101 TB |
| G1: | CRN: 37672 | Credit: 4 hrs | Meets: | 2-3:20 TR | 101 TB |

Prerequisite: GE 331 or IE 300, or equivalent; or consent of instructor.

**IE 445**: *Hum Perf and Eng Psych* *
Human capabilities and limitations in processing information; models and theories of signal detection, stimulus analysis, short-term memory, choice reaction time, decision-making, attention, and motor performance are evaluated with respect to experimental data; emphasizes theory, although implications for design of man-machine systems are considered. *Same as PSYC 456.*

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| AG4: | CRN: 37671 | Credit: 4 hrs | Meets: | 10:30-11:45 TR | 29 Psych Bldg. | Instr: D. Morrow |
| AU3: | CRN: 42726 | Credit: 3 hrs | Meets: | 10:30-11:45 TR | 29 Psych Bldg. | Instr: D. Morrow |
| BG4: | CRN: 44058 | Credit: 4 hrs | Meets: | 9:00-10:15 TR | 21 Psych Bldg. | Instr: J. McCarley |
| BU3: | CRN: 44058 | Credit: 3 hrs | Meets: | 9:00-10:15 TR | 21 Psych Bldg. | Instr: J. McCarley |

Prerequisite: PSYC 100 or 103 or consent of instructor.

**IE 451**: *Num Control of Mfg Processes #*
Study of numerical control systems, manufacturing processes, principles and practices basic to numerical control, and programming methodology for numerical control.

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| ALU (undergrads): | CRN: 31827 | Credit: 3 hrs | Meets: | 1:00-1:50 TR | 260 MEB |
| AL4 (grads): | CRN: 43295 | Credit: 4 hrs | Meets: | 1:00-1:50 TR | 260 MEB |
| AL3 (grad/3hrs): | CRN: 31824 | Credit: 3 hrs | Meets: | 1:00-1:50 TR | 260 MEB |
| AB1: | CRN: 43298 | LAB | Meets: | 12:00-1:50 F | 1228 MEL |
| AB2: | CRN: 43300 | LAB | Meets: | 2:00-3:50 F | 1228 MEL |

Prerequisite: ME 350 or consent of instructor; background in computer technology.

**IE 485**: *Intro MEM Devices & Systems*
Course presents an introduction to the principles, fabrication techniques, and applications of microelectromechanical systems (MEMS). Students will gain an in-depth understanding of sensors and actuator principles and integrated microfabrication techniques for MEMS. It also consists of a comprehensive investigation of the state-of-the-art MEMS devices and systems. *Same as ECE 485.*

CRN: 36992 Credit: 3 hrs Meets: 10:00-11:20 MW TBA Instr: C. Liu

Prerequisite: Senior standing in the COE.

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**GE GRADUATE ELECTIVES**

**GE 521, A**: *Multivariable Control Design*
Frequency response design-specifications; algebraic and analytic constraints in scalar systems; uncertainty representation; Nyquist stability theory, small gain condition, multi-input multi-output systems; singular value decomposition; robustness and u-function; linear quadratic regulator based design; recovery of LQ Design properties; Kalman filter; Riccati equations; H-infinity based design; reduction; balanced truncation; Hankel singular values; coprime factor reduction; loop shaping. *Same as AE 555.*

CRN: 36460 Credit: 4 hrs Meets: 3:00-4:20 MW 241 Everitt

Prerequisite: ECE 515

**GE 530, P**: *Multiattribute Decision Making*
Provides the student with background and practice in applying tools for subjective multiple attribute decision making when present or future states of nature are uncertain. Includes exploration of current research in developing computer aids to decision making. Discusses issues in descriptive versus normative approaches in the context of the interface between operations research and artificial intelligence. Covers multiattribute utility analysis from theoretical foundations through assessment procedures, practice, and pitfalls of potential cognitive bases.

CRN: 37683 Credit: 4 hrs Meets: 10:30-11:50 MW 114 TB

Prerequisite: GE 331 or CEE 202 or equivalent

**GE 531, S**: *Genetic Algorithm Methods*
Genetic algorithms search--procedures based on the mechanics of natural genetics and natural selection--are finding increased application to the difficult problems of engineering, science, and commerce. This course surveys what genetic algorithms are, where they come from, how they work, and how and where they have been applied.

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| CRN: 30321 | Credit: 4 hrs | Meets: | 3:00-4:50 T | 103 TB |
| | | | 3-3:50 R | 103 TB |

Prerequisite: CS 101 & MATH 242

**GE 540, E**: *Simulation of Dynamic Systems*
Modeling and simulation of dynamic engineering systems; distinct modeling approaches for engineering devices; analog and digital computer simulation of dynamic systems; design criteria and performance and design measures; and extensive use of case studies and projects.

CRN: 30328 Credit: 4 hrs Meets: 1:00-2:50 M 101 TB
1:00-1:50 W 101 TB

Prerequisite: GE 320 & IE 485 or equivalents

**GE 598, AY1**: *Product & Market Development for Subsistence Marketplace*
This exciting new course is a joint initiative between the College of Business and the College of Engineering. This course is targeted at second year MBAs and Masters Students in Engineering. In this course you will build real world skills in product development, marketing, cost accounting, project finance, engineering development, and manufacturing development. You will gain real world experience in developing new products and services, interact extensively with corporations and faculty in engineering and business, learn how to segment, target, and position new products in subsistence marketplaces, and learn how to work effectively on cross-functional teams. The course includes an optional field trip to India to learn about your market first hand, to be scheduled based on mutual convenience over a week during winter break. Subsidized student costs for those opting for the field trip is roughly $1000, although attempts will be made to subsidize the trip further.

CRN: 47679 Credit: 3 hrs Meets: 1:00-2:20 TR 138 Wohlers

Course enrollment is by application only, due March 17th. The first course may be taken separately, however, room in the second course is not guaranteed. Priority will be given to students planning to register in the two course sequence.

**GE 598, BAV**: *Managing Advanced Technology in Industry*
This course will focus on the business side of managing advanced technology in industry, introducing students to: the strategic context of advanced technology; analytic financial tools used to estimate the potential value of advanced technology; legal tools important in managing advanced technology; interpersonal issues related to leading, and advocating on behalf of, advanced technology groups.

CRN: 40015 Credit: 1 hr Meets: 3:00-5:15 F (Aug 25-Oct 14) 103 TB

Prerequisite: Graduate Standing in Engineering

**GE 598, CLB**: *Data-Based Modeling and Identification*
This course deals with the problem of identifying and building mathematical and computational models directly from data. The techniques covered in the course apply to a wide range of systems, including biological systems, electro-mechanical systems, economic systems; this will be reflected in the course assignments. Specific topics that will be addressed in the course include an overview of systems and model types, such as state-space models and distributed parameter models; an in-depth discussion of parametric estimation methods, such as regression and least-squares methods; recent subspace identification methods; data preprocessing techniques; and a discussion of model validation methods. Note that this course is intended primarily for graduate students in engineering who have some familiarity with dynamical systems and stochastic signals.

CRN: 39343 Credit: 4 hrs Meets: 10:30-11:50 MW 204 TB

Prerequisite: MATH 225, GE 331, GE 424, or equivalent.

**GE 598, FEM**: *Financing for Engineering Managers*
This course educates students by exposing them to cornerstone financial concepts for engineering management. Topics covered are: the income statement, the balance sheet, the cash flow statement, financial ratio analysis, corporate organizational structures, income taxes relating to corporations, the time value of money, net present value theory. In addition to theory, several case studies are analyzed, homework is assigned, and a financial template is provided for the students to prepare financial statements for a hypothetical product which is assigned at the beginning of the course. The course objective is to enable students to analyze engineering projects from a financial perspective.

CRN: 41135 Credit: 2 hrs Meets: 1:00-1:50 W TBA

Prerequisite: Probability & Statistics including MATH 463, STAT 400 or equivalent. Restricted to graduate students.

**GE 598, HMK**: *Analytical Product Design & Development*
This course is designed to address the fundamental theories for optimal product realization (planning, design and development): 1) Product planning involves demand modeling, customers' preference analysis, and profit modeling under uncertainty, 2) Product design involves the fundamentals of engineering optimization theory, 3) Product development involves analytical problem formulation to achieve the performance targets assigned at the enterprise level and the engineering design level. Students will learn core components of modeling, solving, and validating optimization models in a mathematically rigorous manner. Individual or group semester project is required.

CRN: 42849 Credit: 3 hrs Meets: 1:00-2:20 TR 103 TB

Prerequisite: MATH 225 or equivalent & familiarity with Matlab or other programming languages such as C/C++ or Fortran; graduate standing in engineering or consent of instructor if senior.

**GE 598, IS1**: *Technology Innovation and Market Strategy*
How do new ventures become successful?; Why do large established firms fail? Why are some firms more profitable than others?; When should a new technology be standardized?; When is it more profitable to be an innovator vs. a fast follower? This course answers these questions and covers the principles, practices,and strategies of technology commercialization for new companies as well as larger corporate environments. Course content includes a review of common market-oriented strategies and analysis of their drawbacks, accepted best practices for new product introduction, the new business lifecycle, market adoption, distribution channels, principles of innovation, the framework of sustaining versus disruptive technologies, and strategic technology management. This course applies to the GE/TEC graduate certificate program in Strategic Technology Management, and qualifies as a general elective.

CRN: 39463 Credit: 2 hrs Meets: 4:00-4:50 MW 103 TB

Prerequisite: Graduate Standing

**GE 598, JPK**: *Legal Issues in Entrepreneurship*

CRN: 40007 Credit: 3 hrs Meets: 10:00-11:15 MT TBA

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**IE GRADUATE ELECTIVES**

**IE 510**: *Applied Nonlinear Programming*
Optimization of nonlinear systems, including a survey of classical methods and concepts such as the Lagrangian method, the Jacobian method, and Kuhn-Tucker conditions; emphasizes modern algorithms, numerical methods for digital computers, applications in engineering design, and use of state-of-the-art computer codes.

CRN: 42952 Credit: 4 hrs Meets: 1:00-2:50 TR 336 MEB

Prerequisite: IE 310 or equivalent or consent of instructor.

**IE 512**: *Sys Method and Network Techniq*
Study of basic concepts, theories, and techniques of systems analysis, including modeling of large scale systems, forecasting, planning, control, and information handling; emphasizes the modeling of systems with network techniques, including distance, flow, and project networks. Discusses advanced network topics such as out-of-kilter algorithm and project resource analysis. *Same as CEE 516.*

CRN: 35414 Credit: 4 hrs Meets: 10:00-11:50 TR 260 MEB

Prerequisite: IE 361 or CEE 201 or equivalent; or consent of instructor.

**IE 598, IXZ**: *Seminar with Zhang and Hsaio-Wecksler*

CRN: 39315 Credit: 1-2 hrs Meets: ARR