SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Electrical & Electronics Engineering	LP: EE22301 Rev. No: 00
B.E/~~B.Tech~~/M.E/M.Tech : EEE (Semester: III) **Regulation:2022** PG Specialisation : N/A Sub. Code / Sub. Name : EE22301– ELECTRICAL MACHINES - I Unit : I	Date: 02.08.2023

Unit Syllabus: **MAGNETIC CIRCUITS AND MAGNETIC MATERIALS** 9

Magnetic circuits – Laws governing magnetic circuits –Flux linkage, Inductance and energy – Statically & Dynamically induced EMF – Torque – Properties of magnetic materials, Hysteresis and Eddy Current losses – AC excitation, Introduction to permanent magnets.

Objective: To introduce techniques of magnetic-circuit analysis and introduce magnetic materials.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to Electrical and Magnetic circuits	1, 2	BB
2	Laws governing magnetic circuits	1, 2	BB
3	Flux linkage, Inductance and energy	1, 2	BB
4	Statically and dynamically induced EMF, Torque	1, 2	BB
5	Properties of magnetic materials, Problems on magnetic circuits	1, 2	BB
6	Hysteresis and Eddy Current losses, Problems on losses	1, 2	PPT, BB
7	AC excitation, Introduction to permanent magnets	1, 2	PPT
8	Problems from induced emf	1, 2	PPT, BB
9	AC operation of magnetic circuits, Problems on magnetic circuits	1, 2	PPT
Content beyond syllabus covered (if any): Concept of coupled circuits.			

* Session duration: 50 minutes

Sub. Code / Sub. Name: **EE22301 – ELECTRICAL MACHINES I**

Unit : II

Unit Syllabus: **TRANSFORMERS** 9

Construction –Principle of operation on no load and load – Equivalent circuit – Phasor diagram – Losses – Testing – Efficiency and Voltage regulation – All day efficiency – Sumpner test, Per unit representation –Three phase transformers – Connections, Scott Connection – Parallel operation of transformers – Auto transformer – tap changing transformers

Objective: Outline the principle of operation, construction, testing of single phase transformers and three phase transformer connections.

Session No *	Topics to be covered	Ref	Teaching Aids
10	Introduction to transformers, Construction, Cooling methods, Principle of operation of Transformer	1,2,9	PPT
11	EMF equation derivation, Transformer operation with no load	1,2,9	PPT
12	Transformer operation with load, Phasor diagram	1,2,9	PPT, BB
13	Equivalent circuit of transformer, Problems from equivalent circuit	1,2,9	PPT, BB
14	Efficiency and voltage regulation, problems discussion	1,2,9	BB
15	Problems on transformer testing, efficiency and voltage regulation	1,2,9	BB
16	All day efficiency, problems discussion	1,2,9	PPT, BB
17	Sumpner's test, Parallel operation of transformers	1,2,9	PPT, BB
18	Auto transformer- Copper saving	1,2,9	PPT, BB
19	Features of Tap changing transformers, three phase transformer - Scott Connection	1,2,9	PPT, BB
Content beyond syllabus covered (if any): Introduction to special type of transformers			

* Session duration: 50 mins

Sub. Code / Sub. Name: **EE22301 – ELECTRICAL MACHINES I**

Unit : IV

Unit Syllabus: **DC GENERATORS** 9

Construction & Components of DC Machines – Cooling, Mounting, Standards & Specifications, Principle of operation – Lap and wave windings – EMF equations – Circuit model – Armature reaction – Methods of excitation – Commutation – Compensating winding – Characteristics of DC generators – Parallel operation of shunt generator – Applications

Objective: Demonstrate the working principle of different types of dc machines and analyze the losses in dc machines to improve the efficiency by conducting various tests

Session No *	Topics to be covered	Ref	Teaching Aids
20	Introduction to DC Machines, Construction & Components of DC Machines	3,4,5,9	PPT
21	Cooling, Mounting, Standards & Specifications, Principle of operation, Lap and wave windings	3,4,5,9	PPT
22	EMF equations, Pitch factor and Distribution factor, Problems on EMF induced in DC Generators	3,4,5,9	BB
23	Circuit model of Shunt, Series and Compound Generator,	3,4,5,9	PPT, BB
24	Methods of excitation, Armature reaction	3,4,5,9	PPT, BB
25	Commutation and inter poles, Need for Compensating winding	3,4,5,9	BB
26	Characteristics of DC Shunt generator, Series generator, Compound generator	3,4,5,9	BB
27	Problems on DC generators	3,4,5,9	BB
28	Parallel Operations, Applications of DC generator.	3,4,5,9	PPT, BB
Content beyond syllabus covered (if any): -			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **EE22301 – ELECTRICAL MACHINES I**

Unit : V

Unit Syllabus: **DC MOTORS** 9

Principle of operation – Types of DC Motors – Back EMF and Torque equations – Speed Torque Characteristics – Starting – Types of Starters – Speed control – Testing and efficiency – Swinburne's test and Hopkinson's test – Permanent magnet dc motors (PMDC) – Applications.

Objective: Study the characteristics and speed control methods of dc machines.

Session No *	Topics to be covered	Ref	Teaching Aids
29	Introduction to DC Motor, Principle and operation of DC Motor	3,4,5,9	PPT
30	Types of DC Motors- Back EMF and Torque Equation, Problem discussion	3,4,5,9	PPT, BB
31	Speed Torque Characteristics of DC Motors	3,6,9	PPT, BB
32	Need for starters, Types of Starters-2, 3,4 Point Starters	3,4,5,9	PPT, BB
33	Speed control methods of DC motors	3,4,5,9	BB
34	Testing and efficiency -Retardation test- Swinburne's test	3,6,9	PPT, BB
35	Problems on Retardation test- Swinburne's test	3,4,5,9	PPT, BB
36	Hopkinson's test - Problems on Hopkinson's test	3,6,9	PPT, BB
37	Permanent magnet dc motors (PMDC), DC Motor applications	3,6,9	PPT

Content beyond syllabus covered (if any):

Introduction to braking methods

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **EE22301 – ELECTRICAL MACHINES I**

Unit : III

Unit Syllabus: **ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS IN ROTATING MACHINES** 9

Energy in magnetic system – Field energy and co-energy – Force and torque equations – Singly and multiply excited magnetic field systems – Generated emf – MMF of distributed windings – Magnetic fields in rotating machines – Rotating mmf waves – Magnetic saturation and leakage fluxes – Torque in round rotor machine.

Objective: Illustrate the theory of electromechanical energy conversion and the concept of co energy

Session No *	Topics to be covered	Ref	Teaching Aids
38	Energy in magnetic system, Field energy and co energy-force and torque equations	1,2,6	PPT
39	Singly excited magnetic field systems, problems discussion	1,2,6	PPT, BB
40	Multiply excited magnetic field systems, Problem discussion	1,2,6	PPT, BB
41	MMF of distributed windings	1,2,6	PPT
42	Winding Inductances, magnetic fields in rotating machines, EMF equation	1,2,6	PPT
43	Rotating MMF waves	1,2,6	PPT
44	Magnetic saturation and leakage fluxes.	1,2,6	PPT
45	Torque equation in round rotor machine	1,2,6	PPT

Content beyond syllabus covered (if any):

Real time applications of singly and multi excited systems.

* Session duration: 50 mins

Sub Code / Sub Name: **EE22301 – ELECTRICAL MACHINES I**

REFERENCES:

1. Nagrath I. J and Kothari D. P. "Electric Machines" Fourth Edition, Tata McGraw Hill Publishing Company Ltd, 2017, 5th Edition
2. P.S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2021.
3. M.N. Bandyopadhyay, "Electrical Machines Theory and Practice", PHI Learning Pvt Ltd., New Delhi, 2009.
4. P. C. Sen, "Principles of Electrical Machines and Power Electronics", John Wiley & Sons, 1997.
5. Deshpande M. V, "Electrical Machines", PHI Learning Pvt. Ltd., New Delhi, 2011
6. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, "Electric Machinery", Sixth edition, Tata McGraw Hill Books Company, 2003.
7. S. Sarma & K. Pathak, "Electric Machines", Cengage Learning India (P) Ltd., Delhi, 2011.
8. Richard C Dorf, "Electrical Power Engineering hand book", CRC Press, 1998.
9. B.L. Theraja, A.K.Theraja,"A textbook of Electrical Technology", Volume II, S. Chand publications, 2012

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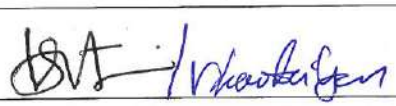
Signature		
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Designation	Assistant Professor	**HoD/EEE**
Date	02/08/2023	02/08/2023
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD