GOPAL KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

GOURAHARI VIHAR, PO: RANIPUT, JEYPORE – 764 005

LESSON PLAN

Name of the Subject: ELECTRICAL MACHINE - I
Name of the Faculty: DEBASHISH PRAHARAJ
Semester: 3RD Semester **Branch:** ELECTRICAL ENGINEERING
Semester From: July to December **No. of Weeks:** 15 Weeks

Week	Day	Theory / Practical Topics	Classes
1		**Module I – Electromechanical Energy Conversion**	**6**
	1	Introduction to Magnetic Circuits	1
	2	Magnetically Induced EMF and MMF	1
	3	Faraday's Law and Lenz's Law	1
	4	Hysteresis and Eddy Current Losses	1
2		**Module II – DC Generators**	**8**
	5	Principle of DC Generators and Commutator Action	1
	6	Constructional Features and Armature Windings	1
	7	Lap and Wave Windings, Simplex Windings	1
	8	E.M.F. Equation of DC Generator	1
3	9	Methods of Excitation: Separately and Self-excited Generators	1
	10	Build-up of E.M.F., Critical Field Resistance and Critical Speed	1
	11	Armature Reaction: Cross and Demagnetizing AT per Pole	1
	12	Compensating Winding and Reactance Voltage	1
4	13	Commutation and Methods of Improving Commutation	1
	14	Internal and External Characteristics of DC Generators	1
	15	Load Characteristics of Shunt, Series and Compound Generators	1
	16	Parallel Operation of DC Generators	1
5		**Module III – DC Motors**	**8**
	17	Principle of DC Motors, Back EMF and Torque Equation	1
	18	Characteristics and Applications of DC Motors	1
	19	Starting of DC Motors and Need of Starter	1
	20	Losses and Efficiency in DC Motors	1
6	21	Conditions for Maximum Efficiency	1
	22	Speed Control of DC Motors: Armature Voltage Control	1
	23	Field Flux Control and Ward-Leonard Method	1
	24	Testing of DC Machines: Brake Test and Swinburne's Test	1
7		**Module IV – Single-phase Transformers and Auto-transformers**	**8**
	25	Construction and Principle of Single-phase Transformers	1
	26	EMF Equation, Magnetizing Current and Core Losses	1
	27	Phasor Diagram at No-load Condition	1
	28	Phasor Diagram at Load Condition	1
8	29	Equivalent Circuit of Single-phase Transformer	1
	30	Transformer Losses and Efficiency	1
	31	All Day Efficiency	1
	32	Voltage Regulation of Transformers	1
9	33	Polarity Test, OC Test and SC Test	1
	34	Back-to-Back Test	1
	35	Parallel Operation of Transformers	1
	36	Load Sharing of Transformers	1
10	37	Auto-transformers: Construction and Working	1

	38	Copper Saving in Auto-transformers	1
	39	VA Conducted Magnetically and Electrically	1
	40	Applications of Auto-transformers	1
		Module V – Three-phase Transformers	**10**
11	41	Construction of 3-phase Transformers	1
	42	Single Unit versus Bank of Single-phase Transformers	1
	43	3-phase Connections and Phase Displacements	1
	44	Connection Diagrams of Various Vector Groups	1
12	45	Phasor Diagrams of Vector Groups	1
	46	Scott Connection	1
	47	Open Delta Connection	1
	48	Parallel Operation of 3-phase Transformers	1
13	49	Review of Magnetic and Electric Circuit Analogies	1
	50	Energy Conversion Principles in Electrical Machines	1
	51	Solved Numericals on Transformers	1
	52	Solved Numericals on DC Generators	1
14	53	Solved Numericals on DC Motors	1
	54	Viva Discussion and Revision on DC Machines	1
	55	Viva Discussion and Revision on Transformers	1
	56	Model Question Paper Solving Session	1
15	57	Practical and Lab-oriented Discussions	1
	58	Feedback and Doubt Clearing	1
	59	Class Test / Assessment	1
	60	Course Summary and Wrap-up	1

Books Recommended:

1. "Electric Machines","J. Nagrath and D. P. Kothari"– McGraw Hill Education, 2010.
2. "Electrical Machinery","P. S. Bimbhra" – Khanna Publishers, 2011.
3. "Electric Machinery","Fitzgerald, Kingsley & Umans" – Tata McGraw Hill.
4. "Electric Machinery and Transformers","Guru & Hiziroglu" – Oxford University Press, 2010.