SARVAJANIK UNIVERSITY

SARVAJANIK COLLEGE OF ENGINEERING AND TECHNOLOGY

BACHELOR OF TECHNOLOGY

B.Tech	1	Semester	1/2	Teaching Scheme				Evaluation Scheme	
Subject Name	**Basic Electrical Engineering**			**L**	**T**	**P**	**Credits**	**CCE**	**SEE**
Subject Code	**BTEL22101**			3	0	-	3	50	50
Type of course	**Engineering Science Course**			CCE : Continuous and Comprehensive Evaluation SEE : Semester End Evaluation					
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 electrical installation and electrical safety.								

Course Outcomes (COs): At the end of the course, students will be able to		**Marks % Weightage**
CO – 1	Apply fundamental electrical laws and circuit theorems in solving electrical circuits.	22
CO – 2	Analyze single-phase and three-phase AC circuits.	24
CO – 3	Comprehend magnetic circuit, describe construction, working principle and application of transformer.	20
CO – 4	Describe construction, operating principle and applications of DC machine, Induction motor and alternator.	22
CO – 5	Comprehend electrical installation components, importance of safety and the precautions to be taken while working with electrical equipments.	12

Course Contents

Unit	Content	Tentative Teaching Hours	Tentative Unit Weight
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.	12	22

2	**Single-phase and Three-Phase AC Circuits** **Single-Phase A. C. circuits:** Generation of sinusoidal voltage-definition of average value, root mean square value, form factor and peak factor of sinusoidal voltage and current, phasor representation of alternating quantities; Analysis of single-phase ac circuits consisting of R, L and C, series-parallel combinations of R-L-C circuit, Impedance, admittance, power triangle, Real power, reactive power, apparent power and power factor, series and parallel resonance. **Three-Phase A. C. circuits:** Necessity and Advantages of three phase systems, Generation of three phase power, concept of phase sequence, balanced supply and balanced load; voltage and current relations between phase and line voltages and currents in balanced star and delta connections, Power measurement in three-phase circuits, Basics of Power factor improvement.	12	24
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.	7	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. Need of starter for D.C. motor. **Three-phase induction Motors:** Concept of rotating magnetic field, types of Induction Motor, construction and principle of operation, applications, Need of starter for Induction Motor. **Alternator:** Principle of operation of synchronous generator; types and constructional features; EMF equation;	10	22
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.	4	12

Recommended Reference Books

1. D. C. Kulshreshtha,Basic Electrical Engineering, McGraw Hill, 2009
2. B. L. Theraja and A. K. Theraja, "A text book of Electrical Technology: Volume I", S. Chand, 2005.
3. B. L. Theraja and A. K. Theraja, "AC and DC Machines: Volume 2", S. Chand, 2005.
4. I. J. Nagrath and D. P. Kothari,Basic Electrical Engineering, Tata McGraw Hill,2010
5. I. J. Nagrath and D. P. Kothari, Electrical Machines, Tata McGraw Hill,2010
6. V. D. Toro, Electrical Engineering Fundamentals, Prentice Hall India, 2016
7. V. N. Mittle,Basic Electrical Engineering, McGraw Hill,1995

CO-PO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
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

List of Open Source/learning website:

1. MIT OPEN COURSEWARE by Massachusetts Institute of Technology - website: ocw.mit.edu
2. **Alternative NPTEL/SWAYAM Course:** - website: nptel.ac.in
   - i) NPTEL course on BASIC ELECTRICAL CIRCUITS by PROF. NAGENDRA KRISHNAPURA, IIT Madras
   - ii) NPTEL course on FUNDAMENTALS OF ELECTRICAL ENGINEERING by PROF. DEBAPRIYA DAS, IIT Kharagpur
1. iii). NPTEL course on BASIC ELECTRICAL CIRCUITS by PROF. ANKUSH SHARMA, IIT Kanpur
2. **List of Open Source Software:** Website: **www.vlabs.co.in**