ELECTRONICS ENGINEERING (EEN)

EEN 531 Microcontrollers (3 Credits)
A hands-on approach to microprocessor and peripheral system programming, I/O interfacing, and interrupt management. A sequence of mini-projects requiring the programming (in assembly language) of a microcontroller are conducted. A midterm and final project provide a venue for complex project design and implementation. Projects require a Motorola microcontroller evaluation board and accessories supplied by the department/student.

EEN 532 Advanced Digital Design (3 Credits)
Analyze digital hardware and design; digital , system organization; digital technologies; and, testing. Use a hardware description language, to introduce design methodology that emcompasses, the range from structural and behavioral models to, design simulation. A hardware design project is , included.

EEN 541 Biomedical Engineering Devices & Systems (3 Credits)
This course introduces graduate students to concepts and theory of biomedical devices, especially for sensing and modulation purposes. The course provides lectures on the operation mechanisms and applications of microsensors and modulators for glucose, neurochemicals, bio-potentials, and cellular ions using electronic or optical transduction. In addition to classroom lectures, students will have a laboratory component for the design and fabrication of microscale biomedical sensors.

EEN 551 Communications Systems (3 Credits)
Presentation of the fundamentals of modern digital communication systems and evaluation of their performance. Topics include a review of random processes theory, principles of optimum receiver design for discrete and continuous messages, matched filters and correlation receivers, signal design, and error performance for various signal geometries. The course also covers link power calculations, noise models, RF components, and antennas.

EEN 562 Semiconductor Processing Technology (3 Credits)
This course presents the fundamentals of semiconductor processing technology, including semiconductor substrates, micro fabrication techniques, and process integration. Lithography, oxidation, diffusion, ion implantation, methods of film deposition and etching, metal interconnections, measurement techniques and packaging. Future trends and challenges in semiconductor manufacturing will also be discussed. A design project is required in this course.

EEN 575 Fossil Energy (3 Credits)
Contact the department for specific course information.

EEN 576 Renewable Bio Energy (3 Credits)
Contact the department for specific course information.

EEN 577 Carbon Free Energy (3 Credits)
Contact the department for specific course information.

EEN 581 Analog Integrated Circuits (3 Credits)
This courses addresses design and analysis of analog integrated circuits. Topics include feedback amplifier analysis and design, including stability and compensation; layout and floor planning issues associated with mixed-signal IC design; selected applications of analog A/D and D/A converters; and current sources. Students will also use CAD tools for design and simulation throughout the course.

EEN 582 Bioelectrics (3 Credits)
This course applies basic electrical engineering principles to understand the proper functioning of biological cells and tissue, and selected human organs. This course covers the important concepts of bioelectrics, bioelectric system modeling and diagnosis. Although emphasis will be given to the cardiovascular system, students will be able to apply the principles of bioelectricity to any bioelectrical system.

EEN 583 Vlsi Systems Design (3 Credits)
This course focuses on the design and synthesis of Very Large Scale Integrated (VLSI) chips using CMOS technology for complex digital systems using integrated circuit cells as building blocks and employing hierarchical design methods. Design issues at layout, schematic, logic and RTL levels will be studied.

EEN 590 Research Methods (1 Credits)
This course introduces students to various styles of technical writing. Style manuals used for master's theses at Norfolk State and the standard technical style manuals for technical journals will be reviewed. Students will also learn how to conduct detailed database searches on technical topics. Exhaustive bibliographic studies of technical issues will be developed.

EEN 601 Systems Modeling (3 Credits)
Principles of systems biology modeling will be, covered in this course. Various numerical, techniques for solving a system of copied, differential equations commonly encountered in, biomedical systems modeling will be covered. , Practical aspects related to numerical, implementation on a computer such as solver, methods, memory requirements and accuracy will, also be covered.

EEN 603 Pc Based Instrumentation (3 Credits)
This course gives graduate students hands-on knowledge in designing instrumentation systems for computer-based data acquisition and control. Sampling and data collection analysis are reviewed in the context of real world scenarios. Memory and ports in Microcomputer Systems are also covered. Programmable parallel ports and handshake Input/Output are presented as well as data structures in a graphical programming language. Computer interfacing using a graphical programming language with applications involving Digital to Analog Conversion (DAC), Analog to Digital Conversion (ADC), Digital Input Output (DIO), Serial Ports, and the general purpose instrument bus (GPIB) will be introduced.

EEN 610 Advanced Engineering Mathematics (3 Credits)
This course covers advanced mathematical tools and techniques for electronics engineering including linear algebra, advanced vector calculus, complex variable theory, ordinary and partial differential equations and integral transform. Emphasis will be on using software such as MATLAB and Mathematical for solving engineering problems.

EEN 614 Neural Networks (3 Credits)
This course provides a working knowledge of the fundamental theory, design, and applications of Artificial Neural Networks (ANN). Topics include the major general architectures: back propagation, competitive learning, counter propagation, etc. Learning rules such as Hebbian, Widrow-Hoff, generalized delta, Kohonen linear and auto associators, etc., are presented. Specific architectures such as the Neocognitron, Hopfield-Tank, etc., are included. Hardware implementation is considered.

EEN 621 Electromagnetic Field Theory (3 Credits)
This course introduces techniques for solving and analyzing electromagnetic systems. Topics include relation of fundamental concepts of electromagnetic field theory and circuit theory, including duality, equivalence principles, reciprocity, and Green's functions; applications of electromagnetic principles to antennas, waveguide discontinuities; and equivalent impedance calculations.

EEN 632 Advanced Digital Design (3 Credits)
Analysis of digital hardware and design; digital system organization; digital technologies; and testing. Use a hardware description language to introduce design methodology that encompasses the range from structural and behavioral models to design simulation. A hardware design project is included.

EEN 640 Embedded Systems (3 Credits)
This course will cover advanced topics in the interfacing of microcomputers (Motorola 6811 or equivalent) and their use as real time embedded systems. Topics covered include Serial I/O devices, serial communications interfaces and their applications, synchronous communication using SPI, memory interfacing, and embedded systems applications.

EEN 641 Computer Architecture (3 Credits)
An introduction to computer architectures. Analysis and design of computer subsystems including central processing units, memories and input/output subsystems. Important concepts include data paths, computer arithmetic, instruction cycles, pipelining, virtual and cache memories, direct memory access and controller design.

EEN 643 Microcomputers for Real-Time Applications (3 Credits)
Introduction to microprocessors, Structures of 80X86 Processors. Microcomputer programming methodologies. Memory and input/output interfacing Peripheral devices. PC-based system for data acquisition and control. Introduction to DOS operating system. Assembly language programming Microcomputers for monitoring and control of real-time system. Trends in parallel processing architecture and operating system for multi-processor microcomputers

EEN 645 Communications Networks (3 Credits)
This course will introduces communication networks technologies. Topics covered include: OSI-RM; Network architectures and protocols (LAN< MAN< WAN); reliable transmission protocols at the data control layer; congestion and flow control; routing algorithms; Mobile IP and Wireless Access Protocols.

EEN 646 Wireless Communications (3 Credits)
This course will introduce wireless communication technologies. Topics covered include transmission fundamentals, cellular systems, digital cellular systems and protocols, coding and error control, handovers, switching and traffic protocol verification techniques.

EEN 650 Microelectromechanical Systems (mems) (3 Credits)
This course covers the MEMS field at the graduate level. Tensor physics is reviewed and used to describe physical properties of sensors and actuators, including stress, strain, piezoresistivity, and elasticity. Students will examine the methods that are used to predict deflection of common mechanical structures used in MEMS. The course also covers both bulk and surface micromachining, including techniques for measuring properties of thin films.

EEN 651 Digital Signal Processing (3 Credits)
An introduction to the analysis and design of discrete time systems. Time domain analysis, solution of difference equations, z-transform analysis, discrete Fourier transforms, sampling of continuous signals, digital filter design and state variable representations for discrete time systems

EEN 661 Optics and Lasers (3 Credits)
This course reviews the electromagnetic principles of optics; Maxwell's equations; reflection and transmission of electromagnetic fields at dielectric interfaces; Gaussian beams; interference and diffraction; laser theory with illustrations chosen from atomic, gas, and semiconductor laser systems; detectors, including photomultipliers and semiconductor-based detectors; and noise theory and noise sources in optical detection

EEN 663 Solid State Devices (3 Credits)
This course introduces semiconductor device operation based on energy bands and carrier statistics. Describes the operation of p-n junctions and metal semiconductor junctions. Extends this knowledge to descriptions of bipolar and field effect transistors, and other microelectronic devices.

EEN 674 Optimal Control Systems (3 Credits)
Analyzes the development and utilization of Pontryagin's maximum principle, the calculus of variations, Hamilton- Jacobi theory and dynamic programming in solving optimal control problems; performance criteria, including time, fuel, and energy; optimal regulators and trackers for quadratic cost index designed via the Ricatti equation; introduction to numerical optimization techniques.

EEN 683 Advanced Topics in Vlsi (3 Credits)
This course covers advanced topics in the design of very large-scale integrated circuits, with emphasis on mixed analog/digital circuits for telecommunications applications. Topic varies from year to year according to departmental research interests. Students may be expected to contribute lectures or seminars on selected topics.

EEN 690 Advanced Topics I (3 Credits)
This course is designed to offer courses on specialized topics that are relevant to student's research work or in a specific research area that is of interest to a select individual or group which are not in the course catalog.

EEN 691 Advanced Topics II (3 Credits)
This is the second course in a series designed to offer courses on specialized topics that are relevant to student's research work or in a specific research area that is of interest to a select individual or group which are not in the course catalog.

EEN 697 Masters Project (3 Credits)
This project course is for non-thesis students. Students are expected to spend the semester conducting a research project. The students must work closely with their research advisor to ensure progress in the course. The course culminates with a formal written report and presentation of their research.

EEN 698 Master's Thesis I (3 Credits)
First semester of the Master's thesis sequence. Under the supervision of the thesis advisor, students prepare a thesis proposal and work toward the goal of completing all background material needed for their research. Minimally, a successfully defended thesis proposal will be used to satisfy completion of the course. The thesis committee should approve thesis topic.

EEN 699 Master's Thesis II (3 Credits)
This is the sequel to Master's Thesis I and is worth 3 credit hours. This is marked by the completion of Research work of the student culminating into a thesis that is defended in front of a committee and approved by the same.

EEN 700 Engineering Seminar (3 Credits)
An elective course designed to provide graduate students an opportunity to gain professional development experience through giving formal presentations and attending technical presentations covering the newest technologies and research developments.

EEN 750 Continuing Registration (1-9 Credits)
A course credit needed to facilitate continuing registration in a graduate program while thesis work and graduate requirements are finalized. Permission of the department chair and graduate advisor are needed to register in this course

EEN 799 Graduate Research (3-9 Credits)
An elective course designed to provide graduate students with an opportunity to conduct research. The course provides structure to complement the, research work students do under the direct, supervision of their advisors. It also provides, an opportunity for non-thesis students to gain research experience in an engineering research lab.