COURSE CODE: **1151EE104**	COURSE TITLE: **AC MACHINES**	L	T	P	C
		3	**0**	**0**	**3**

COURSE CATEGORY:

Program Core

PREAMBLE :

The course provides knowledge on various types of AC Generator, AC Motor and recent Special Machines, which moulds the students in relation to the performance characteristics, operating principle, control techniques and appreciate their application.

PREREQUISITE COURSES:

DC Machines & Transformers

RELATED COURSES:

Solid State Drives

COURSE EDUCATIONAL OBJECTIVES:

The objectives of the course are to make the students,

- To feed knowledge on operating principle, regulation of Synchronous Generator
- To feed knowledge on operating principle, Power factor characteristics of Synchronous Motor.
- To educate the operating characteristics of 3 Phase Induction Motor.
- To design and execute control techniques of 3 Phase Induction Motor.
- To provide the concept of Single Phase Induction Motor and Special Machines.

COURSE OUTCOMES :

Upon the successful completion of the course, students will be able to:

CO No.	Course Outcomes	Level of learning domain (Based on revised Bloom's taxonomy)
C01	Explain the operating principle, methods of improving regulation of a Alternator	K2
C02	Analyze the characteristics of dynamic Power factor Compensator	K4
C03	Explain the operating characteristics of 3 phase Induction Motor	K2
C04	Analyze the control strategies of 3 phase Induction Motor	K4
C05	Understand the operating principle of Single Phase Induction and Special Machines.	K2

CORRELATION OF COs AND POs

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M					L	M			L
CO2	L		M	M				L	M			
CO3			M	L				L	M			
CO4				L				L			M	
CO5	M			H				L	M			

COURSE CONTENT:

UNIT I	SYNCHRONOUS GENERATOR	9
Constructional details – Types of rotors – emf equation – Synchronous reactance – Armature reaction – Voltage regulation – E.m.f, mmf, z.p.f and A.S.A methods – Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input – Two reaction theory – Determination of direct and quadrature axis synchronous reactance using slip test – Operating characteristics - Capability curves.		
UNIT II	**SYNCHRONOUS MOTOR**	**9**
Principle of operation – Torque equation – Operation on infinite bus bars - V-curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed.		
UNIT III	**THREE PHASE INDUCTION MOTOR**	**9**
Rotating magnetic field-Constructional details – Types of rotors – Principle of operation – Slip – Equivalent circuit – Slip-torque characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of no load losses – Double cage rotors – Induction generator – Synchronous induction motor.		
UNIT IV	**STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR**	**9**
Need for starting – Types of starters – Stator resistance and reactance, rotor resistance, autotransformer and star-delta starters – Speed control – Change of voltage, torque, number of poles and slip – Cascaded connection – Slip power recovery scheme		
UNIT V	**SINGLE PHASE INDUCTION MOTORS**	**9**
Constructional details of single phase induction motor – Double revolving field theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors - Shaded pole induction motor, reluctance motor, repulsion motor, hysteresis motor, stepper motor and AC series motor.		
		TOTAL: 45 PERIODS

TEXTBOOKS:

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2010.
2. B. L. Theraja and A.K. Theraja, " A Text Book of Electrical Technology", S. Chand Publication, 2002.

REFERENCE BOOKS:

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery',TataMcGraw Hill publishing Company Ltd, 2002.
2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2009.
3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2004.
4. Sheil1.C.Haran, 'Synchronous, Induction and Special Machines', Scitech Publications, 2001.
5. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

ONLINE RESOURCES:

http://nptel.ac.in/courses/108105017/, http://nptel.ac.in/courses/108106072/1