School of Science and Engineering

Department of Electrical and Computer Engineering

Resnick Engineering Hall

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	REH 101	257·3733	
	(supervises maintenance of electronics laboratories)		
Robert Trahan	Computer Systems Administrator		trahanr@engr.newpaltz.edu
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	(manages student computer laboratories)		

Master of Science in Electrical Engineering

The Master of Science in Electrical Engineering program offers courses in electromagnetic fields and waves, communications, electronics, computer and control systems. The program has two options: with thesis and with non-thesis. The program with thesis emphasizes research and requires submission of a thesis. This option requires completion of 30 credits, 24 course credits and 6 thesis credits. The non-thesis option requires completion of 30 course credits and successful passing of a comprehensive examination. Students can elect courses from an approved list of electrical engineering courses, according to his/her interest. Students can take up to 6 credits of relevant graduate courses from other departments, subject to department approval.

The program, which can be pursued either full or part-time, is designed to serve recent graduates and practicing engineers who need in-depth knowledge in the rapidly changing and expanding areas of electrical engineering beyond what can be included in the traditional bachelor's program.

Admission Requirements

- A bachelor's degree in Electrical Engineering or a closely related field from an ABET accredited program. A minimum undergraduate grade point average of 3.00.
- Three letters of recommendation attesting to the applicant's aptitude and promise for graduate study.
- Acceptable scores on the Graduate Record Examination (GRE), general portion.
- English competency according to College procedures and standards. These include a TOFEL score of 550 and satisfactory performance on the campus-designed and administered English proficiency examination.
- On a case-by-case basis, applicants who do not meet all of the conditions for admission may be granted conditional admission status. These students may register as non-matriculated students for courses of a preparatory nature following the guidance of the Department. They can be considered by the Graduate School for matriculation after this prescribed preparatory work is completed.

Program Requirements

- New students must take the English Exam at the International Office before they can register for any engineering courses.
- Students must maintain a cumulative average of 3.00 or better, with no more than two grades below B.
- Students can take up to two relevant graduate courses outside the department.
- Full-time students are required to take 9 credits per semester.
- Only ONE repeat course is allowed with the permission of student's advisor, department chair, **and** Dean of the Graduate School.
- Before a student can add or drop a course, they must have their advisor's signature.
- Students can transfer up to 9 credits of graduate work from accredited colleges. The minimum grade that can be transferred is a B. Transfer students with 6 or more credits cannot register for outside department courses.
- File a "plan of study" during the **first** semester after matriculation. The advisor of the student, the department chair and the chairman of the graduate faculty must approve the plan of study. If you change any of your courses, you must file a *Request For Change In Plan Of Study*.
- Students must complete prescribed course work and other requirements within seven years after matriculation.
- The GRE is required before graduation.
- For completion of the program and graduation, students must meet the following requirements:

  Thesis option:
  Completion of 24 credits (all electives) of graduate courses.
  Completion of research and presentation of thesis counting as 6 credits.
  Continued Registration will receive a letter grade of "S" or "F"; therefore, we urge you to finish your thesis within two semesters and to keep in contact with your advisor.

  Non-Thesis option:
  Completion of 30 credits (all electives) of graduate courses.
  Successfully passing of comprehensive examination.
  (Comprehensive Exams will be limited to courses taught by full-time professors.)

  Graduation deadlines:
  - November is the deadline to file for May graduation
  - April is the deadline to file for August graduation
  - July is the deadline to file for December graduation

- It is your obligation to file for graduation on time. If you do not, you will graduate the following semester.
- You must register on-line for your graduation tickets.

Electrical Engineering Electives

Eight (8) (thesis option) and ten (10) (non-thesis option) courses are elected by the students from a list of the department graduate courses in electromagnetic fields and waves, communications, electronics, computer, and control systems depending on the students' needs and interest.

The program does not require specialization in a concentration and the student under guidance of a graduate advisor may select courses of interest that will prepare him/her to pursue thesis or future work. Appropriate courses (maximum two) offered by cognate departments may be used to meet this requirement.

MS Thesis in Electrical Engineering (6)

Research, writing and defense of a thesis under the guidance of a faculty member. Prerequisite: MS in Electrical Engineering candidate and PI

Comprehensive Examination

Students with non-thesis option must pass a written comprehensive examination after completing their course works. This examination covers four (4) subject matters based on the plan of study.

Graduation

Students must complete an "Application for Master Degree or Certificate of Advanced Study" and send it to Records & Registration. Late November is the deadline to file for May graduation; April is the deadline to file for August graduation; and July is the deadline to file for December graduation. (Please check the Records & Registration website for actual dates.)

COURSES

EGE505 Analytical Techniques I (3)
Theory of complex variables, analytics, singularities and complex integration. Cauchy's and residue theorems. Series expansions. Taylor and Laurent series. Conformal mapping. Laplace, Fourier and Z transforms.

EGE506 Analytical Techniques II (3)
Linear algebra. State variables applied to continuous and discrete systems. Linear vector spaces. Matrices and matrix transformation. Cayley-Hamilton theorem. Solution to state equations.

EGE512 Advanced Communications (3)
Probability theory and random processes. Behavior of communications systems in presence of noise. Optimum signal detection. Information theory. Error connecting codes.

EGE513 Digital Signal Processing (3)
Continuous-time signals and systems. Discrete-time linear systems. State-space representation. Discrete Fourier transform. Fast Fourier transform. Digital filter design. Finite wavelength and quantization effects.

EGE521 CMOS Analog Circuit Design (3)
Analysis and optimized design of analog integrated circuits and systems in CMOS technology. Specific topics include MOS devices, device physics, basic CMOS analog circuit building blocks, single stage amplifiers, differential amplifiers, operational amplifiers, reference sources, distortions and controls, various circuit design techniques, options and trade-offs. Graduate standing or permission of the instructor.

EGE522 Advanced Analog Circuits (3)
Review of bipolar and MOS transistors. GaAs transistors and circuits. CMOS and BiCMOS amplifiers. Cascade amplifier and its frequency response. Common collector-common emitter cascade and its frequency response. Frequency response of differential amplifiers. Differential amplifier as a wide band amplifier. CMOS and cascade CMOS operational amplifiers. Power MOSFET and class AB power amplifier. Non-linear waveform shaping circuits. Filters, including switched capacitor filters.

EGE523 Wireless Communications (3)
Overview of wireless systems, propagation characteristics of wireless channels, modems for wireless communications, cells and cellular traffic, fading and multiple access techniques.

EGE525 Microelectronic Fabrication (3)
The physics and technology of various steps required to fabricate complicated integrated circuits are explained. The Si and GaAs materials will be covered. The course will cover micro-electromechanical systems (MEMS) fabrication as well.

EGE527 Electronic Properties of Materials (3)
Introduction to electronic properties of materials through the concepts of classical mechanics and quantum mechanics principles. Topics include fundamentals of quantum mechanics, Shrodinger wave equations, energy bands, free-electron energy, applications of electronic theory upon electrical, thermal, optical and magnetic properties of material. Graduate standing or permission of the instructor.

EGE532 Computer Arithmetic (3)
This course deals with algorithms and architectures used for computer arithmetic. Issues that will be addressed include: number systems and representation, redundant and residue systems. Addition/subtraction circuits. Multiplication, division, square root algorithms, cordic arithmetic system. Floating-point arithmetic systems. Implementation issues – pipelining, low-power, fault-tolerant designs.

EGE533 Introduction to Parallel Computing (3)
Paradigms of parallel computer systems. Memory system implementation. Cache memory design of multiprocessors. Pipelining, superscalar, and vector processing. Instruction level concurrency. Parallel algorithms. Survey of commercial parallel machines.

EGE534 Fault-Tolerant Design of Digital Systems (3)
Faults and their manifestations. Reliability, availability and maintainability analysis. System evaluation and performance reliability tradeoffs. Hardware, software, code and time redundancy techniques. Fault-tolerant communication in distributed systems. Real-time fault tolerance. Case study of fault-tolerant systems.

EGE535 Low Power VLSI Design (3)
This course deals with the design of digital systems for low power dissipation. Issues that will be addressed include CMOS power dissipation, analysis and design tools used for low power digital circuits, design methodologies for low power CMOS circuits, low power memory system designs and a discussion on future challenges in low power digital design.

EGE536 Computer Architecture (3)
Computer architecture and hardware system organization are examine. Topics include performance issues, CPU organization and instruction set implementation, performance enhancement through pipelining, memory organizations, input/output structure, and an introduction to parallel architectures.

EGE537 VLSI Design (3)
Introduction to MOS devices and circuits (N-MOS and CMOS), MOS transistor theory, integrated circuit processing and technology and design rules (N-MOS and CMOS), circuit characterization and performance estimation, logic design, interfacing, design tools, testability analysis, and discussion of chip design projects.

EGE542 Numerical Methods in Engineering (3)
Review of electromagnetic theory and analytical methods. Time and frequency domain finite difference methods. Variational methods. Moment methods. Applications to radiation and scattering problems.

EGE543 Antennas and Wave Propagation (3)
Wire antennas and arrays. Aperture antennas and arrays. Solution of antennas by the moment method. Antenna synthesis and optimization.

EGE544 Microwave Circuits (3)
Review of transmission lines, waveguides, impedance matching and scattering parameters. Microwave resonators, power dividers, directional couplers, and hybrids, microwave litters, microwave defectors, mixers, amplifiers, and oscillators.

EGE545 Satellite Communication (3)
Satellite orbits and their effect on communication systems. Design of communication satellites and their sub systems. Communication link analysis. Modulation. Multiplexing. Multiple access. Encoding and error correction. Atmospheric propagation effects.

EGE551 Electromechanical Energy Conversion (3)
Fundamentals of energy conversion including circuits and magnetic circuits. Ideal transformers will be introduced first, and real transformer construction and equivalent circuit will be presented. The equivalent circuit will be solved to determine the transformer efficiency and voltage regulation. Single phase and three phase induction machine construction, equivalent circuit and its analysis under load will be performed to determine motor load characteristics and efficiency. Single phase and three phase synchronous machine construction, excitation, and load characteristics will be studied in detail, and machine transient characteristics will be covered briefly.

EGE561 Adaptive Control (3)
Basic concept of adaptive control. Real time parameter estimation. Model reference adaptive systems. Self-tuning regulators stability. Auto tuning. Gain scheduling. Perspectives on neural networks.

EGE562 Optimal Control (3)
Review of matrix algebra, gradients and series. Introduction to optimization problems. Static optimization. Dynamic optimization. Maximum principle-Hamiltonian. Linear regulator and associated topics. Output feedback problems.

EGE564 Non-linear Control (3)
Phase plane analysis. Lyapunov analysis. Advanced stability theory. Describing function analysis. Feedback linearization design. Sliding control design.

EGE570 Fiber Optic Technology: Fundamentals and Applications (3)
This course will provide an introduction to optical fiber communication systems. Topics to be covered include lasers and other optical transmitters, optical receivers, fiber optic cable design, link budgets and noise sources, and the design of practical fiber networks. Data encoding and standard protocols including SONET, Ethernet, Fibre Channel, and others will be covered, as well as time and wavelength multiplexing, optical amplifiers, and advanced research topics such as optical MEMs, nanofibers and parallel optical links.

EGE572 Engineering Management (3)
The Engineering Management course helps engineering students prepare for a career in management. Through class discussions, group projects, role playing, and guest speakers, students find out what a management role entails and how it differes from what they may have imagined to be. Students learn how to go from being a “doer” (a working engineer) to being an “enabler” and “coach” (an engineering manager).

EGE575 Heterostructure Devices (3)
Heterostructure materials, quantum theory of heterostructures, quantum heterostructure devices (quantum wells, resonant tunneling and superlattice), heterojunction diode, heterojunction bipolar transistor, HBT (operation and properties), modulation doped field effect transistor, MODFET (operation and properties).

EGE580 Power Electronics (3)
The course will enable the students to analyze converter circuits, choose an appropriate converter topology for an application, understand power semiconductor switching devices, design magnetic elements and feedback loops including compensators for the duty-ratio controlled PWM converters.

EGE590 MS Thesis in Electrical Engineering (6)
Research, writing and defense of a thesis under the guidance of a faculty member.

EGE593 Network Security
Students will get exposure to the fundamentals of communications network security and the practical perspectives as well; basic cryptography, including concepts of secret key and public key Encryption and Hush functions; examine typical security vulnerabilities in communications networks and wireless networks; explore various defense techniques. The objective is to provide an in-depth understanding of network security issues. Students will get opportunities to be exposed to current research topics in this area as well. Paper reading, literature review, and presentations will be required to complete the course.

EGE594 Internship (3)
Students will work for one semester (at least half time – 300 hours) on a scientific project under the supervision of a scientist in industry. After conclusion of the internship, the company supervisor will evaluate student work and send a copy of the evaluation to the Engineering Department. Student will give a PowerPoint presentation outlining experiences, results gained and subjects learned. Student will submit a full written report. After studying the evaluation and the quality of the student work, presentation and report, an appropriate grade is determined.

EGE799 Continued Registration