



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course (Category) Code	Course Name	Teaching Scheme (Hrs/week)					Credits Assigned			
		L	T	P	O	E	L	T	P	Total
(ESC)	Basic Electrical Engineering	3	0	2	5	10	3	0	1	4
		Examination Scheme								
		Component		ISE		MSE		ESE		Total
		Theory		75		75		150		300
ET101		Laboratory		50		--		50		100

Pre-requisite Course Codes, if any.	Basic concepts of electric charge, current, voltage and power
Course Objective: To impart a basic knowledge of electrical quantities, Circuits and components.	
Course Outcomes (CO): At the End of the course students will be able to	
ET101.1	Compute various electrical quantities of given dc circuit using circuit simplification techniques and various network theorems.
ET101.2	To expose the students to different terms and concepts in AC Circuits at fundamental frequency and to expose them to basics of effects of harmonics in the waveforms
ET101.3	To study the working principles of electrical machines and their applications
ET101.4	To expose the students the fundamental concepts in Controllable Switch and Modulation based Power Conversion
ET101.5	To study Electrical Parameters of the Batteries and their selection and design criteria for a specific application

CO-PO Correlation Matrix (3-Strong, 2-Moderate, 1-Weak Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ET101.1												
ET101.2												
ET101.3												
ET101.4												
ET101.5												

CO-PEO/PSO Correlation Matrix (3-Strong, 2-Moderate, 1-Weak Correlation)

	PEO1	PEO2	PEO3	PEO4	PSO1	PSO2	PSO3
ET101.1							
ET101.2							
ET101.3							
ET101.4							
ET101.5							



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BLOOM'S Levels Targeted (Pl. Tick appropriate)

Remember	Understand	Apply	Analyze	Evaluate	Create
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Theory Component

Module No.	Unit No.	Topics	Ref.	Hrs
1	Title	DC Circuits		10
	1.1	Electrical circuit elements (R, L and C), Voltage and current sources, Equivalent resistance of circuits, Simplification using delta-star and star-delta transformation.		
	1.2	Kirchhoff's current and voltage laws, Analysis of simple circuits with dc excitation. Mesh analysis, Superposition, Thevenin, Norton and Maximum Power Transfer Theorems		
	1.3	Time-domain analysis of first-order DC Transients in RL and RC circuits.		
2	Title	AC Circuits		12
	2.1	Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Harmonics, Total Harmonic Distortion, Power supplied by Harmonic voltages and currents, Power factor in case of non-sinusoidal waveforms.		
	2.2	AC Analysis of series and parallel RLC Circuits with Resonance, Concept of Bandwidth and Q-factor,		
	2.3	Three-phase balanced circuits, voltage and current relations in star and delta connections.		
3	Title	Electromagnetic and Electro-Mechanical Energy Converters		10
	3.1	Magnetically Coupled Coils, Self and Mutual Inductance and Dot Convention		
	3.2	Single Phase Transformer: Principle of Operation, Equivalent Circuits, Efficiency and Regulation.		
	3.3	Introduction to Three-phase Transformers and Applications		
	3.4	Fundamental Principles of Rotating Machines, Characteristics of Induction motor and DC motor		
4	Title	Electric Power Converters		05
	4.1	Fundamental Principles of Buck, Boost and buck-boost DC-DC converters and their Transfer Characteristics, Duty Ratio Control		
	4.2	Single-phase voltage source inverters and PWM		
5	Title	Batteries: Electrical Characteristics and Applications		05
	5.1	Introduction to type of Batteries, Generalized Battery parameters such as SoC, DoD, Energy and Power Densities, Battery C-rating, etc. Comparison		



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		of Batteries, Charging and Discharging Characteristic		
	5.2	Selection and Sizing of Battery Packs for Specific Applications		
6	Self Study	Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Elementary calculations for energy consumption and power factor improvement.		3*
Total (*Not included)				42

Laboratory Component (Minimum 10 Laboratory experiments are expected)

Sr. No	Title of the Experiment
01	Introduction to Electrical Measuring instruments, Lamp Loads, Inductor Loads and Capacitor Bank
02	Verification of Star-Delta and Delta-star Transformation with Kirchoff's Laws
03	Verification of Thevenin's Norton's and Maximum Power Transfer Theorem
04	Verification of DC Transient equations in RL and RC Circuits
05	Experimental study of single-phase AC circuit with R-L and R-C Load with Measurement of Power and Power factor
06	Experimental study of R-L-C series Resonance. To plot resonance curve, To compute Bandwidth and Q-factor
07	Experiment on Magnetic Circuit Fundamentals
08	Loading of a transformer: measurement of primary and secondary voltages and currents, and power. To compute efficiency and regulation.
09	Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
10	Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super-synchronous speed.
11	Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform.
12	Demonstration of V/F control of Induction motor
13	Experimental study of charge and Discharge characteristics of a Lead-acid Battery
14	Introduction to L.T. Switch gear



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Text Books

Sr. No	Title	Edition	Authors	Publisher	Year
1	Basic Electrical Engineering	3rd	D.P. Kothari and I. J.	Tata McGraw Hill	2010
2	Electrical Technology	23rd	B. L. Theraja	S. Chand Publications	2003

Reference Books

Sr. No	Title	Edition	Author	Publisher	Year
01	Basic Electrical Engineering	2 nd	D.C. Kulshreshtha	McGraw Hill	2019
02	Fundamentals of Electrical Engineering	2 nd	L.S. Bobrow	Oxford University Press	2011
03	Electrical and Electronics Technology	3rd	E. Hughes	Pearson	2010
04	Electrical Engineering Fundamentals	2 nd	V.D. Toro	Prentice Hall India	1989
05	Elements of Power Electronics	2 nd	P. T. Krein	New York and Oxford: Oxford University Press	2015
06	Power Electronics: Converters, Application and Design	2 nd	Ned Mohan, T.M Undelands and W P Robbins	John Wiley and Sons. Inc.	1995
07	Electric Machinery	6 th	A. E. Fitzgerald, C. Kingsley and S. D. Umans	McGraw-Hill	2003