

ELECTRICAL ENGINEERING

932*. **Advanced Topics in Analog Circuits (MTC)**
 Spring of odd-numbered years. 3(3-0)
 P: EE 831 R: NONE
 Subtitle: Advanced Circuit Analysis.

932A*. **Advanced Circuit Analysis**
 Spring of odd-numbered years. 3(3-0)
 P: EE 831 R: NONE
 Advanced treatment of methods for circuit analysis. Application of graph theory to circuit analysis. Linear graphs. Mesh and node formulations. Topological formulas. Signal flow graphs.

960*. **Advanced Topics in Control (MTC)**
 Fall. 3(3-0) May reenroll for a maximum of 6 credits.
 P: EE 827 R: NONE
 Subtitles: Adaptive Control, Nonlinear Control
 QP: EE 826

960A*. **Adaptive Control**
 Fall. 3(3-0)
 P: EE 827 R: NONE
 Model reference adaptive control in continuous time and discrete time. Lyapunov and hyperstability approaches, adaptive observers, self-tuning regulators, design using pole-zero assignments. Minimum variance control and LQG control.
 QP: EE 827 QA: EE 965

960B*. **Nonlinear Control**
 Fall. 3(3-0)
 P: EE 827 R: NONE
 Relay control, stabilizing controllers. Design via variable structure, high gain, geometric, and Lyapunov-based methods. Feedback linearization and tracking controls.
 QP: EE 826 QA: EE 960

963*. **Advanced Topics in Systems (MTC)**
 Fall, Spring. 3(3-0) May reenroll for a maximum of 9 credits.
 P: Variable, depending upon the subtitle
 R: NONE
 Subtitles: Robot Dynamic and Control, System Identification and Adaptive Filtering, Learning and Theory of Artificial Neural Networks.

963A*. **System Identification and Adaptive Filtering**
 Fall, Spring. 3(3-0)
 P: EE 466, EE 826, EE 863 R: NONE
 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.
 QP: EE 863 QA: EE 963

963B*. **Robot Dynamics and Control**
 Fall, Spring. 3(3-0)
 P: EE 829, EE 827 R: NONE
 Robot dynamics, different formulations, joint space control, task space control, force and compliance control, robust control, coordination of multiple robots, mobil robots.

963C*. **Learning in Artificial Neural Networks**
 Fall, Spring. 3(3-0)
 P: EE 826, EE 827 C: EE 829 R: NONE
 Advanced topics in the theory of artificial neural networks (ANNS). Analysis, design. Learning algorithms. Stability, convergence. Possible engineering applications.

966*. **Advanced Topics in Signal Processing (MTC)**
 Fall, Spring. 3(3-0) May reenroll for a maximum of 9 credits.
 P: EE 863, EE 866 R: NONE
 Subtopics: Discrete Time Processing of Speech Signals, Multidimensional Signal Processing, Detection and Estimation Theory.
 QP: NONE QA: NONE

966A*. **Discrete Time Processing of Speech Signals**
 Fall. 3(3-0)
 P: EE 866, EE 406 or EE 863 R: NONE
 Digital speech models. Short term temporal processing. Linear predictive and cepstral analysis. Speech coding and synthesis. Speech recognition. Speech enhancement.
 QP: EE 880 QA: EE 801

966B*. **Multidimensional Signal Processing**
 Spring. 3(3-0)
 P: EE 866 R: NONE
 Multidimensional signals and systems concepts. 2-D sampling. 2-D windowing. Design of 2-D filters. Fast algorithms for convolution and transforms. Sensor array processing. Interpolation.
 QP: EE 880 QA: NONE

966C*. **Detection and Estimation Theory**
 Spring. 3(3-0)
 P: EE 847, EE 863 R: NONE
 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.
 QP: EE 847 EE 863 QA: EE 845

989*. **Advanced Topics in Plasma (MTC)**
 Fall of odd-numbered years. 3(3-0)
 May reenroll for a maximum of 6 credits.
 P: EE 835, EE 850 R: NONE
 Subtitles: Plasma Processing for IC Fabrication, Plasma Diagnostic Techniques.
 QP: EE 850 QA: EE 989

989A*. **Plasma Processing for IC Fabrication**
 Fall of odd-numbered years. 3(3-0)
 P: EE 835, EE 850 R: NONE
 Process requirements. Plasma reactors. Etching and deposition applications. Broad ion beam processing.
 QP: EE 850 EE 835 QA: EE 989

999*. **Doctoral Dissertation Research**
 Fall, Spring, Summer. 1 to 12 credits.
 May reenroll for a maximum of 0 credits.
 P: Approval of Department R: Major, Electrical Engineering
 Doctoral dissertation research
 QP: NONE QA: EE 999

ENGINEERING EGR

150. **Engineers and the Engineering Profession**
 Spring. 2(2-0)
 R: Open only to freshmen and sophomores.
 Overview of the engineering profession. Historical background. Engineering specialties. Engineers at work. Professionalism and ethics. Communication skills. Future trends and challenges.

160*. **Minority Engineering Education Seminar**
 Fall. 2(2-0)
 R: Open only to freshmen in the College of Engineering and to freshmen no-preference students.
 Issues relevant to underrepresented engineering minority groups. Diversity in engineering. Transitional problems. Communication skills. Career options.
 QA: EGR 290

200W*. **Technology, Society and Public Policy**
 Fall. 2(2-0)
 P: 2 courses in mathematics or engineering or science R: Sophomores and above Engineering students
 Description and analysis of certain technologies and their consequences. Development of techniques for assessing consequences as an aid to formulation of public policy.
 QA: EGR 200

290. **Independent Study**
 Fall, Spring, Summer. 1 to 4 credits.
 May reenroll for a maximum of 4 credits.
 R: Students in College of Engineering, approval of department.
 Independent undergraduate research in engineering.

291. **Selected Topics**
 Fall, Spring, Summer. 1 to 4 credits.
 R: Open only to freshmen, sophomores.
 Experimental course development or special topics appropriate for freshmen and sophomores.
 QP: EGR 290

393. **Engineering Cooperative Education**
 Fall, Spring, Summer. 1(1-0) May reenroll for a maximum of 6 credits.
 R: Open only to students in College of Engineering. Educational employment assignment approved by College of Engineering.
 Pre-professional educational employment experiences in industry and government related to student's major.
 QA: EGR 344

ENGLISH ENG

090*. **Intensive English for International Students**
 May reenroll for a maximum of 45 credits.
 R: Permission of English Language Center
 Explanation and intensive practice of basic English skills. Students are tested and placed in groups, from beginning to advanced, depending on their need.
 QA: ENG 091 ENG 092 ENG 093 ENG 094 ENG 095

091*. **English Structure for International Students**
 Fall, Spring. 3(5-0)
 R: Permission of English Language Center
 Explanation and practice of advanced grammatical structures of English in relation to written communication. Heavy emphasis on editing skills.
 QA: ENG 091

092*. **Academic Communication Skills for International Students**
 Fall, Spring. 3(5-0)
 R: Permission of English Language Center
 Intensive speaking and listening practice of spoken academic English, lecture-listening and note-taking strategies developed. Oral communication skills improved through discussions and classroom presentations.
 QA: ENG 092

093*. **Academic English for International Students**
 Fall, Spring. 6(10-0) May reenroll for a maximum of 12 credits.
 R: Permission of English Language Center
 Integrative reading and writing strategies for academic purposes. Includes vocabulary development, intensive and extensive reading and critical reading skills. Develops academic writing style and editing strategies.
 QA: ENG 094 ENG 095