

TABLE 00:

Sl. No.	Sub. Code	Subject	L-T-P	Credit
1	<u>MA 202</u>	<u>Mathematics – IV</u>	3-1-0	4
2	<u>EE 202(8)</u>	<u>Electrical Engineering</u>	3-1-0	4
3	<u>EC 202</u>	<u>Digital Electronics</u>	3-0-0	3
4	<u>EC 204</u>	<u>Semiconductor Devices</u>	3-0-0	3
5	<u>CR 339</u>	<u>Ceramics in Electronics Applications</u>	3-0-0	3
6	EE 270	Basic Electrical Engineering Laboratory	0-0-3	2
7	EC 274	Analog Electronics Laboratory	0-0-3	2
8	EC 276	Digital Electronics Laboratory	0-0-3	2
9	HS 270	Language Laboratory	0-0-3	2

**MA 202: COMPLEX ANALYSIS AND PARTIAL DIFFERENTIAL EQUATIONS****4 credits [3-1-0]**

(a) Complex Analysis: Derivative. Analytic function, Cauchy Riemann equations, Laplace's equation, Geometry of analytic functions, Exponential function, Trigonometric functions, Hyperbolic functions, Logarithm, General power, Conformal mapping, Linear fractional transformations. Complex integration, Line integral in the complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivative of Analytic functions, Power series, Taylor series, Sequences, Series, Convergence tests, Functions Given by power series, Taylor series and Maclaurin series, Uniform convergence. Laurent series, Residue integration, Laurent series, Singularities and zeros infinity, Residue integration methods, Evaluation of real integrals. (b) Partial Differential Equations: Basic concepts, Modeling of vibrating string, Wave equation, Separation of variable, Use of Fourier series, D'Alembert's solution of the wave equation, Heat equation, Solution by Fourier Series, Solution by Fourier integral and transforms, Modeling: Membrane, Two-dimensional wave equation, Rectangular membrane. Use of double Fourier series, Laplacian in polar coordinates, Circular membrane, Use of Fourier-Bessel series, Laplace's equation in cylindrical and spherical coordinates, Potential, Solution by Laplace transforms.

Essential Reading:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd. 2007 Chapters: 11, 12 (12.3 – 12.9), 13, 14, 15.

**EE 208: ADVANCED ELECTRICAL ENGINEERING****3 credits [3-0-0]**

Transformer: Three phase transformer connections, Testing, Phase conversion, Autotransformer and Induction Regulator. D.C Machines: Construction, Basic EMF and torque equations, classification. Voltage builds up in D.C generators, performance characteristics; D.C motors torque /speed characteristics, speed control and braking, Testing and efficiency. Induction machines: Constructional features and rotating magnetic field. Circuit model and phasor diagram. Torque-slip characteristics pull-out torque, Operating performances, Circle diagram, Testing, starting and speed control and Braking. Single phase induction motors – classification, Universal motors, Utility. Synchronous machines: Constructional features, synchronous generators and motors, equivalent circuit and phasor diagram, power and torque characteristics, hunting, starting of synchronous motors; Salient pole synchronous machine - phasor diagram and determination of synchronous reactance, Voltage regulation of alternators, parallel operations, Utility.

**Essential Reading:**

1. A.E. Fitzgerald, C.M. Kingsley (Jr) and Umans, Electric Machinery, Tata McGraw Hill, 2003.

**Supplementary Reading:**

1. I. L. Kosow, Electric Machinery & Transformers, PHI, 2001.

**EC 202: DIGITAL ELECTRONICS**

**3 credits [3-0-0]**

Prerequisites: EC 100: Basic Electronics

Design Concepts: Digital Hardware, Design Process, Hardware, Logic Circuit Design, Theory and Practice; Introduction To Logic Circuits: Variables and Functions, Inversion, Truth Tables, Logic Gates and Networks, Boolean Algebra, Synthesis using AND, OR AND NOT Gates, Design Examples, Introduction to Cad Tools, Introduction to VHDL.; Implementation Technology: Transistor Switches, NMOS Logic Gates, CMOS Logic Gates, Negative Logic System, Standard Chips, Programmable Logic Devices, Custom Chips, Standard Cells and Gate Arrays Practical Aspects, Transmission Gates, Implementation details for FPGAs.; Optimized Implementation of Logic Functions: Karnaugh Map, Strategy for Minimization, Minimization of Product-of-Sums Forms, Incompletely Specified Functions, Multiple-Output Circuits, NAND and NOR Logic Networks, Multi-Level Synthesis, Analysis of Multi-Level Circuits, CAD Tools. ; Number Representation And Arithmetic Circuits: Positional Number Representation, Addition of Unsigned Numbers, Signed Numbers, Fast Adders, Design of Arithmetic Circuits Using Cad Tools. ; Combinational Circuit Building Blocks: Multiplexers, Decoders, Encoders, Code Converters, Arithmetic Comparison Circuits, VHDL for Combinational Circuits. ; Flip-Flops, Registers And Counters, A Simple Processor: Basic Latch, Gated SR Latch, Gated D Latch. Master-Slave and Edge-Triggered D Flip-Flops, T Flip-Flop, JK Flip-Flop, Registers, Counters, Reset Synchronization, Other Types of Counters, Using Storage Elements with Cad Tools, Using Registers and Counters With Cad Tools, Design Examples. ; Synchronous Sequential Circuits: Basic Design Steps, State Assignment Problem, Mealy State Model, Design of Finite State Machines using CAD Tools, Serial Adder Example, State Minimization, Design of a Counter using the Sequential Circuit Approach, FSM as an Arbiter Circuit, Analysis of Synchronous Sequential Circuits.

Essential Reading:

1. S. Brown and Z. Vranesic, Fundamental of Digital Logic with VHDL design Tata Mc GRAW-Hill, 2003

Supplementary Reading:

1. F. Vahid: Digital Design: Wiley Student Edition, 2006
2. J. F. Wakerly, Digital Design Principles and Practices, Fourth Edition, Prentice-Hall, 2005.
3. R. L. Tokheim, Digital electronics, Principles and applications, 6th Edition, Tata McGraw Hill Edition, 2003

## **EC 204: SEMICONDUCTOR DEVICES**

**3 credits [3-0-0]**

Prerequisites: EC 100: Basic Electronics

Semiconductor Crystals: Atomic Bond Model; Drift: Energy Bands, Ohm's Law, Carrier mobility; Diffusion: Current equation, Einstein's Relationship, Continuity equation; Generation & Recombination: Mechanisms, Minority Carrier Lifetime; P-N junction: Principles, DC model, Capacitance of Reverse bias PN junction, store charge effects, Metal Semiconductor contacts: Schottky diode, Mos Capacitor; MOSFET: Principles, C-V Characteristics, Second order effects; BJT: Principles, C-V Characteristics, Second order effects; IC Technology: Diode in IC Technology, MOSFET Technologies; Bipolar IC Technologies; Photonic Devices: LEDs, Photo Detectors, Solar Cells, LASERS; Microwave FETs & Diodes; Power Devices: IGBT, Thyristors

Essential Reading:

1. S. Dimitrijević, Principles of Semiconductor Devices: Oxford University Press, 2005

Supplementary Reading:

1. Benman- Introduction to Semi conductor Devices – Cambridge. 2004
2. Dasgupta & Dasgupta, Semiconductor Devices PHI, 2004

**CR 339: CERAMICS IN ELECTRONIC APPLICATIONS****3 credits [3-0-0]**

Introduction, elementary solid state science, electrical conduction, defect and defect Chemistry, charge displacement process. Ceramic conductors: high temperature heating elements and electrodes, ohmic resistors, varistors, thermistors – PTC, NTC, fuel cells and batteries, sensors, materials system, powder synthesis, processing, properties, devices and application. Fundamentals of superconductivity, theories of superconductors, materials system, synthesis, processing, properties and application; Dielectric and insulators, fundamentals of capacitors, classification of dielectric materials, materials system, low permittivity, medium permittivity and high permittivity, Powder synthesis, processing, properties, fabrication and application. Capacitor designs, processing; Fundamentals of piezoelectricity, materials system, synthesis, processing, properties, devices and application. Fundamentals of pyroelectricity, materials system, synthesis, processing, properties, devices and application. Electro-optic fundamentals, materials system, synthesis, processing, properties, devices and application; Fundamentals of magnetism, Magnetics ceramics basic concepts, model ferrites: spinel ferrites, hexaferrites, garnets, properties influencing magnetic behaviour, soft ferrites, hard ferrites, microwave ferrites, Preparation of ferrites, raw materials, mixing calcinations and milling, sintering, post sintered processing, applications.

**Essential Reading:**

1. R. C. Buchanan, Ceramic Materials for Electronics: processing, properties and applications, Marcel Dekker, NY, 1986.
2. L. M. Levinson, Electronic Ceramics: properties, device and applications, CRC Press, 1987.

**Supplementary Reading:**

1. A. J. Moulson and J. M. Herbert, Electroceramics: Materials, Properties and Applications, Springer, 1990.
2. B. Jaffe, W. R. Cook, H. Jaffe and H. L. C. Jaffe, Piezoelectric Ceramics, R.A.N Publishers, 1990.