**23EE1101 – BASIC ELECTRICAL & ELECTRONICS ENGINEERING**

**(Common to EEE, ECE, Civil & Mechanical)**

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| **Course category:** | Professional core | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture - Tutorial - Practical:** | 3 - 0- 0 |
| **Pre-requisite:** | Fundamental concepts of Electricity , Electromagnetic induction and engineering physics. | **Sessional Evaluation :**  **External Evaluation:**  **Total Marks:** | 30  70  100 |

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| **Course**  **Objectives** | Students undergoing this course are expected to learn: | |
| 1. Basic characteristics of DC and AC networks.  2. Construction and operation of DC &AC machines and measuring Instruments.  3. Fundamentals of energy resources, electricity bill calculation & Safety measures.  4. The theory, construction and operation of electronic devices.  5. The concept of science and mathematics to explain the working of diodes, transistors, and their applications.  6. About the small signal amplifier circuits to find the amplifier parameters. | |
| **Course Outcomes:** | Upon successful completion of the course , the students will be able to: | |
| **CO1** | Understand basic characteristics of DC and AC networks. |
| **CO2** | Demonstrate working of DC &AC machines and also measuring Instruments. |
| **CO3** | Explain the fundamentals of energy resources, electricity bill calculation & Safety measures. |
| **CO4** | Enumerate the concept of science and mathematics to explain the working of diodes, transistors, and their applications |
| **CO5** | Describe the concept of science and mathematics to explain the working of diodes, transistors, and their applications. |
| **CO6** | Analyze the small signal amplifier circuits to find the amplifier parameters. |
| **Course**  **Content:** | **PART A: BASIC ELECTRICAL ENGINEERING**  **UNIT I DC & AC Circuits**  **DC Circuits:** Electrical circuit elements (R, L and C), Ohm’s Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.  **AC Circuits:** A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems). UNIT II Machines and Measuring Instruments **Machines:** Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications  of electrical machines.  **Measuring Instruments:** Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge. UNIT III Energy Resources, Electricity Bill & Safety Measures **Energy Resources:** Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.  **Electricity bill:** Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of “unit” used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.  **Equipment Safety Measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock. PART B: BASIC ELECTRONICS ENGINEERING **UNIT I SEMICONDUCTOR DEVICES**  Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary – Treatment of Small Signal Amplifier.  **UNIT II BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION**  Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response, Concept of voltage divider biasing. Electronic Instrumentation: Block diagram of an electronic instrumentation system.  **UNIT III DIGITAL ELECTRONICS**  Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code.  Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs). Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters. | |
| **Text books**  **&**  **Reference books:** | PART A: BASIC ELECTRICAL ENGINEERINGText books:  1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019. 2. Basic Electrical Engineering by S. N. Singh, PHI Publishers, 2011 3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI publishers, Third Edition, 2014.  Reference Books:  1. Principles of Power Systems by V.K. Mehtha, S.Chand Technical Publishers, 2020. 2. A textbook of Electrical Technology by B.L. Theraja, S. Chand and Company, reprint edition, 2014. 3. S. K. Bhatacharya, Basic Electrical and Electronics Engineering,   Second Edition, Person Publications, 2018. PART B: BASIC ELECTRONICS ENGINEERINGText books:  1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021. 2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009  Reference Books:  1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010. 2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002. 3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009. | |
| **e-Resources** | 1. <http://nptel.ac.in/courses> 2. <https://dspace.mit.edu/handle/1721.1/57007> 3. http://dl.acm.org/citation.cfm?id=562622 | |