**23A02101T-BASIC ELECTRICAL & ELECTRONICS ENGINEERING**

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

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| **Course category:** | Engineering Science | **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 andoperation of DC &AC machinesandmeasuring Instruments.  3. Fundamentals of energyresources,electricity bill calculation& Safetymeasures.  4. Thetheory, construction, andoperationofelectronicdevices.  5. Theconceptofscienceandmathematicstoexplaintheworkingofdiodes,transistors,andtheirapplications.  6. About the smallsignalamplifiercircuitstofindtheamplifierparameters. | |
| **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 machinesand also measuring Instruments. |
| **CO3** | Explain the fundamentals of energyresources,electricity bill calculation& Safetymeasures. |
| **CO4** | Enumerate theconceptofscienceandmathematicstoexplaintheworkingofdiodes,transistors,andtheirapplications |
| **CO5** | Describe theconceptofscienceandmathematicstoexplaintheworkingofdiodes,transistors,andtheirapplications. |
| **CO6** | Analyze the smallsignalamplifiercircuitstofindtheamplifierparameters. |
| **Course**  **Content:** | **PARTA: BASICELECTRICALENGINEERING**  **UNIT I :DC & AC Circuits DC Circuits:** Electrical circuit elements (R,LandC),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, timeperiod ,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 powerfactor (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 MovingCoil (PMMC), Moving Iron(MI) Instruments and WheatStone 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.  **PARTB:BASICELECTRONICSENGINEERING** **UNITI: SEMICONDUCTOR DEVICES**  Introduction-Evolution o felectronics–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.  **UNITII: BASICELECTRONICCIRCUITSANDINSTRUMENTTAION**  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.  **UNITIII: DIGITALELECTRONICS**  LogicgatesincludingUniversalGates,BCDcodes,Excess-3code,Graycode,Hammingcode. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR IntegratedCircuits(ICs).Simplecombinationalcircuits–HalfandFullAdders.Introductiontosequentialcircuits,Flipflops,Registers and counters. | |
| **Text books**  **&**  **Reference books:** | PARTA: BASICELECTRICALENGINEERINGText books:  1. Basic Electrical Engineeringby D C Kulshreshtha,Tata McGraw Hill,FirstEdition2019. 2. BasicElectricalEngineeringbyS. N.Singh, PHIPublishers, 2011 3. FundamentalsofElectricalEngineeringbyRajendraPrasad,PHIpublishers,ThirdEdition,2014.  ReferenceBooks:  1. PrinciplesofPower Systems byV.K.Mehtha, S.ChandTechnicalPublishers, 2020. 2. Atextbook ofElectricalTechnologybyB.L.Theraja,S.ChandandCompany,reprintedition,2014. 3. S.K.Bhatacharya,BasicElectrical andElectronicsEngineering,   SecondEdition,PersonPublications,2018. PARTB:BASICELECTRONICSENGINEERINGTextbooks:  1. R.L.Boylestad&LouisNashlesky,ElectronicDevices&CircuitTheory,PearsonEducation,2021. 2. R.P.Jain, ModernDigitalElectronics,4thEdition,TataMcGrawHill,2009.  ReferenceBooks:  1. R.S.Sedha,ATextbookofElectronicDevicesandCircuits,S.Chand&Co,2010. 2. SantiramKal,BasicElectronics-Devices,CircuitsandITFundamentals,PrenticeHall, India,2002. 3. R.T.Paynter,IntroductoryElectronicDevices&Circuits–ConventionalFlowVersion,PearsonEducation,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 | |

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| Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low) | | | | | | | | | | | | | | |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | - | - | 2 | - | - | - | - | - | - | - | 2 | - |
| CO2 | 3 | 3 | 2 | - | 2 | 2 | - | - | - | - | - | - | 2 | - |
| CO3 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | - | - | - | - | 3 | 3 | 2 |
| CO4 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | 2 | 2 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | 2 | 2 | 3 | 2 |
| CO6 | 3 | 3 | 2 | 1 | 2 | - | - | - | - | - | - | 2 | 3 | 2 |