BVM ENGINEERING COLLEGE [AN AUTONOMOUS INSTITUTION]

2EE04: ELECTRICAL MACHINES - I
CREDITS - 3 (LTP:3,0,0)

Course Objectives:

The subject aims to provide the student with:

1. Understanding of the basics of electrical machines and their construction
2. Knowledge of testing and performance of electrical machines.
3. Knowledge for learning advanced machines and their control.
4. In-depth understanding of application based knowledge in the field of electrical drives.

Teaching and Assessment Scheme

Teaching Scheme (Hours per week)			Credits	Assessment Scheme				Total Marks
				Theory		Practical		
L	T	P	C	ESE	CE	ESE	CE	
3	0	0	3	60	40	00	00	100

Course Contents:

Unit No.	Topics	Teaching Hours
1	**Electromechanical Energy Conversion Principles:** Energy in a magnetic systems, field energy and mechanical force, energy in singly and multiply excited magnetic systems, determination of magnetic force and torque from energy and co energy, Forces and torques in magnetic field systems, dynamic equations of electro-mechanical systems and analytical techniques.	06
2	**DC Generators:** Construction of DC Machine, Working, types, EMF equation, Armature windings, Characteristics and applications, Building of EMF, Armature reaction - Demagnetizing and Cross magnetizing mmf and their estimation; Remedies to overcome the armature reaction; Commutation process, Causes of bad commutation and remedies.	07
3	**D.C. Motors:** Principles of working, Significance of back EMF, Torque Equation, Types, Characteristics and Selection of DC Motors, Starting of DC Motors, Speed Control, Losses and Efficiency, Condition for Maximum Efficiency, Braking of DC Motors, Effect of saturation and armature reaction on losses; Applications, Permanent Magnet DC Motors, Type and Routine tests.	07
4	**Single Phase Transformer:** Transformer construction, Ideal and practical transformer, exact and approximate equivalent circuits, no load and on load operation, phasor diagrams, power and energy efficiency, voltage regulation, parallel operation, effect of load on power factor, Per Unit system, excitation phenomenon in transformers, switching transients, Auto transformers, voltage and current transformers, welding transformers, Pulse transformer and applications.	10
5	**Three Phase Transformers:** Constructional features of three phase transformers, Cooling methodology, Standard and special transformer connections, Phase conversion, Parallel operation of three phase transformers, three winding transformers and its equivalent circuit, On load tap changing of transformers, Modern trends in	10

Unit No.	Topics	Teaching Hours
	transformers, Type and routine tests, Standards.	
	Total	**40**

List of References:

1. D. P. Kothari and I. J. Nagrath, "*Electric Machines*", Tata McGraw HillPublication,4th Edition 2010, Reprint 2012.
2. B.L.Theraja,"*A Textbook of Electrical Technology Volume II (Multicolour Edition)",* S.Chand Publication,
3. J.B.Gupta, "*Theory and Performance of Electrical Machines*" S.K Kataria &Sons Publication, fifteenth Edition 2015, Reprint 2017
4. M. G.Say,"*Performance and design of AC machines*", CBS Publishers,2002.

E-resource: nptel.ac.in/courses/108105017; NPTEL: Electrical Engineering, Electrical Machines –I.

Course Outcomes

At the end of this course, students will demonstrate the ability to

1. Analyse and apply the energy conversion principles to rotating machines.
2. Evaluate the steady state parameters, basic operating characteristics and performance of DC Machine and its application.
3. Evaluate the steady state parameters, basic operating characteristics and performance of transformers.