RAGHU ENGINEERING COLLEGE

Autonomous

(Approved by AICTE, New Delhi, Accredited by NBA (CE,ECE, MECH, CSE), NAAC with 'A+' Grade & Permanently Affiliated to JNTU GV-Vizianagaram)

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Department of Electronics and Communications Engineering

I Year I Semester	**L**	**T**	**P**	**C**
Code: 23ES104	**3**	**0**	**0**	**3**

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to All branches of Engineering)

PART A: BASIC ELECTRICAL ENGINEERING

Preamble This course enables the students to understand basic concepts of Electrical and Electronics Engineering.

Pre-requisites Engineering Mathematics, Physics

Course Objectives

To expose to the field of electrical & electronics engineering, laws and principles of electrical/electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes

CO1	Understand the problem-solving concepts associated to AC and DC circuits	L3
CO2	Remember the fundamental laws, operating principles of construction and operation of AC and DC machines, MC and MI instruments.	L2
CO3	Understand different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.	L2

CO – PO & CO – PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	-	-	-	-	-	-	-	1	1	1
CO2	2	1	1	-	-	-	-	-	-	-	-	1	1	1
CO3	3	2	1	-	-	3	2	1	-	-	-	2	1	1

1 – Weak, 2 – Moderate and 3 – Strong

UNIT–I: DC & AC Circuits **12 Hours**

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 **12 Hours**

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 Measurement of resistance by Volt &Ammeter.

UNIT–III: Energy Resources, Electricity Bill & Safety Measures **12 Hours**

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.

Text books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition.
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013.
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition.
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020.
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017.
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics

Course Outcomes

CO4	**Describe the Construction, Operation and Characteristics of PN Junction Diode, Zener diode and BJT.**	**L2**
CO5	**Illustrate the basic Electronics circuits and Instrumentation system.**	**L3**
CO6	**Understand the binary number system and various binary circuits.**	**L2**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO4	2	1	1	-	-	-	-	-	-	-	-	-	1	1
CO5	1	2	2	-	-	1	1	1	-	-	-	1	1	1
CO6	-	1	2	-	-	-	-	-	-	-	-	-	1	1

UNIT–IV: Semiconductor Devices **12 Hours**

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.

UNIT–V: Basic Electronics and Instrumentation **12 Hours**

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. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT–VI: Digital Electronics **12 Hours**

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).

Text 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.