Basic Electrical & Electronics Engineering

Course Code	23ES1202	**Year**	I	**Semester**	II
Course Category	Engineering Science	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Describe** the fundamentals of electrical circuits, machines, MC/MI instruments, semiconductor devices, and digital electronics to explain their working principles and applications. *(L2)*
CO2	**Apply** fundamental concepts of mathematics, science, and electrical engineering to operate circuits, machines, measuring instruments, and power generation systems safely. *(L3)*
CO3	**Analyze** circuit behavior and electrical load to ensure safe and efficient operation of electrical systems. *(L4)*
CO4	**Apply** the principles of semiconductor devices and digital electronics to interpret analog and digital circuits effectively. *(L3)*
CO5	**Analyze** the characteristics of analog circuits and the performance of digital circuits to evaluate their functionality. *(L4*

Contribution of Course Outcomes towards achievement of Program Outcomes & Strengthof correlations (3: High, 2: Medium, 1: Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2											2	1
CO2	3					1						2	1
CO3		3									1	2	1
CO4	3											2	1
CO5		3										2	1

Syllabus		
Unit No.	**Contents**	**Mapped CO**
Part A: Basic Electrical Engineering		
1	**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).	CO-1,2,3
2	**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 Stonebridge.	CO-1,2
3	**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.	CO-1,2,3
Part B: Basic Electronics Engineering		
4	**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 CE Amplifier.	CO-1,4,5
5	**Basic Electronic Circuits and Instrumentation** 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	CO-1,4,5

	common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.	
6	**Digital Electronics** Overview of Number Systems, 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. Simple Combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)	CO-1,4,5

Learning Resources
Part A: Basic Electrical Engineering
Text Books
1. D. C. Kulshreshtha, Basic Electrical Engineering, Tata McGraw Hill, 2019, 1st Ed. 2. P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, Power System Engineering, 2013 3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, 3rd Ed.
Reference Books
1. D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, Mc Graw Hill, 2019, 4th Ed. 2. V.K. Mehtha, S.Chand Principles of Power Systems Technical Publishers, 2020 3. T. K. Nagsarkar and M. S. Sukhija, Basic Electrical Engineering, Oxford University Press, 2017 S. K. Bhattacharya Basic Electrical and Electronics Engineering, Pearson Publications, 2018,2nd Ed.
e- Resources & other digital material
1. https://nptel.ac.in/courses/108105053 2. https://nptel.ac.in/courses/108108076
Part B: Basic Electronics Engineering
Textbooks 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 & other digital material
1. https://nptel.ac.in/courses/108105132 2. https://nptel.ac.in/courses/108101091