

Course Number and Name	
BEE302 & Electrical Machines–I	
Credits and Contact Hours	
3 & 45	
Course Coordinator's Name	
Mrs.Anitha Sampathkumar	
Text Books and References	
Text Books:	
1. Kothari.D.P and Nagrath.I.J., “Electrical Machines”, Tata McGraw Hill Publishing Co.Ltd, New Delhi, 5th edition 2002.	
2. Bimbhra.P.S, Electrical Machinery, Khanna Publishers, IL	
3. Stephen L. Herman“Electrical transformers and rotating machines “ Prentice Hall of India. 1st edition 2012.	
4. Theraja B.L. “Electrical Technology: Volume II. S. Chand and Co., New Delhi – 2012.	
References:	
1. Dr. Murugesh Kumar.K. “DC Machines & Transformers”, Vikas Publishing House PvtLtd.,2nd edition 2003.	
2. Fitzgerald, A.E., Charles Kingsely Jr. Stephen D.Umans, “Electric Machinery” McGraw Hill Books Company, 6 th edition 2002.	
3. Hill Stephen, Chapman.J, “Electric Machinery Fundamentals”, McGraw Hill Book Co., New Delhi, 4th edition 2005.	
4. Albert E Clayton and Hancock.N.N, “The performance and design of direct current Machines”, Oxford and IBH publishing company Pvt. Ltd., New Delhi 1990.	
5. http://nptel.ac.in/courses/108105017/	
Course Description	
To give the students a fair knowledge on the working of various DC machines & Transformers	
Prerequisites	Co-requisites
Basic Electrical & Electronics Engineering	Nil
required, elective, or selected elective (as per Table 5-1)	
Required	
Course Outcomes (COs)	
CO1: To familiarize the constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer Connections.	
CO2: To introduce the principles of electromechanical energy conversion in singly and multiply excited systems.	
CO3: To study the working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated	

voltage and torque developed in all Electrical Machines.

CO4: To study the working principles of DC machines as Generator and Motor, types, determination of their no-load/load characteristics, starting and methods of speed control of motors.

CO5: To estimate the various losses taking place in D.C. machines and to study the different testing methods to arrive at their performance.

Student Outcomes (SOs) from Criterion 3 covered by this Course

COs/SOs	a	b	c	d	e	f	g	h	i	j	k	l
CO1	H	H	L	L	H	M	M	L	L	L	L	L
CO2	H	H	L	L	M	M	M	L	L	L	L	L
CO3	H	H	L	L	H	M	M	L	L	L	L	L
CO4	H	H	L	L	H	M	M	L	L	L	L	L
CO5	H	H	L	L	H	M	M	L	L	L	L	L

List of Topics Covered

UNIT I ELECTRO MAGNETIC INDUCTION & BASIC CONCEPTS IN ROTATING MACHINES 9

Introduction to magnetic circuits – Magnetically induced EMF and force – AC operation of magnetic circuits –. Energy in magnetic systems – Field energy & mechanical force – Single and Multiple excited systems. MMF of distributed windings – Magnetic fields in rotating machines – Generated voltages – Torque.

UNIT II DC GENERATORS 9

Constructional features of DC machine – Principle of operation of DC generator – EMF equation – Types of excitation – No load and load characteristics of DC generators – commutation – armature reaction – Parallel operation of DC generators.

UNIT III DC MOTORS 9

Principle of operation of DC motors-Back EMF – Torque equation –Types of DC motors-Speed – Torque characteristics of DC motors – Starting of DC motors: 2 point starter, 3 point starter, 4 point starter – Speed control: Field control, Armature control, voltage control, Thyristor control – Losses and efficiency – Applications

UNIT IV TRANSFORMERS 9

Principle of operation – Constructional features of single phase and three phase transformers – EMF equation – Transformer on No load and Load –Phasor diagram --equivalent circuit – Regulation - three phase transformer connections- parallel operation of single phase and three phase transformer- Auto transformers

UNIT V TESTING OF DC MACHINES& TRANSFORMERS

9

Losses and efficiency –Condition for maximum efficiency – Testing of DC machines: Brake test, Swinburne's test, Retardation test, Hopkinson's test- Testing of transformer: polarity test, load test, open circuit and short circuit test, Sumpner's test – All day efficiency.