COURSES DESCRIPTIONS

The following section gives a brief description of the contents of core electrical engineering courses.

EE 200 - Digital Logic Circuit Design (3-3-4)

Number systems & codes. Logic gates. Boolean Algebra. Karnaugh maps. Analysis and synthesis of combinational systems. Decoders, multiplexers, adders and subtractors, Programmable Logic Arrays (PLAs). Types of flip-flops. Memory concept. Counters. Registers. Introduction to sequential circuit design.

Prerequisite: MATH 102 and PHYS 102

EE 201 - Electric Circuits 1 (3-3-4)

Basic laws: Ohm's law, KVL, KCL. Resistive networks. Circuit analysis techniques: nodal and mesh analysis. Network theorems: Thevenin's theorem, Norton's theorem, source transformations, superposition principles, maximum power transfer theorem. Energy storage elements. Phasor technique for steady-state sinusoidal response. Important power concepts of AC circuits. Transient analysis of first-order circuits.

Prerequisite: MATH 102 and PHYS 102

EE 203 - Electronics 1 (3-3-4)

Diodes: models and circuit analysis. Diode applications (rectifiers and clipping circuits). Transistors: Bipolar Junction Transistor (BJT), Junction Field Effect Transistor (JFET) and Metal Oxide Semiconductor Field Effect Transistor (MOSFET). DC and small signal AC analysis. Amplifier configurations. Differential Amplifiers. Digital logic families (TTL, ECL, I^2L, and CMOS circuits).

Prerequisite: EE 200, **EE 201**

EE 204 – Electric & Magnetic Fields (3-3-4)

Review of vector analysis. Coulomb's law and electric field intensity. Electric flux density, Gauss' law and divergence. Electric energy and potential. Conductors, dielectrics, and capacitance. The steady magnetic field. Magnetic energy and forces. Materials and inductance. Time varying fields and

Maxwell's equations. Plane waves propagation, reflection and refraction. Transmission lines.

Prerequisite: PHYS 102, MATH 102

EE 205 – Electric Circuits 2 (3-0-3)
Analysis of three-phase networks. Time domain solutions of second order circuits. State equations for linear circuits. Computer-aided circuit analysis. Frequency domain analysis and Bode plots. Network analysis in the S-domain. Mutual inductance and transformers. Two port networks. **Prerequisite: EE 201, Math 201**

EE 206: Electric Energy Engineering (3-3-4)
Energy sources and electric power generation. Three-phase circuits. Transformers: single-phase and three-phase. Generators - DC and AC. Motors - DC and AC. Synchronous, induction, fractional horse power motors. Electric energy transmission.
Prerequisite: EE 201, EE 204

EE 207 - Signal Analysis (3-0-3)
Fourier series. Fourier transform. Laplace transform. Linear circuits and systems concepts. Impulse response. Convolution. Transfer function. Frequency response. State space representation. Introduction to sampling of analog signals. Introduction to difference equations and z-transform. **Prerequisite: EE 201, Math 201**

EE 303 - Electronics 2 (3-3-4)
Amplifier frequency response. Linear and nonlinear operational amplifier (OP-AMP) applications. Non-ideal characteristics of OP-AMPs. Multistage amplifiers. Active filters. Feedback: Circuit topologies and analysis. Oscillators. **Prerequisite: EE 203**

EE 315 – Probabilistic Methods in Electrical Engineering (3-0-3)
Fundamentals of probability theory. Single and multiple discrete and continuous random variables. Probability density function. Gaussian and other distributions. Functions of random variables. Joint and conditional probabilities. Moments and statistical averages. Central limit theorem. Random processes. Stationarity and ergodicity. Correlation function. Power spectral density. Gaussian and Poisson random processes. Response of linear systems to random signals.
Prerequisite: EE 207

EE 330 - Power Systems Analysis 1 (3-0-3)
Synchronous generator models for power systems analysis. Transmission line models. Power systems representation: one line diagram, impedance (reactance) diagrams. Per unit system. Network calculations. Network matrices. Symmetrical fault studies. Symmetrical components. Unsymmetrical faults.

EE 350 Cooperative Work Progress (0-0-0) (Summer)
A continuous period of 10 weeks spent in the industry working in any of the fields of electrical engineering. During this training period, the student is exposed to the profession of electrical engineering through working in many of its fields. The student is required to submit, and present, a formal written report of his work.
Prerequisite: ENGL 110 and the completion of 90 credit hours including all 300 level EE courses.

EE 351 Cooperative Work (0-0-9)
A continuous period of 18 weeks spent in the industry working in any of the fields of electrical engineering. During this training period, the student is exposed to the profession of electrical engineering through working in many of its fields. The student is required to submit, and present, a formal written report of his work.
Prerequisite: EE 350

EE 370 - Communications Engineering 1 (3-3-4)
Review of signals and linear systems. Amplitude modulation (AM, DSB, SSB, VSB). Angle modulation (FM, PM). Frequency Division Multiplexing (FDM), Sampling, Quantization, PCM, DPCM, DM. Time Division multiplexing (TDM). Line coding and baseband transmission. Bandlimited channels and ISI. Digital carrier modulation (PSK, ASK, FSK, and M-ary). Examples of modern communication systems.
Prerequisite: EE 203, EE207

EE 380 - Control Engineering 1 (3-3-4)
Introduction to feedback control systems. Block diagram and signal flow graph representations. Mathematical modeling of physical systems. Stability of linear control systems. Time-domain and frequency-domain tools and performance assessment. Lead and lag compensator design. Proportional, integral and derivative control.
Prerequisite: EE 207

EE-390 - Digital Systems Engineering (3-3-4)
8088/8086 Microprocessor hardware and software Models. Instruction sets. Assembly language programming and debugging. Memory and input/output mapping. Input and output instructions. Input/output Interfacing. Introduction to interrupts and basic microcontrollers.

EE 411 - Senior Project (1-6-3)
A comprehensive course that integrates various components of the curriculum in a comprehensive engineering design experience. Design of a complete project including establishment of objectives and criteria, formulation of design problem statements, preparation of engineering designs. The design may involve experimentation, realization and/or computer project are essential requirements for completion of the course. Team design projects, where appropriate, are highly encouraged.
Prerequisite: Senior standing (senior level), EE351

EE Electives

EE 400 Telecommunication Networks (3-3-4)
This course gives a survey of the design and implementation of communication networks. The concepts and fundamental design principles will be explained. Topics include transmission media, network topology, routing, switching, network protocols and architectures, internetworking, network performance and broadband access.
Prerequisite: EE 315, EE 370, EE351

EE 417 Communications Engineering 2 (3-0-3)
Noise in telecommunication systems. Representation of white and narrow-band noise. Transmission of noise through linear filters. Performance of continuous wave modulation (full-AM, DSBSC, SSB, and FM) in the presence of additive white Gaussian noise. Digital waveform coding (DM, PCM, DPCM and ADPCM). Digital communication systems. Noise effects and probability of error in digital communication systems. Matched filter. **Prerequisite: EE 315, EE 370, EE351**

EE 418 Introduction to Satellite Communications (3-0-3)
Overview of satellite systems. Orbits and launching methods. Communication satellite subsystems. Modulation schemes and satellite multiple access (FDMA, TDMA, CDMA, and SDMA). Space link analysis. Satellite antennas. Applications of satellites. **Prerequisite: EE 370, EE204, EE351**

EE 430 Information Theory & Coding (3-0-3)
Concept of information and its measurement. Entropy source coding theorem. Huffman codes, LZW, arithmetic codes. Introduction to rate distortion theory. Channel coding theorem, channel capacity. Block codes: detection and correction. Linear codes, cyclic codes, hamming codes, BCH codes, encoding, and decoding algorithms. Introduction to convolutional codes.
Prerequisite: EE 315, EE 370, EE351

EE 434 Industrial Instrumentation (2-3-3)
Instrumentation and control. Signal and data acquisition and processing. Interfacing techniques. Physio-chemical principles of instrumentation. Force, torque, and pressure measurements. Temperature, flow, moisture, and humidity sensors. Digital transducers. Calibration techniques. Errors in measurements. Introduction to actuators. Norms and standardization. Introduction to intelligent instrumentation.

EE 445 - Industrial Electronics (3-3-4)
555 timers. Optoelectronic sensors. Micro switches. Ultrasonic transducers. Thermal sensors. Strain gauges and instrumentation amplifiers. UJT, PUT, multilayer diodes. SCRS and TRIACS. Triggering and power control techniques. Solid state relays. Practical applications. **Prerequisite: EE 303, EE351**

EE 446 – Programmable Logic Controllers (2-3-3)
Basic concepts of microcontrollers. The structure of programmable logic controllers: I/O, relays, counters and timers. Ladder diagram concept. PLC's intermediate and advanced functions, PLC's instruction set and data manipulation. PLC's industrial applications in process control.
Prerequisite: EE 380, EE 390, EE 351

EE 455 Analog Communication Electronics (3-3-4)
Functional blocks of analog communication systems. Design of mixers, converters, RF and IF amplifiers, AM detectors, and FM discriminators. Functional blocks of monochrome TV receivers. Design of video IF amplifiers, video amplifiers, sync. separators, horizontal and vertical oscillators and AFC. Functional blocks of color TV receivers. Color signal representation and processing.
Prerequisite: EE 303, EE 370, EE 351

EE456- Digital Communication Electronics (3-3-4)
Functional blocks of digital communication systems: PAM, PWM, PPM and PCM. Design of S/H circuits, A/D and D/A converters, and timing (clock generator) circuits. Circuit design using PLL, VCO and multipliers. Design of PAM, PPM, PWM and PCM transmitters and detectors. Special circuits for phase shift keying.
Prerequisite: EE 303, EE 370, EE 351

EE 460: Power Electronics (3-3-4)
Various aspects of power electronics and drive technology. Study of diodes, Thyristor, protection circuits, harmonic generation, fundamentals of Static Converters, Firing angle control, Multi cycle Control, AC/DC Drives, Frequency, Speed/Regulation, Control of asynchronous machines and D.C. Motors, Regenerative Braking. 3-phase drives, Torque and Current in star and delta operation. Introduction to Power Electronics & Semiconductor Diodes, Diode Circuit & Rectifiers Diode Circuit & Rectifiers, Thyristors, Controlled Rectifiers, Controlled Rectifiers, Voltage Controllers, Power
Transistors , DC-DC Converters , PWM Inverters, Resonant Pulse Inverters
Prerequisite: EE206, EE 380, EE351

EE 462 Electrical Machines (3-3-4)
Electromechanical energy conversion principles, Synchronous machines: Steady state, Synchronous machines: Transient performance, DC machines: Steady state & Dynamic analysis, Poly-phase induction machines: Steady state, Poly-phase induction machines: Dynamics & control, Fractional horsepower and special type machines. **Prerequisite: EE 330, EE 380, EE 351**

EE 463 Power Systems Analysis 2 (3-0-3)
Power flow analysis, Transient stability analysis, Economic power dispatch, Automatic generation control (AGC), Reactive power control.
Prerequisite: EE 330, EE351

EE 465 Power Transmission & Distribution (3-0-3)
Transient over voltages and insulation coordination, Circuit Breakers*:* Types, Ratings, and selection**.,** Limiting factors for Extra-High and Ultra-High voltage TLs*:* Corona, radio noise, audible noise, and conductor size selection. Design of sub-transmission lines and distribution substations*:* Layout, protection needs. Voltage drop and power loss calculations
Prerequisite: EE 330, EE351

EE 466 Power System Protection (3-0-3)
Protection principles and devices, Protection of single phase and three phase transformers, Protection of rotating machines (motors and generators), Transmission line protection (pilot, non-pilot and distance), Relay coordination, and Circuit interruption. **Prerequisite: EE 330, EE351**

EE 467 Electrical Energy Efficiency (3-0-3)
Overview of the different technologies involved in electro efficiency, outlining monitoring and control concepts and practical design techniques used in residential and industrial applications. Description of the current standards of power transformers and electrical motors, with illustrative case studies showing how to achieve better design. Up-to-date information on standardization, technologies, economic realities and energy efficiency indicators (the main types and international results). Coverage on the quality and efficiency of distribution systems (the impact on distribution systems and loads, and the calculation of power losses in distribution lines, motors and in power transformers). **Prerequisite: EE 330, EE351**
