Electrical Engineering 415
Fiber Optics.
Communication via light waves over fiber optics cables. Analysis of light emission and light detection. Absorption loss. Optical devices, connectors, splices and Local Area Networks (LANs).
Pre-requisite: Physics 112 or equivalent.
3 lecture hours; 3 semester hours

Electrical Engineering 416
Fiber Optics Lab.
Hands on experience with fiber optic hardware. Fiber properties, sources, detectors, splices, connectors. Design and test fiber optic transmission and receiver circuits for both analog and digital transmission.
Pre-requisite: Electrical Engineering 415.
3 semester hours

Electrical Engineering 430
Satellite/Wireless communication Systems.
Detailing concepts and calculations from the entire field is enough to permit the kinds of analysis needed for major systems planning decisions. This course covers channel capacity, picture quality, signal to noise ratio, bit error rate, earth station antenna size and offers new materials on orbital mechanics and geometry.
Pre-requisite: Electrical Engineering 441 or equivalent.
3 semester hours

Electrical Engineering 437
Microwaves.
Passive and Active elements for the generation, modulation, amplification and reception of microwaves. Radar and other microwaves systems.
Pre-requisite: Field Theory.
3 lecture hours; 3 semester hours

Electrical Engineering 441
Analog Communications.
Spectral analysis; modulation and demodulation system analysis, including AM, FM, pulse modulation and transmission of digital information. Signal design and system considerations.
Pre-requisite: Electrical Engineering 234.
3 semester hours

Electrical Engineering 442
Digital Communications.
Detection of noise in thermal noise. Digital sequences. Optimal filtering and statistical decision theory. Optimum receiver design criteria. Performance, configuration and trade –offs.
Pre-requisite: Electrical Engineering 441.
3 lecture hours, 3 semester hours

Electrical Engineering 443
Digital Signal Processing.
The FFT Spectral Analysis, Filtering in the presence of noise. Correlation. Introduction to stochastic signal processing. Computer projects.
Pre-requisite: Electrical Engineering 234 or equivalent.
3 lecture hours, 3 semester hours

Electrical Engineering 444
Power Electronics.
Application of power diodes and power transistors in rectifier arrangements and voltage regulators. Properties and application in power converters, inverters and motor drives.
Pre-requisite: Electrical Engineering 348.
3 lecture hours, 3 semester hours

Electrical Engineering 445
DC Motor Drives.
Application to control speed and efficiency of motors using conventional thyristors control as well as modern variable frequency drives.

Computer Engineering/ Electrical Engineering 446
MEMS (Micro-Electro-Mechanical Systems).
Basic micro fabrication techniques, MEMS materials and their properties, MEMS device design and simulation, MEMS packaging and assembly, signal testing and MEMS reliability analysis. MEMS industrial applications in various areas will also be discussed. Students used ANSYS FEM software to design and simulate their behavior.

Electrical Engineering 447
Semiconductors.
Crystal fabrication: MBE, MOCVD, LEC, Bridge Mann. Study material and electronic properties of single crystal Si, poly, a-Si, GaAs, GaN, SiC, Ge and II-VI compounds. Transport properties: Hall Peltier, resistivity, mobility. Analysis of capacitance and I/V data for pn, pin, schottky and hetero-junction devices.
Pre-requisite: Mathematics 110.
3 lecture hours, 3 semester hours

Electrical Engineering 448
Microelectronic Fabrication
This class covers basic microfabrication processes for semiconductor and VLSI fabrication, including photolithography, plasma and reactive ion etching, ion implantation, diffusion, oxidation, evaporation, vapor phase epitaxial growth, sputtering, and CVD. Advanced processing topics such as next generation lithography, MBE, and metal organic CVD are also introduced. The physics and chemistry of each process are introduced along with descriptions of the equipment used for the manufacture of integrated circuits. The integration of microfabrication process into CMOS, bipolar, and MEMS technologies are also discussed. The purpose of this course is to provide students with technical background and knowledge in silicon microelectronic fabrication process. Upon finishing this course, students will be familiar with the basic semiconductor and VLSI microfabrication processes.
3 lecture hours, 3 semester hours

Electrical Engineering 450
Communication Systems Lab.
Hands-on experience with digital and analog communication equipment, AM, FM and digital modulation techniques. Design and test of optimal configuration. Measurement of performance parameters in the presence of thermal noise.
Pre-requisite: Electrical Engineering 441.
3 semester hours

Electrical Engineering 453
Pattern Recognition.
Operation and Design of systems that recognize patterns in data, based primarily on statistical and neural network approaches. Topics include Bayesian decision theory, Parametric likelihood estimation, Nonparametric techniques, Linear discriminant functions and Neural Networks.

Electrical Engineering 455
Microwave Lab.
Hands on experience with basic microwave coaxial and wave guide components in various circuit configurations. Measurement of power, wavelength, VSWR, attenuation, directional coupling, impedance. Use of the Smith chart.
Pre-requisite: Electrical Engineering 437.
3 lecture hours; 3 semester hours

Computer ENGINEERING / ELECTRICAL Engineering 458
Analog VLSI.
Modeling, design and analysis of analog VLSI circuits. CMOS processing and layout, current mirrors, Opamp, comparators, S/H voltage references, switched-capacitor circuits, data converters, filters and PLLs. Students design analog VLSI layouts, extract the netlists and simulate the circuit behavior. Transistors sizing will also be discussed. EDA tools PSPICE, Mentors Graphics are used.

Electrical Engineering 460
Controls.
Analysis of steady state and transient response of control systems. Laplace transforms methods. Transfer functions. Stability criteria. Nyquist, Bode and root locus methods. System stabilization. System Design.

Electrical Engineering 461
Control Lab.
Laboratory study of feedback control systems with experiments analyzing different types of plants, transducers and control techniques; emphasis on real-time computer control.

Electrical Engineering 481
Analog Electronics Lab.
With a set of 6 experiments and simulating them using P-Spice, the goal of this course is to teach the concepts from the theory of analog electronics. The user must have solid understanding of the basic electronics and circuit theory aka Network Analysis.
Pre-requisite: Electrical Engineering 348, 234 or equivalents.
3 semester hours

Electrical Engineering 482
Analog /Digital Integrated Circuit Design.
Do a complete analysis of the 741 op-amp, including bandwidth, gain analysis, slew rate, power efficiency and I/O impedances. Analyze ROM, Ram, TTL, ECL, CMOS and more modern logic structures including Fanout, noise margin, latching, contention, logic and delay response.
Pre-requisite: Electrical Engineering 348.
3 lecture hours; 3 semester hours

Electrical Engineering 500
Graduate Co-op/Internship in Electrical Engineering.
By arrangement.
1-3 semester hours

Electrical Engineering 510
Medical Electronics and Electrical Safety.
Electrical safety is studied by full analysis of grounding and modeling of the human body under various electric shock conditions. The ECG machine (for measuring heart performance) is analyzed as both an analog and a digital machine, with emphasis on cleaning up signal problems and extending the analysis of the data recorded. Other instruments that are analyzed include the blood sugar tester, the hospital thermistor, the lung pressure machine, the anesthesia vaporizer, the pulse oximeter and various cardiac output devices. Discussion made about the minimum alveolar concentration (MAC) as it applies to anesthesia. Discussion is also made about modern hearing aids and advances in eye replacement via electrical means.
Pre-requisite: Electrical Engineering 348, 234 or equivalent.
3 semester hours

Electrical Engineering 543
Digital Signal Processing Lab.
Centered on a set of experiments for the ADSP21061 and ADS21065L, the goal of this course is to teach how to program the ADSP21061 and ADS21065L using visual DSP++ and MATLAB and illustrate concepts from theory of digital signal processing. The user must have solid understanding of DSP algorithms as well as an appreciation of basic computer architecture concepts.
Pre-requisite: Electrical Engineering 443 or equivalent.
3 semester hours

Electrical Engineering 546
Biomedical and Biometric Signal Processing.
The course teaches all of the basics of image processing as applied to biometrics analysis and medical imaging.
3 semester hours

Computer ENGINEERING / ELECTRICAL Engineering 548
Low Power VLSI Circuit Design
With the rapid development of mobile computing, low power VLSI design has become a very important issue in the VLSI industry. A variety of low-power design methods are employed to reduce power dissipation of VLSI chips. This course is designed to cover low-power design methodologies at various design levels (from system level to transistor level). The basic low-power design strategies will be introduced in the class. Students will use the learned knowledge to design low-power VLSI circuits. Upon completion of this course, students will be able to analyze the power consumption of VLSI circuits, and design low-power VLSI circuits using various strategies at different design levels. The major target is to design VLSI chips used for battery-powered systems and high-performance circuits not exceeding power limits.
3 semester hours

ELECTRICAL ENGINEERING 597 A
Master's Project.
Lecture hours and topics to be arranged with Department Chair.
1 credit hour

ELECTRICAL ENGINEERING 597 B
Master's Project.
Lecture hours and topics to be arranged with Department Chair.
2 credit hours

ELECTRICAL ENGINEERING 597 C
Master's Project (completion).
Lecture hours and topics to be arranged with Department Chair.
1 credit hour

ELECTRICAL ENGINEERING 598
Thesis in Electrical Engineering.
Lecture hours, semester hours and topics to be arranged with Department Chair.
3-6 credit hours

ELECTRICAL ENGINEERING 599
Independent Study in Electrical Engineering.
Independent study of advanced topics in Electrical Engineering and submission of project report as required. Problem assignment to be arranged with and approved by the Department Chair.
3 credit hours