Introduction to Electrical Engineering

SWAYAM Prabha Course Code – E8

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COURSE OUTLINE	**Network theory** • DC and AC sources, Concept of phasor, Single phase circuits, KCL and KVL, Thevenin and Norton Theorems, Nodal and mesh equations, Y-Δ conversion, power calculations • Three phase circuits, Power in three phase circuit. • Magnetic Circuits, mutually coupled circuits **Electrical Machines** • DC Machines Constructional details, Separately & shunt excited DC motors/ generator, Series DC motors, Compound machines, torque speed characteristics, Application of DC motors & generators. • Induction Machine: Constructional equivalent Circuits, Torque- speed characteristics, speed control, starting and application. • Synchronous Machines Constructional, Equivalent circuit, Generator and Motor operation, Power angle characteristics, hunting, pull out. • Single phase Induction motors, Stepper Motors and their Control

COURSE DETAILS

S. No	Module ID/ Lecture ID	Lecture Title/Topic

1	L1	Introduction Basics of circuits elements and electrical quantities
2	L2	AC quantities, Electrical sources (Independent and dependent), Ohm's Law
3	L3	Kirchhoff's Voltage and Current Laws (KVL and KCL) and its application to DC circuits
4	L4	Basics of Resistance, capacitance and Inductance with series and parallel connection
5	L5	Star -Delta Transformation, Source transformation
6	L6	Sinusoids and Introduction to Phasors
7	L7	Single Phase AC circuits, Resistive inductive and capacitive circuits with phasor diagrams
8	L8	Power calculation in AC circuits, solution to AC circuits with example
9	L9	Circuits Solving techniques: Mesh Analysis with matrix representation with example
10	L10	Nodal Analysis with matrix representation with example
11	L11	Useful Theorems: Superposition theorem, Thevenin's and Norton's Theorem, Maximum Power Transfer Theorem (for AC and DC network)
12	L12	Application of theorems to some circuits with dependent and independent sources
13	L13	Three Phase circuits and power calculation in three phase circuits
14	L14	Magnetics circuits, Electrical analogy, and Mutual coupling
15	L15	Transformers, magnetic circuits, equivalent circuits, phasor diagrams for ideal and practical transformers
16	L16	Transformer OC and SC tests with some example to calculate the circuits parameters
17	L17	Per Unit system of measurements, voltage regulation and efficiency
18	L18	Auto Transformer with some examples

19	L19	Three Phase Transformer, star-delta connection, open delta
20	L20	Introduction to DC machines, equivalent circuit, EMF equation, torque calculations, types of DC machines
21	L21	Efficiency calculation, Motoring and Generator mode
22	L22	DC generator equivalent circuits, terminal characteristics of a DC series generators
23	L23	DC series motors operation and characteristics
24	L24	DC separately excited motors operation and characteristics
25	L25	Speed Control of DC separately excited motors
26	L26	DC series and compound generator
27	L27	Analysis of different generators with numerical
28	L28	Induction Motors, working principle equivalent circuits and characteristics
29	L29	Double revolving field theory, cross field theory of single-phase induction motor
30	L30	Starting of single-phase induction motor, different starting mechanism
31	L31	Some numerical Problems on Induction Motors
32	L32	Equivalent circuit of induction motor, motor and modes of operation
33	L33	Three Phase Induction motor, starting mechanism speed torque characteristics
34	L34	Introduction to Synchronous Machines, construction details, equivalent circuits
35	L35	Starting of synchronous machine by reduced frequency, use of external prime mover
36	L36	Synchronous Generators and its synchronization principal
37	L37	Motor Operation and power angle and terminal characteristics
38	L38	Some numerical problems
39	L39	Special motors such as stepper motors and its working principle

40	L40	Some extra topics such as Power distribution systems and electrical safety.