Semester	**I/II**		
Course Title:	**INTRODUCTION TO ELECTRICAL ENGINEERING**		
Course Code:	**BESCK104B /204B**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	IPCC	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L: T:P: S)	2:0:2:0	Exam Hours	03
Total Hours of Pedagogy	40 hours Theory + 10 hours Lab slots	Credits	03

Course Learning Objectives

CLO1. To explain the basic laws used in the analysis of DC circuits, and energy sources.
CLO2. To explain the behavior of circuit elements in single-phase circuits. And three phase circuits.
CLO3. To explain the behavior of DC machines.
CLO4. To explain the behavior of transformer, three phase induction motor and universal motor.
CLO5.To explain domestic wiring and electrical safety and measures.

Teaching - Learning Process

- Chalk and talk, Animated/ NPTEL videos, Cut sections and PPTs

Module-1 (8 hours)

DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. Simple numerical problems.

Introduction to Conventional and Non-Conventional Energy Resources: Hydel, Nuclear, Solar & wind power (Block Diagram approach).

Power Generation: General structure of electrical power systems using single line diagram approach.

Self-study: Visit any power generating station**.**

Applications: The basic laws used in the analysis of DC circuits, and energy sources.

(RBT Levels: L_1, L_2 and L_3)

Module-2 (8 hours)

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. (only definitions)

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).

Three Phase Circuits: Generation of Three phase AC quantity, advantages and limitations; star and delta connection, relationship between line and phase quantities (excluding proof)

Self-study: Simulate simple single phase AC circuits using Pspice

Applications: The behavior of circuit elements in single-phase circuits and three phase circuits.

(RBT Levels: L_2 and L_3)

Module-3 (8 hours)

DC Machines:

DC Generator: Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. Simple numerical.

DC Motor: Principle of operation, Back emf and its significance. Torque equation, types of motors, characteristics and speed control (armature & field) of DC motors (series & shunt only). Applications of DC motors. Simple numerical.

Self-study: Simulate the behavior of the machine by Pspice.

Applications: To study the behavior of D C machines.

(RBT Levels: L_1,L_2 and L_3)

Module-4 (8 hours)

Transformers: Necessity of transformer, principle of operation, Types and construction of single- phase transformers, EMF equation, losses, Efficiency and simple numerical.

Three-phase Induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip and its significance simple numerical.

Universal motor: Working principal and type's classification of universal motors.

Self-study: To study the analysis of transformer and universal motor.

Applications: The behavior of transformer, three phase induction motor and universal motor.

(RBT Levels: L_2 and L_3)

Module-5 (8 hours)

Domestic Wiring: Conductive wiring. Two way and Three-way control of load**.**

Electrical Safety measures: Working principle of Fuse and Miniature circuit breaker (MCB), and Residual Current Circuit Breaker (RCCB) and Earth Leakage Circuit Breaker (ELCB). merits and demerits. Earthing and its types, Safety Precautions to avoid shock,

Introduction to Electric Vehicles: Overview and block diagram approach to Electric Vehicles and types of EV batteries.

Introduction to BLDC motors, Working and construction of BLDC motor.

Self-study: Using software tools to simulate control of switches

Applications: Domestic wiring and electrical safety and measures. And study of electrical vehicles.

(RBT Levels: L_2 and L_3)

List of Laboratory experiments (2 hours / week per batch / batch strength 15)
10 labs sessions+1 repetition class+1 Lab Assessment

PRACTICAL COMPONENT OF IPCC

Sl. NO	Experiments
1.	Verification of KCL and KVL for DC circuits
2.	Measurement of Current, Power, and Power Factor of Fluorescent Lamp And LED Lamp.
3.	Measurement of Resistance and Inductance of a Choke coil using three voltmeter method.
4.	Measurement of 3–phase Power using Two Wattmeter Method.
5.	Determination of efficiency of a single-phase transformer by direct load test.
6.	Two Way and Three-Way Control of Lamp and Formation of Truth Table.
7.	Measurement of Earth Resistance
8.	Study of the effect of Open and Short circuits in simple circuits.
9.	Speed Vs Torque characteristics of shunt Motor
10.	Speed Vs Torque characteristics of series Motor

Course outcomes

At the end of the course the student will be able to:

CO1-Understand the concept of AC and DC circuits, Construction of DC machines, Transformer, BLDC motor, Renewable Energy Sources and Electric Vehicles fundamentals.

CO2- Apply KCL, KVL, Ohms law to Electric Circuits & EMF equation to solve the problems on DC Machines, Transformers and Induction motors.

CO3-Analyse the 1 phase and 3 phase AC circuit and Practical Safety measures.

Course Assessment and Evaluation Details (both CIE and SEE)

Continuous Internal Evaluation: 50 marks		
Theory Assessment Tool	**Marks**	**Reduced marks**
IAT-1	25	**15**
IAT-2	25	
Assessment -1(activity based)	25	**10**
Assessment -2(activity based)	25	
Lab Assessment Tool	**Marks**	**Reduced marks**
Conducting Experiment and Laboratory Record (10 labs)	15(Each lab)	**15**
Lab Test	10	**10**
Semester End Examination (SEE): 50 marks		
SEE	**Marks**	**Reduced marks**
Course end examination (Answer any one question from each unit – Internal choice)	100	**50**

Suggested Learning Resources: VTU e DUSAT

Textbooks:

1. Basic Electrical Engineering by DC Kulshreshtha,Tata Mc Graw Hill,First Edition 2019.
2. A text book of Electrical Technology by B.L.Theraja, Schand and Company,reprint edition 2014.
3. Electrical Technology Edward Hughes Pearson 10thEdition,2014

Reference Books:

1. Basic Electrical Engineering, D.P. Kothari and I.J. Nagrath, Tata McGraw Hill 4th edition,2019.
2. Principles of Electrical Engineering & Electronics by V.K. Mehta, Rohit Mehta, S. Chand and Company Publications,2nd edition, 2015.

Web links and Video Lectures (e-Resources):

1. www.nptel.ac.in
2. http://nptel.ac.in/courses/108105053/
3. http://nptel.ac.in/courses/108108076/

Activity Based Learning (Suggested Activities in Class)/Practical Based Learning

- Cut -out demo/actual machine models, video for working of machine,
- Industrial visit for electrical equipment's manufacturing unit.
- Simulation studies various motor performances other electrical equipment's.

CO'S & PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	0	1	1	1	1	0	0	0	1
CO2	3	3	2	1	1	1	0	0	0	0	0	1
CO3	3	2	1	1	1	1	1	1	0	0	0	1

Level3- Highly Mapped, Level 2-ModeratelyMapped, Level1-LowMapped, Level0-Not Mapped