

## Electrical and Computer Engineering—ECE

- 929A Planar Waveguides and Circuits**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 835) SA: EE 929A  
Planar open-boundary waveguides and circuits. Surface and microstrip waveguides. Propagation-mode spectrum. Spectral analysis of layered media. Sommerfeld analysis. Integral-operator description of open waveguides and planar circuits.
- 929B Antenna Theory**  
Fall of odd years. Spring of odd years. 4(4-0) RB: (ECE 835) SA: EE 929B  
Antennas and EM scattering. Radiation by currents and surface fields. Equivalence principle. Receiving antennas. Arrays and synthesis. Integral equations. Current and impedance of wire antennas. Slot, aperture and reflector antennas. Singularity expansion method.
- 929C Geometrical Theory of Diffraction**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 835) SA: EE 929C  
Fourier expansion and asymptotic evaluation of two-dimensional electromagnetic fields. Scattering from half-planes, wedges and cylinders. Geometrical optics and ray-tracing. Reflection and transmission matrices. Geometrical diffraction theory.
- 931 Advanced Topics in Electronic Devices and Materials**  
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. SA: EE 931  
Topics vary each semester.
- 931A VLSI Technology**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 875) SA: EE 931A  
Oxidation, doping techniques, simulation techniques, film deposition and etching, epitaxial growth, lithography, passivation, and packaging.
- 931B Microdevices and Microstructures**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 875) SA: EE 931B  
Technology, modeling and simulation of submicron solid state devices. Microsensors and micromachining. Diamond and superconducting devices. Vacuum microelectronic structures.
- 931C Properties of Semiconductors**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 874) SA: EE 931C  
Carrier scattering, single particle and collective transport, quantum effects, hot electron effects, electron-photon and electron-phonon interactions.
- 932 Advanced Topics in Analog Circuits**  
Spring of odd years. 3(3-0)  
Variable topics in advanced circuit analysis.
- 960 Advanced Topics in Control**  
Fall, Spring. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. RB: (ECE 827 and ECE 829) SA: EE 960  
Topics vary each semester.
- 960A Adaptive Control**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 827 and ECE 829) SA: EE 960A  
Model reference adaptive control in continuous and discrete time. Lyapunov and hyperstability approaches, adaptive observers, self-tuning regulators, design using pole-zero assignments. Minimum variance and LQG control.
- 960B Nonlinear Control**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 827 and ECE 829) SA: EE 960B  
Relay control, stabilizing controllers. Design via variable structure, high gain, geometric, and Lyapunov-based methods. Feedback linearization and tracking controls.
- 963 Advanced Topics in Systems**  
Fall, Spring. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. SA: EE 963  
Topics vary each semester.
- 963A Sensor Fusion and System Identification and Observation**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 826) SA: EE 963A  
Model parameterization, adaptive filters, identifiability criteria, equation and output error methods, recursive algorithms, least squares and maximum likelihood identification, convergence analysis, closed-loop system identification, experiment design.
- 963B Intelligent Control in Robotics and Automation**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 818 and ECE 826) SA: EE 963B  
Robot dynamics, different formulations. Control types: joint space, task space, force and compliance, robust control. Coordination of multiple robots, mobile robots.
- 963C Adaptation and Learning in Neural Networks and Systems**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 885) SA: EE 963C  
Analysis, design. Learning algorithms. Stability, convergence. Possible engineering applications.
- 966 Advanced Topics in Signal Processing**  
Fall, Spring. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. SA: EE 966  
Topics vary each semester.
- 966A Discrete Time Processing of Speech Signals**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 466 and ECE 863 and ECE 864) SA: EE 966A  
Digital speech models. Short term temporal processing. Linear predictive and spectral analysis. Speech coding and synthesis, recognition, enhancement.
- 966B Multidimensional Signal Processing**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 466 and ECE 864) SA: EE 966B  
Multidimensional signals and systems concepts. Two-dimensional sampling, windowing, filter design. Fast algorithms for convolution and transforms. Sensor array processing. Interpolation.
- 966C Advanced Topics in Statistical Signal Processing**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 466 and ECE 863 and ECE 864) SA: EE 966C  
Communication channels, noise models, hypothesis testing of signals by Bayesian minimax, and Neyman-Pearson criteria. Performance evaluation using ROC. Bayesian and maximum likelihood parameter estimation. Kalman-Bucy filtering.
- 989 Advanced Topics in Plasma**  
Fall of odd years. Spring of odd years. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. SA: EE 989  
Topics vary each semester.
- 989A Plasma Processing for IC Fabrication**  
Fall of odd years. Spring of odd years. 3(3-0) RB: (ECE 835 and ECE 850) SA: EE 989A  
Process requirements. Plasma reactors. Etching and deposition applications. Broad ion beam processing.
- 999 Doctoral Dissertation Research**  
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 72 credits in all enrollments for this course. SA: EE 999  
Doctoral dissertation research.

## ENGINEERING EGR

### College of Engineering

- 101 Preview of Science**  
Fall. 1(1-0) Interdepartmental with Natural Science; Agriculture and Natural Resources; Social Science. Administered by Natural Science. R: Approval of college.  
Overview of natural sciences. Transitional problems. Communications and computer skills. Problem solving skills. Diversity and ethics problems in science. Science and society.
- 124 Internet and Technology**  
Fall, Spring, Summer. 2(2-0)  
The Internet from a user perspective and from a technical perspective. History and social impact of the Internet. Internet tools.
- 150 Engineers and the Engineering Profession**  
Spring. 2(2-0) R: Open only to freshmen or sophomores.  
Overview of the engineering profession. Historical background. Engineering specialties. Engineers at work. Professionalism and ethics. Communication skills. Future trends and challenges.
- 160 Diversity and Engineering**  
Fall, Spring. 2(2-0) P:M: (MTH 116 or concurrently or MTH 132 or concurrently) R: Open only to freshmen or sophomores in the College of Engineering.  
Diversity and engineering. Transitional problems. Career options. Communication skills.
- 192 Environmental Issues Seminar**  
Fall, Spring. 1 credit. A student may earn a maximum of 4 credits in all enrollments for this course. Interdepartmental with Natural Science; Agriculture and Natural Resources; Social Science; Communication Arts and Sciences. Administered by Natural Science. R: Open only to students in the College of Agriculture and Natural Resources or College of Engineering or College of Natural Science or College of Communication Arts and Sciences or College of Social Science. Approval of college.  
Environmental issues and problems explored from a variety of perspectives, including legal, scientific, historical, political, socio-economic, and technical points of view.

**290 Independent Study**  
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to students in the College of Engineering, approval of college.

Independent undergraduate research in engineering.

**291 Selected Topics**  
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to freshmen or sophomores.

Experimental course development or special topics appropriate for freshmen and sophomores.

**300 Technology, Society and Public Policy**  
 Fall. 2(2-0) P:M: Completion of Tier I writing requirement. RB: Two courses in mathematics or engineering or science. SA: EGR 200, MSM 300

Defining, describing and analyzing technology. Impact of technology on society. Public policy and technology. Short history of technology. Development and use of assessment tools to measure impact and consequences of technology.

**393 Engineering Cooperative Education**  
 Fall, Spring, Summer. 1(1-0) A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to students in the College of Engineering.

Pre-professional educational employment experiences in industry and government related to student's major. Educational employment assignment approved by College of Engineering.

**400 Special Problems in International Engineering**  
 Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to juniors or seniors or graduate students in the College of Engineering.

Supervised study of selected topics in engineering using laboratories, equipment, and engineering design techniques. Given at various international universities and institutes.

**410 System Methodology**  
 Spring. 2(1-3) P:M: (EGR 300) SA: SYS 410, MSM 400

System analysis and design. Needs analysis, system identification, graphical models. Team project required.

**475 Special Topics in International Engineering**  
 Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to juniors or seniors or graduate students in the College of Engineering.

Topics selected to supplement regular courses. Given at various international universities and institutes.

**888 Capstone Project in Manufacturing**  
 Fall, Spring, Summer. 3(1-6) Interdepartmental with Marketing and Supply Chain Management. Administered by Department of Marketing and Supply Chain Management. R: Open only to seniors in the Manufacturing Engineering major or to students in the Business Management of Manufacturing major.

Problem solving in manufacturing. Design of products and processes for manufacturing using a systems approach. Teaming and communication skills are emphasized.

**106 Contemporary Life Through Literature**  
 Fall, Spring, Summer. 4(4-0)  
 Contemporary literature written since 1945 exploring issues in modern life. Personal or public, artistic or political, natural or cultural.

**108 Children's Literature and Literature for Young Adults**  
 Fall, Spring, Summer. 4(4-0)  
 Children's literature and different genres of literature for young adults, including realistic and historical fiction, modern fantasy, myth, legend, poetry, and nonfiction.

**110 The Comic Impulse in Narrative, Drama, and Film.**  
 Fall, Spring, Summer. 4(4-0)  
 Comedy from classical literature to the present, drawing on novels, drama, films and humorous verse. Humor and its relation to culture.

**120 Great Books of Western Literature**  
 Fall, Spring, Summer. 4(4-0)  
 Literary texts of varied eras and genres that have exerted enduring influence on English and related literatures.

**121 Shakespeare on Page and Screen**  
 Fall of odd years. 4(4-2)  
 Shakespearean plays emphasizing productions for film and television.

**130 Film and Society**  
 Fall. 3(3-2) A student may earn a maximum of 6 credits in all enrollments for this course. SA: ENG 370  
 How films reflect social issues of gender, ethnicity, class, sexual orientation and handicapper status. How film affects and shapes social attitudes.

**142 Chillers and Thrillers: Introduction to Popular Literary Genres**  
 Fall, Spring, Summer. 4(4-0)  
 Popular literary genres such as science fiction, romance, detective novels, and spy thrillers, including film and other non-print media.

**153 Introduction to Women Authors**  
 Fall, Spring, Summer. 4(4-0)  
 Writings by women from various racial, socio-economic and historical backgrounds. Women's choices of subject matter and style. Women's redefinition of literary genres.

**203 Genres and Themes**  
 Fall, Spring. 3(3-0) R: Not open to students in the Department of English or American Studies major or English disciplinary minor.  
 Texts organized by genre and theme with attention to the historical and cultural perspectives which define them.

**204 Readings in North American Literatures**  
 Fall, Spring. 3(3-0) R: Not open to students in the Department of English or English disciplinary minor.  
 Selected texts from North American literatures drawn from a variety of historical periods, genres, and cultures, reflecting the diversity of North American experiences.

**205 Readings in British Literatures**  
 Fall, Spring. 3(3-0) R: Not open to students in the Department of English or English disciplinary minor.  
 Selected texts from British literatures drawn from a variety of genres and historical periods, reflecting the diversity of human experiences and the continuity of human concerns.

## ENGLISH

## ENG

### Department of English College of Arts and Letters

**092 Academic Oral Skills for Non-Native Speakers of English**  
 Fall, Spring. 0(3-0) R: Approval of English Language Center.

Intensive speaking and listening practice of spoken academic English. Lecture-listening and note-taking strategies. Oral communication skills improved through discussions and classroom presentations.

**093 Academic Reading and Writing Skills for Non-Native Speakers of English**  
 Fall, Spring. 0(6-0) R: Approval of English Language Center.

Integrative reading and writing strategies for academic purposes. Vocabulary development, intensive and extensive reading, and critical reading skills. Academic writing style and editing strategies.

**094 Academic Reading Skills for Non-Native Speakers of English**  
 Fall, Spring. 0(3-0) R: Approval of English Language Center.

Intensive and extensive reading skills. Vocabulary development, pre-reading strategies, reading for comprehension, and critical reading skills.

**095 Academic Writing Skills for Non-Native Speakers of English**  
 Fall, Spring. 0(3-0) R: Approval of English Language Center.

Writing, editing, and revision of journals, essays and research papers.

**097 Oral Skills for Foreign Teaching Assistants**  
 Fall, Spring. 0(5-0) R: Approval of English Language Center.

Practice in English skills for classroom instruction. Pronunciation. Presentations and handling questions. Managing student interactions and classroom situations.

**101 Cross-Cultural Literature**  
 Fall, Spring, Summer. 4(4-0)  
 Fiction, drama, or poetry of major authors, written in or translated into English, reflecting a broad range of cultures.