SARVAJANIK UNIVERSITY
SarvajanikCollege of Engineering and Technology
Bachelor of Technology

B.Tech. Semester I/II

Subject Name:Basic Electrical Engineering **Subject Code: BTEL12108**

Type of course: **ESC**
Prerequisite: NA
Rationale: Electricity has been the main source of energy for the developing and developed countries. Per capita consumption of electricity of a country can be considered as an indicator of the development of the country. In view of this, it is essential for all engineering graduates to know the basic aspects of electrical engineering. This subject deals with basic circuit solution methods, single-phase and three-phase AC circuits, magnetic circuits and transformers, introduction to electrical machines, introduction to batteries, illumination schemes and Electrical safety.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage %
1.	**DC Circuits** Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's laws, analysis of simple circuits with dc excitation using Loop Current and Nodal Voltage techniques, Source Conversion, Star-delta conversion, Superposition theorem, Thevenin's and Norton's theorems, Series-parallel combination of capacitors, energy stored in capacitor, Time-domain analysis of first-order RL and RC circuits.	**10**	**20**
2.	**Single-phase and Three-Phase AC Circuits** Representation of sinusoidal waveforms, peak and RMS values, phasor representation of AC quantities, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L and C, series-parallel combinations of R-L-C circuit, series and	**12**	**25**

	parallel resonance. Three-Phase balanced circuits, voltage and current relations in star and delta connections, Power measurement in three-phase circuits, Basics of Power factor improvement.		
3.	**Magnetic Circuit and Transformer** Magnetic materials, B-H characteristics, Series and Parallel magnetic circuit, Concepts of self-inductance, mutual inductance and coefficient of coupling; Statically and dynamically induced EMF; Hysteresis and Eddy current losses. Need of Transformer, Construction and working principle of single-phase transformer, emf equation, losses and efficiency, voltage regulation, auto transformer.	**8**	**20**
4.	**Electrical Machines** **DC Machines:** Principle of operation, constructional details, induced emf expression, types of generators, and the relation between induced emf and terminal voltage, Principle of operation, back emf and torque equations, types of motors, characteristics (shunt and series only), and applications **Three-phase induction Motors:** Concept of rotating magnetic field, Types of IM, Construction and Principle of operation, Applications	**8**	**20**
5.	**Electrical Installations and Safety** Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of wires and cables, earthling, electrical safety precautions, electric shock and first-aid for electric shock, other hazards of electrical laboratories & safety rules.	**7**	**15**

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
40	**20**	**20**	**20**	**-**	**-**

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels **(Revised Bloom's Taxonomy)**

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

ESC: Engineering Science Course

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Basic Electrical Engineering	D. C. Kulshreshtha,	McGraw Hill,	2009	**First**
2.	Electrical Technology: Vol1 Basic Electrical Engineering	B. L. Theraja	S. Chand and Co.	2005	**First Multicolour**
3.	Electrical Technology : Vol2 AC & DC Machines	B. L. Theraja	S. Chand and Co.	2005	**First Multicolour**
4.	Basic Electrical Engineering	I. J. Nagrath and D. P. Kothari	Tata McGraw Hill	2010	**Second**
5.	Electrical Machines	D. P. Kothari and I. J. Nagrath	Tata McGraw Hill	2010	
6.	Electrical Engineering Fundamentals	V. D. Toro	Prentice Hall India	2016	**Second**
7.	Basic Electrical Engineering	V. N. Mittle	McGraw Hill	1995	

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Apply fundamental electrical laws and circuit theorems in solving electrical circuits.	20
CO-2	Analyze single-phase and three-phase AC circuits.	25
CO-3	Comprehend magnetic circuit, principle and application of transformer.	20
CO-4	Describe operating principle and applications of DC machines and Induction motors.	20
CO-5	Comprehend electrical installation components, importance of safety and the precautionsto be taken while working with electrical equipments.	15

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Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	2		3	2	-	-	-	-	-	-	3			
CO-2	3	2	2	3	2	-	2	-	-	-	-	3			
CO-3	3	2		3	2	-	-	-	-	-	-	3			
CO-4	3	2		3	2	-	-	-	-	-	-	3			
CO-5	3	2	3	3	2	3	-	3	-	-	-	3			
Rationale*	15	10	6	15	10	3	2	3	-	-	-	15			

Rationale*: Explaining why it is matching this particular program outcome

LIST OF PRACTICALS: (Minimum ---**10**--- performed.)

(1) Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Resistors, Capacitors andInductors, basic safety precautions.
(2) To verify Kirchoff's current and voltagelaws.
(3) To verify superposition theorem for DC circuit.
(4) To verify Thevenin's theorem.
(5) To verify Norton's theorem.
(6) To obtain sinusoidal steady state response of R-L and R-C circuits – impedance calculation and verification. Observation of phase differences between current andvoltage.
(7) To measure power in single-phase R-L and R-C series circuits.
(8) ToverifytheresonanceinR-L-C circuits.
(9) To measure the power in three-phase circuits using two wattmetermethod.
(10) To verify the current and voltage relationships in three phase star and deltaconnections.
(11) Demonstration of cut-section models and charts of variousmachines.
(12) To verify the power factor improvement in single phase ACcircuit.

Major Equipment:

Ammeters, Voltmeters, Watt-meters, Resistors, Capacitors and Inductors of appropriate rating, Multi-meters, Digital storage oscilloscope, Power supply, Cut section models/charts of various machines, Charts for earthling and safety precaution.

List of Open Source/learning website:

1. MIT OPEN COURSEWARE by Massachusetts Institute of Technology - website: ocw.mit.edu

2. Courses available through NPTEL. - website: nptel.ac.in

List of Open Source Software:

Website: **www.vlabs.co.in**

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