Course Syllabus
Gyanmanjari Institute of Technology
Semester-1

Subject: Basics of Electrical & Electronics Engineering - BETEE10301

Type of course: Major

Prerequisite: Basic knowledge of Physics

Rationale:

The course is designed to provide Elementary concept of Electrical and Electronics Engineering to the students of various branches of engineering. It is essential for all engineering graduates to know the basics of electrical as well as electronics engineering. The course is divided into three parts: DC circuits, AC circuits and basics of semiconductor.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
3	0	2	4	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Continuous Assessment:

(For each activity maximum-minimum range is 5 to 10 marks)

Sr. No	Active Learning Activities	Marks
1	**Quiz** Students will be assigned a quiz of 10 MCQs per unit.	10
2	**Do & Learn** Students will design and prepare a micro project. Video clip of working should be upload to Moodle. (Group of Four)	10
3	**Go Green** Students will prepare a report on any recent trend of green & clean energy concept and upload to Moodle (Group of Two)	10
Total		30

Course Content:

Unit. No	Course content	Hrs	% Weightage
1	**CHAPTER -1 Elementary Concept of DC Circuit – 6 Hours** Definition of Current, Voltage, e.m.f., Power, Energy, Ideal electrical circuit elements - Resistor, Inductor and Capacitor, Ohm's Law, Analysis of Series, Parallel and series-parallel connection of resistances, Comparison between series and parallel circuits, Delta-Star and Star-Delta transformation, Kirchoff's Laws, Nodal & Mesh Analysis **CHAPTER -2 Safety &Protection – 2 Hours** Electrical Hazards & Safety Precautions, Earthing, Importance & Methods of Earthing, Circuit protection devices: Fuses, MCB, ELCB, MCCB **CHAPTER -3 Magnetic Circuits – 2 Hours** Magnetic Circuits & Terminology, Electric and Magnetic Circuit Analogy, Calculation of Ampere turns, Leakage flux, Magnetization Curve	10	25%
2	**CHAPTER -4 Electromagnetic – 6 Hours** Electromagnetic induction, Faraday's Laws, Lenz's Law, Fleming's Rules, Induced emf, statically and dynamically induced EMF, self-inductance, mutual inductance, coefficient of coupling, inductance of coupled coils, Inductance in series and parallel, energy stored in magnetic field, Charging and discharging of inductor, magnetic hysteresis, eddy current losses **CHAPTER -5 Electrostatics & Capacitance - 4 Hours** Electric charge and Laws of electrostatics; Definitions – Permittivity, Electric field, lines of force, electric field intensity, electric flux and flux density; Dielectric strength; Capacitor; Capacitor in series and parallel, Energy stored in a capacitor.	10	20%

3	**CHAPTER -6 Single Phase AC Circuit – 10 Hours** Generation of Alternating voltage and current, sinusoidal function- Terminology, Average value, Root Mean Square value Form Factor and Peak Factor, Phase and Phase Difference, Phasor representation , Concepts of Real power, Reactive power, Apparent power and Power factor, Behaviour of purely resistive, inductive and capacitive circuits, Phase relation between voltage and current, Analysis with phasor diagrams of R, L, C, R-L, R-C and R-L-C circuits; Series, Parallel and Series - Parallel circuits; Resonance in series and parallel circuits, Q-factor, Bandwidth and Selectivity. **CHAPTER -7 Three Phase AC System – 4 Hours** Necessity of three phase systems, Generation of three phase power, Phase sequence Interconnection of three phases, star & delta connection, Relationship between line and phase values of balanced three phase circuit, power in three phase systems, Balanced supply and Balanced load, Measurement of power and power factor in balanced three phase load, Advantages of three phase system.	14	30%
4	**CHAPTER -8 Basics of Semiconductor – 4 Hours** Structure of atom, valence electron, Energy Band, eV Unit of Energy, Conductor, semiconductor, insulator, Mobility and Conductivity, Donor and Acceptor Impurities, Doping, Intrinsic semiconductor, extrinsic semiconductor, P-type and N-type semiconductor, majority charge carrier, minority charge carrier, Depletion Layer **CHAPTER -9 Diode Circuit & Application – 8 Hours** Open –Circuited P-N Junction, Basic idea about forward bias, reverse bias and VI characteristics, knee voltage, ideal diode, Load-Line Concept, half wave, Full wave & Bridge rectifier, clipping circuit, Clamping circuit, Design of un-regulated DC power supply, Ripple Effect, Calculation of PIV & Ripple Factor & Derivation, C, L & LC filters, Zener Diode, Voltage Regulator Special Diodes – (Power Diode, Tunnel Diode, Semiconductor Photodiode, Photovoltaic Effect, Light –Emitting Diodes)	12	25%

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20	40	30	10	0	0

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Apply fundamental electrical laws to electrical circuits, Analyze and solve DC Circuits, protection and personnel safety
CO2	Understand and apply principle of electromagnetism and electrostatic to electric circuits
CO3	Analyze single phase and three phase AC circuits
CO4	Analyze the general and special-purpose diode circuits and their applications

List of Practical

(Minimum-10practical):

Sr. No	Descriptions	Unit No	Hrs
1	To study use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope	1	2
2	To understand various safety precautions for electrical installations	1	2
3	To observe waveform and measure amplitude and frequency of sine wave and square wave on oscilloscope	3	2
4	To verify the DC circuit currents and voltages by calculations and actual measurements	1	2

5	To verify ohm's law in an electric circuit	1	2
6	To verify the Kirchhoff's current and voltage laws	1	2
7	To determine power in a single-phase circuit using wattmeter	3	2
8	To verify Phase and Line quantity relationship in star and delta connection in three phase systems	3	2
9	To determine power in a three-phase balanced circuit using two wattmeter method	3	2
10	To obtain inductance, power and power factor of the Series R-L circuit with AC supply using Phasor diagram	3	2
11	To obtain VI characteristics of semiconductor rectifier diode	4	2
12	To study the regulated power supply (SMPS)	4	2
13	To observe output waveform of half wave rectifier with and without filter capacitor.	4	2
14	To observe output waveform of bridge rectifier with and without filter capacitor		2
15	Demonstration of domestic installations like MCB, ELCB, MCCB etc	1	2
	TOTAL		**30**

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] B. L. Theraja, "*Electrical Technology*", S. Chand Publication,

[2] V.N. Mittal, "*Basic Electrical Engineering*", Tata McGraw-Hill,

[3] D. P. Kothari and I. J. Nagrath, "*Theory and Problems in Basic Electrical Engineering*", Prentice Hall India

[4] David A. Bell, *"Electronic Devices and Circuits"*, Oxford University Press

[5] Albert Malvino & David, *"Electronic Principles"*, Tata McGraw-Hill