PVP20

ELECTRICAL MACHINES-II

Course Code	20EE3402	**Year**	II	**Semester(s)**	II
Course Category	Professional Core	**Branch**	EEE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	1.Basic Electrical and Electronics Engineering 2.Electrical Machines-I
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Understand** the basic concepts of three phase induction motors, synchronous machines single phase motors and special electrical machines. (L2)
CO2	**Apply** the basic knowledge to obtain the desired parameters and performance characteristics of three phase induction motors. (L3)
CO3	**Apply** the basic knowledge to obtain the desired parameters and performance characteristics of synchronous machines, single phase motors and special electrical machines. (L3)
CO4	**Analyze** the concepts of torque equation, testing techniques and speed control methods of three phase induction motor (L4)
CO5	**Analyze** the concepts of synchronous machines, single phase motors and special electrical machines. (L4)
CO6	**Submit a report** in three phase induction motors, synchronous machines, single phase motors and special electrical machines.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3												2	1
CO3	3												2	1
CO4		3											2	1
CO5		3											2	1
CO6									3	3			2	1

SYLLABUS		
Unit No.	**Contents**	**Mapped CO**
I	**Three phase Induction motors:** Concept of rotating magnetic field, principle of operation, constructional details of squirrel-cage & slip-ring rotor machines, slip, torque-slip characteristics, maximum torque, equivalent circuit and phasor diagram of induction motor.	CO1 CO2 CO4 CO6

II	**Testing of three-phase Induction Motor:** Losses in three phase induction motor, efficiency, no-load and blocked rotor tests, circle diagram and performance evaluation of induction motor, cogging and crawling. **Starting methods of Induction Motors:** Necessity of starter, Direct on Line (DOL), star-delta starter, autotransformer starter and Rotor resistance starter. **Speed Control of Three-phase Induction Motors:** frequency, voltage and rotor resistance control methods, pole changing and cascading of motors. Principle of operation of induction generator.	CO1 CO2 CO4 CO6
III	**Synchronous Generator** Constructional Features of wound rotor and salient pole machines, distributed and concentrated windings, distribution, pitch and winding factors, E.M.F Equation. harmonics in generated e.m.f. – suppression of harmonics, Voltage regulation by synchronous impedance method, M.M.F. method and Z.P.F. method, salient pole alternators, determination of X_d and X_q (Slip test), phasor diagrams. **Parallel operation of alternators** Synchronizing of alternators with infinite bus bars, synchronizing power and torque, parallel operation and load sharing.	CO1 CO3 CO5 CO6
IV	**Synchronous Motors – Principle of Operation** Theory of operation, phasor diagram, variation of current and power factor with excitation , synchronous condenser, mathematical analysis for power developed, V and inverted V curves, hunting and its suppression, methods of starting.	CO1 CO3 CO5 CO6
V	**Single Phase Induction Motor** Classification of single phase induction motors, double revolving field theory – working principle of single phase single winding induction motor – equivalent circuit, no load and blocked rotor tests, spilt phase induction motor, capacitor start motor, capacitor start capacitor run motor, shaded pole motor, ratings and their applications. **Special Electrical Machines** **Principle of Operation:** Stepper Motor, Reluctance Motor, Universal Motor, BLDC Motor. **(Theoretical Analysis Only)**	CO1 CO3 CO5 CO6

Learning Resources
Text Books
1. Electrical Machinery by Dr. P. S Bimbhra- -7/e -Khanna Publishers,2018 2. Electric Machines by I.J. Nagarath and D.P. Kothari,4/e, McGraw Hill, 2010.
Reference Books
1. Electrical Machines by J.B.Gupta, Kataria publications. 2. The Performance and Design of A.C.Machines by M.G.Say, ELBS and Pitman & Sons. 3. Electromachanics-III (Synchronous and single phase machines) by S.Kamakashiah, Right Publishers.
e- Resources
https://nptel.ac.in/courses/108/105/108105131/