

## Level-3 Term-II (Common to all)

Sl. No	Course Number	Course Name	Contact Hours per Week	Credit Hour
1	EEE 303	Digital Electronics	3.0	3.0
2	EEE 304	Digital Electronics Laboratory	3.0	1.5
3	EEE 313	Solid State Devices	3.0	3.0
4	EEE 315	Power Electronics	3.0	3.0
5	EEE 316	Power Electronics Laboratory	3.0	1.5
6	EEE 317	Control Systems I	3.0	3.0
7	EEE 318	Control Systems I Laboratory	3.0	1.5
8	IPE 493	Industrial Management	3.0	3.0
		<b>Total</b>	<b>24.0</b>	<b>19.5</b>

### EEE 313 Solid State Devices

3 Credit Hours, 3 Contact Hours per Week

Semiconductors in equilibrium: Energy bands, intrinsic and extrinsic semiconductors, Fermi levels, electron and hole concentrations, temperature dependence of carrier concentrations and invariance of Fermi level.

Carrier transport processes and excess carriers: Drift and diffusion, generation and recombination of excess carriers, built-in-field, recombination-generation SRH formula, surface recombination, Einstein relations, continuity and diffusion equations for holes and electrons and quasi-Fermi level.

PN junction: Basic structure, equilibrium conditions, contact potential, equilibrium Fermi level, space charge, non-equilibrium condition, forward and reverse bias, carrier injection, minority and majority carrier currents, transient and AC conditions, time variation of stored charge, reverse recovery transient and capacitance.

Bipolar Junction Transistor: Basic principle of pnp and npn transistors, emitter efficiency, base transport factor and current gain, diffusion equation in the base, terminal currents, coupled-diode model and charge control analysis, Ebers-Moll model and circuit synthesis. BJT non-ideal effects; Hetero-junction transistors.

Metal-semiconductor junction: Energy band diagram of metal semiconductor junctions, rectifying and ohmic contacts.

MOS structure: MOS capacitor, energy band diagrams and flat band voltage, threshold voltage and control of threshold voltage, static C-V characteristics, qualitative theory of MOSFET

operation, body effect and current-voltage relationship of a MOSFET. Non-ideal characteristics of MOSFET: channel-length modulation and short-channel effects in MOSFETs. MOS scaling.

Introduction to Multigate FET architecture: Double gate MOSFET, FinFET, Surrounding gate FET, high-K dielectric FETs.

## **EEE 315 Power Electronics**

3 Credit Hours, 3 Contact Hours per Week

Fundamental of power electronics, characteristics of static power semiconductor devices (BJT, MOSFET, IGBT, Thyristors). AC/DC power converters: uncontrolled rectifiers (single phase and three phase), controlled rectifiers (single phase and three phase), dual converter. AC/AC power converters: phase controlled converters (single phase and three phase), AC switch, cycloconverter. DC/DC converters: choppers (step down and step up), switching regulators (buck, boost, buck-boost). DC/AC converters: types, single phase and three phase inverters. Various applications of converters.

## **EEE 316 Power 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 315. In the second part, students will design simple systems using the principles learned in EEE 315.

## **EEE 317 Control System I**

3 Credit Hours, 3 Contact Hours per Week

Review of Laplace transform, Initial and Final value theorems, Transfer Functions: Open-loop stability, Poles, Zeros, Time response, Transients, Steady-state, Block diagrams and signal flow diagram, Feedback principles: Open versus Closed-loop control, High gain control, Inversion; State variables: Signal flow diagram to state variables, transfer function to state variable and state variable to transfer function, Stability of closed-loop systems: Routh's method, Root locus, PID control: Structure, Design using root locus, Pole assignment: Sylvester's theorem, PI and PID synthesis using pole assignment, Frequency Response: Nyquist plot, Bode diagram, Nyquist stability theorem, Stability margins, Closed-loop sensitivity functions, Model errors, Robust stability, Controller design using frequency response: Proportional control, Lead-lag control, PID control, Digital control systems: introduction, sampled data systems, stability analysis in Z-domain.

## **EEE 318 Control 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 to verify practically the theories and concepts learned in EEE 317. In the second part, students will design simple systems using the principles learned in EEE 317.

## **IPE 493 Industrial Management**

3 Credit Hours, 3 Contact Hours per Week

Management Functions and Organization: Evolution, management function: organization, theory and structure, span of control, authority delegation, manpower planning.

Personal Management: Importance, need hierarchy, motivation, leadership, wage incentives, performance appraisal, participative management.

Operation Management: Production planning and control (PPC) functions, quantitative methods applied in production, quality management, location and layout planning safety and loss management.

Cost and Financial Management: Elements of cost products, cost analysis, investment analysis, benefit cost analysis, risk analysis.

Management Accounting: Cost planning and control, budget and budgetary control.

Marketing Management: Concepts, strategy, sales promotion, patent laws.

Technology Management: Management of innovation and changes, technology life cycle.

Case studies.