



Course Description

Legend

Course Title [A – B – C]	Course #:	Prereq.:
A: Theoretical hrs B: Practical hrs C: Credit hrs		
Engineering Mathematics [3 – 0 – 1]	Course #:0904201	Prereq.: 0300102
Vectors and the geometry of space: dot product, cross product. Lines and planes in space. Vector functions: derivatives and integrals. Function of two or more variables: partial derivatives, gradient, divergence, Curl. Lagrange's multipliers. Multiple integral. Double integrals in polar coordinates; triple integrals; triple integrals in cylindrical and spherical coordinates; change of variables in multiple integrals;		
Electrical circuits (1) [3 – 0 – 1]	Course #:0904211	Prereq.: 0300122
Basic Electric Components and Equivalent Circuit. Kerchief's laws (KVL and KCL). Circuit analysis techniques: Nodal analysis, mesh analysis, superposition, source transformations. Thevenin and Norton theorems, maximum power transfer. Unit step response of RL and RC circuit. Steady state sinusoidal circuit analysis using phasor techniques		
Electrical circuits (2) [3 – 0 – 1]	Course #:0904212	Prereq.: 0904211
Ac circuit introduction, frequency response; filters. Time response of reactive power. Admittance. Apparent Power and average power, power factor, complex power. Transformers: kinds, coupling and circuit equivalent analysis. Single and three phase circuit analysis, star and delta connection. Balanced Three-Phase loads circuit. Troubleshooting in DC and AC circuits.		
Electrical circuits lab [0 – 3 – 1]	Course #:0904213	Prereq.: 0904212*
DC circuits: Ohm's law; KVL and KCL; network theorems; transient analysis of RL; RC; and RLC circuits; impedance concept and techniques; power and P.F; series and parallel resonance; three phase circuits; Transformers; magnetically coupled circuits; filters; troubleshooting.		
Electronics (1) [3 – 0 – 1]	Course #:0904221	Prereq.: 0904211
Semiconductor materials; intrinsic, N-type and P-type semiconductors; carriers, conductivity and Driftcurrent; diffusion current, PN junction; depletion region, Diode: Forward and reverse biasing. Diode circuits analysis. Basic diode applications, bipolar junction transistor (BJT): theory, dc biasing and basic amplifier, FET & MOSFET transistors (DC & small signal analysis).		
Digital fundamentals [3 – 0 – 1]	Course #:0904234	Prereq.: ---
Logic levels and pulse waveforms; number systems and their conversion; types of logic gates; Boolean algebra; combinational logic; types of sequential elements and their applications; memories: types and classifications.		
Digital fundamentals lab [0 – 3 – 1]	Course #:0904235	Prereq.: 0904234
Gates; sequential and combinational logic circuits; applications of logic circuits; troubleshooting of logic circuits; projects.		



Electromagnetics (1) [3 – 0 – 1]	Course #:0904245	Prereq.: 0300122+0904201
Vectors. Coordinate systems and transformation. Electrostatics: Coulomb's law, Gauss's law, electric potential, electric dipoles, resistance, capacitance, boundary condition. Magnetostatics: Biot-Savart law, Ampere's law, Magnetic forces. Magnetic boundary conditions. Time varying fields: Faraday's Law, Maxwell's equations.		
Signals and systems [3 – 0 – 1]	Course #:0904300	Prereq.: 0905201+0904211+0904200
Classification of signals and systems. Linear Time-Invariant (LTI) systems: convolution and impulse response, Fourier series, Fourier transform and Energy and power spectral densities Laplace transform. Transfer function. Discrete time systems: convolution and impulse response. Introduction to the Z-transform.		
Probability and random variables [3 – 0 – 1]	Course #:0904303	Prereq.: 0904300
Probability principles and set theory. One and Multiple random variables. Probability density function. Special probability density functions, cumulative distribution function Joint distribution functions. Conditional distributions. Moments. Random process. Stationary and ergodicity. Spectral analysis of random signals. Response of linear systems to random signals.		
Numerical analysis [3 – 0 – 1]	Course #:0904304	Prereq.: 0905201
Error analysis. Solution of equations in one variable. Numerical solution of a set of linear and nonlinear equations. Curve fitting and interpolation. Numerical integration and differentiation. Numerical solution of ordinary differential equations.		
Electrical engineering software (1) [3 – 0 – 1]	Course #:0904305	Prereq.: 1501110+ 0904212
The MATLAB environment, Predefined MATLAB functions, Solutions to systems of linear equations, Symbolic mathematics, User defined MATLAB functions, Special topics in electrical engineering (signal processing, controls, electric circuits), Graphical user interface (GUI) building in MATLAB.		
Electronics (2) [3 – 0 – 1]	Course #:0904328	Prereq.: 0904221
Amplifier configurations and characteristics Modeling of transistor circuits. Frequency analysis of BJT and FET amplifiers. Single & Multistage amplifiers. Frequency response of single-and-multi-stage amplifiers. Differential amplifier. Theory of Op-Amps. Applications of Op-Amps. Power amplifiers.		
Electronics lab [0 – 3 – 1]	Course #:0904329	Prereq.: 0904213+0904328*
Diode characteristics; half-wave & full-wave rectification; clipping and clamping; Zener diode and voltage regulation, BJT characteristic; BJT AC Amplifier, Darlington pair transistor & Current mirror circuit, Field Effect Transistor Characteristics.		
Microprocessors and assembly language [3 – 0 – 1]	Course #:0904330	Prereq.: 0904234
Introduction to microprocessors and microcomputers, Software architecture of the 8088 and 8086 microprocessors, 8088/8086 instruction set, machine codes, and addressing modes, The Debug, a software development program for the PC, 8088/8086 microprocessor programming 1: (Data transfer instructions, Arithmetic instruction, Logic instruction, Shift instruction, Rotate instruction), 8088/8086 microprocessor programming 2: (Flag control instructions, Compare instruction, Jump instruction, Subroutines and subroutines handling instruction, Loop and loop handling instruction, Strings and string handling instructions), Assembly language programming development with MASM		



Microprocessors and assembly language lab [0 – 3 – 1]	Course #:0904331	Prereq.: 0904330*
Introduction to MTS-86C Microprocessor Training System, Keypad Operations, Assembling, Downloading, and Debugging, 8086 Registers and Instructions, Software and Hardware Interrupts, 8255- Parallel Port Control, 74LS373- Latch Control, 8253- Timer Control, 8259- Programmable Interrupt Control, DAC0808- Digital to Analog Conversion, ADC0809- Analog to Digital Conversion, 8279- Keypad and LCD Control, 8251- Serial Port Control.		
Electromagnetics (2) [3 – 0 – 1]	Course #:0904345	Prereq.: 0904245
Review of Maxwell's equations. Plane wave propagation in lossy, free space, good conductors and lossless media. Reflection, refraction, and scattering. Pointing vector. Wave polarization. Transmission line (TL) equations and parameters: input impedance, SWR and power. Applications of TL charts. Matching in TL. Impedance measurement at high frequencies. Waveguides: TM, TE modes, and mode excitations. Introduction to antennas. Introduction to numerical techniques for radiation and scattering.		
Electrical machines (1) [3 – 0 – 1]	Course #:0904361	Prereq.: 0904245+0904212
Magnetic circuits; principles of electromechanical conversion, induced forces and voltages, single-phase transformers: types; construction; ideal and practical transformers; equivalent circuit; testing; voltage regulation and efficiency; three-phase transformers: construction and vector groups; direct current machines: construction and classification; elementary DC machine; excitation; torques and power relations; armature reaction and commutation; DC generators: DC motors: performance characteristics; starting; speed control and applications. Introduction to PM machines and BLDC machines		
Electrical machines lab (1) [0 – 3 – 1]	Course #:0904365	Prereq.: 0904361
Magnetic circuit tests. PM flux density tests and repulsive force tests. Single phase transformer tests. Three phase transformer tests. DC motor tests: series, compound, shunt. Speed control of DC motor. DC generator tests: series, compound, shunt.		
Measurements and instrumentation [3 – 0 – 1]	Course #:0904374	Prereq.: 0904328+0904204
Basic concepts, general measurement system, analysis of experimental data, units and error analysis, statistical analysis, Electromechanical indicating instruments, DC/AC meter construction; loading effect; insertion loss, Bridges measurements. A/D converter and D/A converter digital instruments, Oscilloscope, CRT spectrum analyzer and calibration, Transducers and sensors as input Elements to Instrumentation system: photo-electric transducers, photoconductive cell, photodiodes, and photovoltaic cell. Capacitive and inductive transducers. Transducers and sensors: passive and self generating transducers.		
Measurements and instrumentation Lab [0 – 3 – 1]	Course #:0904375	Prereq.: 0904374*
Error and accuracy; AVO meters; bridges; potentiometers; calibration; transducers characteristics and applications; Temperature sensors; Proximity Switches.		
Electrical engineering software (2) [3 – 0 – 1]	Course #:0904403	Prereq.: 0904305+0904461
Simulink, SimPower Systems, ,Simulation of differential equations, Simulation of power transformers, Simulation of Single phase Induction Motor, Simulation of three phase Induction Motor, Simulation and odeling of DC Motors, Simulation of electric drives.		
Digital electronics [3 – 0 – 1]	Course #:0904420	Prereq.: 0904328
Properties and definitions of Digital ICs, RTL, DTL, TTL gates, basic Emitter-Coupled Logic (ECL), MOS Digital Circuits, NMOS Inverter, CMOS, BiCMOS, interfacing Logic Families, Semiconductor		



memories (RAM/ROM).		
Power electronics [3 – 0 – 1]	Course #:0904428	Prereq.: 0904328+0904204
Introduction to PE, applications of PE, classification of Power conditioners; Power semiconductor devices: classification; V-I and switching characteristics; basic drive circuits and applications; line commutated converters; single-phase rectifiers: half-wave and full-wave rectifiers with freewheeling diodes; 3-phase half-wave and full-wave rectifiers; single-phase and 3-phase controlled and uncontrolled rectifiers; performance of rectifiers circuits; introduction to AC/AC controllers; phase voltage controller; cycloconverters; basics of DC-to-DC converters (choppers). Basics of DC-to-AC converters (inverters)		
Power electronics lab [0 – 3 – 1]	Course #:0904429	Prereq.: 0904428
Power semiconductor devices: power transistors: (BJT; MOSFET; IGBT); thyristors; characteristics of drive circuits. Converters (rectifiers; choppers; AC controllers) and inverters.		
Communications (1) [3 – 0 – 1]	Course #:0904456	Prereq.: 0904300
Review of Fourier transform and filters. Amplitude modulation (AM, DSB, SSB, VSB). Angle modulation (FM, PM). Sampling, Quantization, PCM, DPCM, DM. Multiplexing. Line coding. Baseband channel and ISI. Digital modulation (PSK, ASK, FSK, and M-ary). Power spectra of digital signals. Synchronization.		
Electrical machines (2) [3 – 0 – 1]	Course #:0904461	Prereq.: 0904361
Rotating magnetic field; MMF and flux distribution; synchronous generators: classification; construction; equivalent circuit; power and torque relationships; parallel operation; performance and characteristics; synchronous motors: principles; power flow and efficiency; starting; power factor correction and V-curve; 3-phase induction motors: types; construction and basic concepts; equivalent circuit; power and torque relations; power flow and performance characteristics; starting; speed control; single-phase induction motors: Construction; classification; starting; equivalent circuit; and performance characteristics; Introduction to universal motors, reluctance motors, stepper motors.		
Electrical power system analysis [3 – 0 – 1]	Course #:0904462	Prereq.: 0904361+0904362
Power system components and single line diagram. Phasors, analysis of three phase balanced power systems, power factor correction. per-unit system; transmission lines: short; medium and long; equivalent circuits and RLC parameters; cables; sequence networks of synchronous machines and power transformers; load flow; symmetrical components; symmetrical and asymmetrical fault analysis		
Electrical power system lab [0 – 3 – 1]	Course #:0904463	Prereq.: 0904462
Equivalent circuits of transmission lines; voltage regulation; reactive power compensation; line losses; various types of loads. Power system simulators; equivalent circuits of power system components; control of real and reactive power; steady state and transient state in power system. Practical relay protection of generators transformers and transmission lines.		
Electrical machines lab (2) [0 – 3 – 1]	Course #:0904465	Prereq.: 0904365+0904461
Single Phase & three phase watt meters measurements (Blondel theory), Testing of Single phase induction Motor, Testing of three-phase induction motors, Testing of three-phase synchronous motors, star-Delta Motor connections, Speed control of three phase Induction Motor.		



Control theory [3 – 0 – 1]	Course #:0904470	Prereq.: 0904300
Open and closed-loop (feedback) systems; examples of feedback control systems; review of complex variables; Laplace transform and transfer functions of basic elements; modeling of: electrical; mechanical; hydraulic and pneumatic systems; linearization of nonlinear systems; systems block diagram and signal flow graphs; transfer function; block diagram reduction techniques; Mason's gain formula; sensitivity of open and closed loop control systems; time response analysis and performance indices of first and second order systems; dominant poles of high order systems. Routh-hurwitz stability criterion; steady-state error coefficients; design and effects of basic control actions: proportional; integral and derivative; Bode diagrams and Nyquist stability criterion; gain and phase margins		
Control lab [0 – 3 – 1]	Course #:0904471	Prereq.: 0904470*.
Open and closed loop process control systems and servomechanisms. The effect of gain; integral and derivative feedback on control systems. PLC programming through practical activities related to power system. Data acquisition using NI myRIO.		
Programmable Logic Control (PLC) lab [0 – 3 – 1]	Course #:0904474	Prereq.: 0904470*
Ladder diagram , programming PLC using statements list ,PLC programming for practical applications and industrial automation using timers , counters , mathematical and logic functions, and data operations such as move , rotate , INC , DEC and others. Practices include Sequential processes , motor control stations , traffic control schemes and other similar activities		
Communications (2) [3 – 0 – 1]	Course #:0904478	Prereq.: 0904456+0904303
Representation of white and narrow-band noise. Behavior of continuous wave modulation (AM, DSBSC, SSB, and FM) in the presence of additive white Gaussian noise. Quantization noise. Noise analysis in PCM and DM systems. Matched filter receiver. Error probability analysis for baseband digital transmission. Behavior of digital communication systems in the presence of noise: ASK, PSK, DPSK, FSK and QAM. Signal space representation. BER for M-ary digital signals Introduction to Information Theory. Introduction to Error control coding.		
Communications lab [0 – 3 – 1]	Course #:0904479	Prereq.: 0904478*
Filters. AM and FM modulation and demodulation. Amplitude Modulators. Super heterodyne receiver		
Microcontrollers [3 – 0 – 1]	Course #:0904537	Prereq.: 0904330+0904538*
Basic architectures of a microcontroller, and the Arduino. The C- language of The PIC microcontroller and the Arduino (structured commands programming, Timer programming). PIC18 and Arduino serial port programming, Interrupt programming, LCD and Keyboard interfacing. ADC, DAC and sensor interfacing.Term project.		
Microcontrollers lab [0 – 3 – 1]	Course #:0904538	Prereq.: 0904537*
Programming PIC microcontroller and Arduino using C-language, PIC & Arduino Timer programming, PIC and Arduino I/O Port Programming, Serial and Parallel port programming, Application on Interrupt programming, LCD and Keyboard interfacing and programming, ADC, DAC and sensor Interfacing and programming. Applications on motor drive controllers and switched mode power supplies.		
Communications systems [3 – 0 – 1]	Course #:0904556	Prereq.: 0904478
Transmission Media. Propagation of RF Waves: ground wave, skywave, troposphere propagation, multipath channel, microwave Links. Noise in Communication Systems. Multiplexing Techniques. Wireless technology: Bluetooth, ZigBee, WiMax, WiFi, Infrared wireless and near-field communications. Satellite Communications and multiple-access techniques. Mobile phone generation technologies.		



Project (1)	Course #:0904571	Prereq.: 0904444
Project (2)	Course #:0904572	Prereq.: 0904571
Electrical installation [3 – 0 – 1]	Course #:0904468	Prereq.: 0904361
Electrical system design for residential; commercial and industrial plants: lighting and power distribution; Design circuit breakers motor branch feeders and controllers; switchboards; unit substation; earthing; light; photometry; electrical lighting systems , light sources; electrical lamps; load estimation methods; testing and maintenance; codes symbols and standards. Project design.		
Power system distribution and transmission [3 – 0 – 1]	Course #:0904563	Prereq.: 0904462
Basic principles; distribution systems layout; distribution transformers: types; connections; harmonics; transmission line and insulators; Towers, distribution equipment: circuit breakers and lightning protection; distribution station and substations units; voltage drop over distribution feeders, voltage regulation, faults and testing		
Electrical drive [3 – 0 – 1]	Course #:0904565	Prereq.: 0904461
Elements of electric drive systems; the mechanical system torque equation and steady-state stability; classification of load torques; braking; gear and belt drive; classification of motors and converters; selection of converters and motors ratings and types. DC motor drive using controlled rectifiers; DC motor drive using choppers; induction motor drives: soft starters; control strategies; analysis and characteristics; synchronous motor drives: control strategies; analysis and characteristics		
Power system protection [3 – 0 – 1]	Course #:0904566	Prereq.: 0904462
Principles; elements and requirement; Voltage & Current transformers; electromechanical; static and numerical relays; over current and earth fault protection; differential and distance protection; protection of power system elements: Generator; transformer; bus-bars; lines and motors; testing and maintenance of protection components.		
High voltage engineering [3 – 0 – 1]	Course #:0904567	Prereq.: 0904462
H.V generation for testing purposes; H.V. measurements; break down in gasses; cathode processes and secondary effects; streamers and Kanal mechanism; Paschen's law; partial discharges and corona; break down in solid insulation; over voltages caused by dart leaders: strokes to towers and to earth wires; attraction of lightning flashes to lines; shield angle; over-voltage limitations; surge deviators; arrestors and arcing horn; external insulation; Insulators function and types; clearance; creepage distance and contamination, insulation coordination , troubleshooting in high voltage engineering..		
Special topics In power engineering [3 – 0 – 1]	Course #:0904568	Prereq.: 0904462
Selected topics in electrical power engineering taught by faculty members.		
Power plants [3 – 0 – 1]	Course #:0904569	Prereq.: 0904462
Introduction to power generation systems; steam power plants; boilers, steam generators and turbines; diesel power plant; gas turbine power plant; nuclear power plants; hydro-electric power plant; electrical generation systems: generators, excitation system, power plant economics, unit commitment, economic dispatch		
Railways technology for Electrical Engineering [3 – 0 – 1]	Course #:0904560	Prereq.: 0904556 + 0904462
Introduction to railways technology, principles of electrification, traction, signaling, telecommunication and control.		



Communications electronics [3 – 0 – 1]	Course #:0904524	Prereq.: 0904456+0904328
Mixers. Oscillators, voltage-controlled oscillators; Phase-locked loops (PLL) and their applications in communication systems. Frequency synthesizers. AM and FM modulator and demodulator circuits. RF/IF amplifiers. Power amplifiers.		
Antennas and wave propagation [3 – 0 – 1]	Course #:0904546	Prereq.: 0904345
Introduction to antennas: Principles of radiation, antenna parameters. Wire antenna including monopole, dipole and loop antennas. Antenna array analysis by array factors. Aperture antenna including rectangular and conical horn. Reflector antenna. Microstrip antennas. Introduction to smart antennas. Antenna design using computer software.		
Microwave engineering [3 – 0 – 1]	Course #:0904549	Prereq.: 0904345
Review of Maxwell's equations. General concept of transmission lines (TLs) for microwave frequencies. Waveguides and resonant cavities. Scattering Parameters. Microwave passive devices: filters, microstrip, planer microwave elements (directional copular, circulators). Microwave oscillators, detectors, transistor amplifiers, and microwave mixers.		
Special topics in communications engineering [3 – 0 – 1]	Course #:0904551	Prereq.: 0904478
Selected Topics in communications engineering taught by Faculty members		
Mobile communications [3 – 0 – 1]	Course #:0904552	Prereq.: 0904478
Cellular system design concepts: Channel planning, Link control, Handoff, Traffic Capacity, Power control. Propagation modeling. Diversity and Fading. Modulation Techniques. Link budget analysis. Multiple Access Techniques: FDMA, TDMA, CDMA. Examples of current wireless systems standards		
Optical communications [3 – 0 – 1]	Course #:0904557	Prereq.: 0904478
Light propagation. Theory of dielectric optical waveguides: Step and graded index optical fibers. Multimode and single mode optical fibers. Waveguide propagation attenuation and dispersion. Coherent (LASER) and incoherent (LED) optical sources and modulation techniques. Optical detectors: photodiodes and receiver circuits. Sources of Noise. Simple optical fiber Link Design. Optical transmission technologies (SONET, and Ethernet.		
Information theory and coding [3 – 0 – 1]	Course #:0904558	Prereq.: 0904478
Information concept: Entropy and source Coding. Lossless data compression. Channel capacity theorem and bandwidth-efficiency diagram, Gaussian channel, capacity of band-limited channels. Error control coding: Block codes, Syndrome decoding, and Viterbi decoding, Cyclic Codes; Convolutional Codes. Turbo codes.		
Digital signal processing and filters [3 – 0 – 1]	Course #:0904559	Prereq.: 0904300
Discrete Time signals and systems. The Z-Transform. Modeling and implementation of discrete time system. Discrete and Fast Fourier transform (FFT). FIR, IIR, Recursive and non Recursive Filters. spectrum analysis using the DFT. Design Techniques for digital Filters, software-based applications.		