Level-3 Term-I (Common to all)

Sl. No	Course Number	Course Name	Contact Hours per Week	Credit Hour
1	EEE 305	Power System I	3.0	3.0
2	EEE 306	Power System I Laboratory	3.0	1.5
3	EEE 307	Electrical Properties of Materials	3.0	3.0
4	EEE 309	Communication Systems I	3.0	3.0
5	EEE 310	Communication Systems I Laboratory	3.0	1.5
6	EEE 311	Digital Signal Processing I	3.0	3.0
7	EEE 312	Digital Signal Processing I Laboratory	3.0	1.5
8	HUM 279	Financial and Managerial Accounting	3.0	3.0
		Total	**24.0**	**19.5**

EEE 303 Digital Electronics

3 Credit Hours, 3 Contact Hours per Week

Introduction to number systems and codes. Analysis and synthesis of digital logic circuits: Basic logic functions, Boolean algebra, combinational logic design, minimization of combinational logic. MOSFET Digital circuits: NMOS inverter, CMOS inverter, CMOS logic circuits, Clocked CMOS logic circuits, transmission gates, sequential logic circuits,

Memories: classification and architecture, RAM memory cells, Read only memory, data converters, BJT digital circuits: ECL, TTL, STTL, BiCMOS, Design application A static ECL gate.

Modular combinational circuit design: pass transistor, pass gates, multiplexer, demultiplexer and their implementation in CMOS, decoder, encoder, comparators, binary arithmetic elements and ALU design.

Sequential circuits: different types of latches, flip-flops and their design using ASM approach, timing analysis and power optimization of sequential circuits. Modular sequential logic circuit design: shift registers, counters and their applications. State Machine Design.

Asynchronous and synchronous sequential circuits.

EEE 304 Digital Electronics Laboratory

1.5 Credit Hours, 3 Contact Hours per Week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 303. In the second part, students will design simple systems using the principles learned in EEE 303.

EEE 305 Power System I

3 Credit Hours, 3 Contact Hours per Week

Network representation: Single line and reactance diagram of power system and per unit system. Line representation: equivalent circuit of short, medium and long lines, reactive compensation of lines, introduction to DC transmission.

Load flow: Gauss- Siedel and Newton Raphson methods. Power flow control.

Synchronous machines: transient and subtransient reactance and short circuit currents. Symmetrical fault calculation methods. Symmetrical components: power, unsymmetrical series impedances and sequence networks. Different types of unsymmetrical faults: solid faults and faults through impedance.

Protection: fault level calculation, selection of circuit breakers, introduction to relays and circuit breakers. Typical layout of a substation.

Power plants: types, general layout of a thermal power plant and major components of gas turbine, steam turbine and combined cycle power plants.

EEE 306 Power System I Laboratory

1.5 Credit Hours, 3 Contact Hours per Week

This course consists of two parts. In the first part, students will perform experiments and do simulations to verify practically the theories and concepts learned in EEE 305. In the second part, students will design simple systems using the principles learned in EEE 305.

EEE 307 Electrical Properties of Materials

3 Credit Hours, 3 Contact Hours per Week

Crystal structures: Types of crystals, lattice and basis, Bravais lattice and Miller indices. Classical theory of electrical and thermal conduction: Scattering, mobility and resistivity, temperature dependence of metal resistivity, Mathiessen's rule, Hall effect and thermal conductivity. Introduction to quantum mechanics: Wave nature of electrons, Schrodinger's equation, one-dimensional quantum problems- infinite quantum well, potential step and potential barrier; Heisenbergs's uncertainty principle and quantum box, Electron in a 3D box. Hydrogen Atom.

Band theory of solids: Band theory from molecular orbital, Bloch theorem, Kronig-Penny model, Brillouin zone, effective mass, density-of-states. Carrier statistics: Maxwell-Boltzmann and Fermi-Dirac distributions, Fermi energy. Modern theory of metals: Determination of Fermi

energy and average energy of electrons, classical and quantum mechanical calculation of specific heat.

Dielectric properties of materials: Dielectric constant, polarization- electronic, ionic, orientational and interfacial; internal field, Clausius-Mosotti equation, spontaneous polarization, frequency dependence of dielectric constant, dielectric loss, piezoelectricity, ferroelectricity, pyroelectricity.

Magnetic properties of materials: Magnetic moment, magnetization and relative permitivity, different types of magnetic materials, origin of ferromagnetism and magnetic domains.

Introduction to superconductivity: Zero resistance and Meissner effect, Type I and Type II superconductors and critical current density. BCS theory. Magnetic recording materials, Josephson theory.

Introduction to meta-materials.

EEE 309 Communication Systems I

3 Credit Hours, 3 Contact Hours per Week

Overview of communication systems: Basic principles, fundamental elements, system limitations, message source, bandwidth requirements, transmission media types, bandwidth and transmission capacity.

Noise: Sources of noise, characteristics of various types of noise and signal to noise ratio.

Communication systems: Analog and digital. Continuous wave modulation: Transmission types-base-band transmission, carrier transmission; amplitude modulation- introduction, double side band, single side band, vestigial side band, quadrature; spectral analysis of each type, envelope and synchronous detection; angle modulation- instantaneous frequency, frequency modulation (FM) and phase modulation (PM), spectral analysis, demodulation of FM and PM. Sampling-sampling theorem, Nyquist criterion, aliasing, instantaneous and natural sampling, flat-topped sampling; pulse amplitude modulation- principle, bandwidth requirements; pulse code modulation (PCM)- quantization principle, quantization noise, non-uniform quantization, signal to quantization error ratio, differential PCM, demodulation of PCM; delta modulation (DM)-principle, adaptive DM; line coding- formats and bandwidths.

Digital modulation and demodulation: Amplitude-shift keying- principle, ON-OFF keying, bandwidth requirements, detection, noise performance; phase-shift keying (PSK)- principle, bandwidth requirements, detection, differential PSK, quadrature PSK, noise performance; frequency-shift keying (FSK)- principle, continuous and discontinuous phase FSK, minimum-shift keying, bandwidth requirements, detection of FSK, Multilevel signalling

Multiplexing: Time-division multiplexing (TDM)- principle, receiver synchronization, frame synchronization, TDM of multiple bit rate systems; frequency-division multiplexing (FDM)- principle, de-multiplexing. PDH, SONET/SDH.

Multiple-access techniques: Time-division multiple-access (TDMA), frequency-division multiple access (FDMA); code-division multiple-access (CDMA) - spread spectrum multiplexing, coding techniques and constraints of CDMA.

EEE 310 Communication Systems I Laboratory

1.5 Credit Hours, 3 Contact Hours per Week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 309. In the second part, students will design simple systems using the principles learned in EEE 309.

EEE 311 Digital Signal Processing I

3 Credit Hours, 3 Contact Hours per Week

Introduction to digital signal processing. Sampling, quantization and signal reconstruction. Analysis of discrete-time system in the time domain: impulse response model, difference equation model. Correlation: power signal, energy signal, applications. Z-transform and analysis of LTI systems. Frequency analysis of discrete-time signals: discrete Fourier series and discrete-time Fourier transform (DTFT). Frequency analysis of LTI systems. Discrete Fourier transform (DFT) and fast Fourier transform (FFT). Minimum phase, maximum phase and all pass systems. Calculation of spectrum of discrete-time signals. Digital filter design- linear phase filters, specifications, design using window, optimal methods; IIR filters- specifications, design using impulse invariant, bi-linear z- transformation, least-square methods.

EEE 312 Digital Signal Processing I Laboratory

1.5 Credit Hours, 3 Contact Hours per Week

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 311. In the second part, students will design simple systems using the principles learned in EEE 311.

HUM 279 Financial and Managerial Accounting

3 Credit Hours, 3 Contact Hours per Week

Financial Accounting: Objectives and importance of accounting, branches of accounting, accounting as an information system, computerized system and applications in accounting. Recording System: Double entry mechanism, accounts and their classification, accounting equation, accounting cycle journal, ledger, trial balance. Preparation of financial statements

considering adjusting and closing entries. Accounting concepts and conventions. Financial statements analysis and interpretation: ration analysis- tests for profitability, liquidity, solvency and overall measure.

Costs and Management Accounting: Cost concept and classification. Segregation and mixed cost. Overhead cost: meaning and classification, allocation of overhead cost, overhead recovery method. Job order costing: preparation of job cost sheet and quotation price. Inventory valuation: absorption costing and variable costing technique. Cost volume profit analysis: meaning, breakeven analysis, contribution margin approach, sensitivity analysis. Short-term investment decisions: Relevant and differential cost analysis; Linear programming. Long-term investment decisions: Capital budgeting, various techniques of evaluation of capital investment, investment appraisal under uncertainty, risk management, capital rationing. Concept of working capital, need for working capital, management of cash, stock debtors.