AC MACHINES LABORATORY

IV Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEE106	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 42				Total Classes: 42		

I. COURSE OVERVIEW:

This course is intended to train the students on alternating current machines. It provides hands-on experience by conducting various direct and indirect tests on transformers, synchronous and asynchronous machines to analyse the characteristics of AC machines and separate various losses. This course also enables to develop skills to select, install, operate, and maintain various types of ACmachines and transformers

II. OBJECTIVES:

The course should enable the students to:

I	The elementary experimental and modeling skills for handling problems with electrical machines in industries and domestic applications.
II	The operation of AC machines and its role in power transmission and generating stations.
III	The automation concepts through programmable logic controllers to control the speed and starting current.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Select** suitable testing strategies for evaluating the performance characteristics of transformers.	Apply
CO 2	**Determine** the performance parameters of induction motor byconducting direct and indirect tests.	Evaluate
CO 3	**Explain** the parallel operation of alternators for load sharing undervarious loading conditions.	Evaluate
CO 4	**Distinguish** the synchronous impedance and ampere turns methods for the computation of voltage regulation of an alternator.	Analyze
CO 5	**Estimate** the voltage and current swings in salient pole alternator fordetermination of direct and quadrature axis reactance.	Evaluate
CO 6	**Apply** programmable logic controllers for limiting the starting current ofpoly phase induction motors.	Apply

IV. SYLLABUS:

LIST OF EXPERIMENTS

Expt. 1	**OC AND SC TEST ON SINGLE PHASE TRANSFORMER**

Determine the equivalent circuit parameters; predetermine the efficiency and regulation by open circuit and short circuit test on a single phase transformer.

Expt. 2	**SUMPNER'S TEST**

Predetermine the efficiency and regulation of two identical single phase transformers.

Expt. 3	**SCOTT CONNECTION OF TRANSFORMERS**

Conversion of three phase to two phase using single phase transformers.

Expt. 4	**SEPARATION OF CORE LOSSES IN SINGLE PHASE TRANSFORMER**
Find out the eddy current and hysteresis losses in single phase transformer.	
Expt. 5	**HEAT RUN TEST ON SINGLE PHASE TRANSFORMERS**
Determine the temperature rise in three single phase transformers set.	
Expt. 6	**BRAKE TEST ON THREE PHASE SQUIRREL CAGE INDUCTION MOTOR**
Plot the performance characteristics of three phase induction motor**.**	
Expt. 7	**CIRCLE DIAGRAM OF THREE PHASE SQUIRREL CAGE INDUCTION MOTOR**
Plot the circle diagram and predetermine the efficiency and losses of three phase squirrel cage induction motor.	
Expt. 8	**REGULATION OF ALTERNATOR**
Determine the regulation of alternator using synchronous impedance method.	
Expt. 9	**SLIP TEST ON THREE PHASE SALIENT POLE SYNCHRONOUS MOTOR**
Determination of Xd and Xq in a three phase salient pole synchronous motor.	
Expt. 10	**'V' AND INVERTED 'V' CURVES OF SYNCHRONOUS MOTOR**
Plot 'V' and inverted 'V' curves to study the effect of power factor in synchronous motor.	
Expt. 11	**EQUIVALENT CIRCUIT PARAMETERS OF SINGLE PHASE INDUCTION MOTOR**
Determine the equivalent circuit parameters of a single phase induction motor.	
Expt. 12	**OC AND SC TESTS ON SINGLE PHASE TRANSFORMER USING DIGITAL SIMULATION**
Determine the efficiency and regulation by open circuit and short circuit test in a single phase transformer using digital simulation.	
Expt. 13	**SCOTT CONNECTION OF TRANSFORMERS USING DIGITAL SIMULATION**
Scott connection of single phase transformers using digital simulation.	
Expt. 14	**STARTING AND SPEED CONTROL OF INDUCTION MOTOR USING PLC**
Implementation of star-delta starter using PLC; Speed control of three phase slip ring induction motor with rotor resistance cutting using PLC.	
Reference Books:	
1. P S Bimbhra, "Electrical Machines", Khanna Publishers, 2nd Edition, 2008. 2. M V Deshpande, "Electrical Machines", PHI Learning Private Limited, 3rd Edition, 2011. 3. R K Srivastava, "Electrical Machines", Cengage Learning, 2nd Edition, 2013.	
Web References:	
1 https://www.ee.iitkgp.ac.in 2 https://www.citchennai.edu.in 3 https://www.iare.ac.in	
Course Home Page:	

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

SOFTWARE: MATLAB R2015a and Wpl Soft software

HARDWARE: Desktop Computers (03 nos)

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:

S. No	Name of the Equipment	Range
1	Single phase Transformer	3 KVA
2	Ammeter	0-2.5 / 5A MI
3	Ammeter	0-10 / 20A MI
4	Voltmeter	0-150 / 300V MI
5	Voltmeter	0-300 / 600V MI
6	Wattmeter	5 / 10A, 75 / 150 / 300V LPF
7	Wattmeter	10 / 20A, 150 / 300 / 600V UPF
8	Single phase variac	0-230 / 270V, 8A
9	Three phase variac	0-440 / 470V, 15A
10	Ammeter	0-2A MC
11	Tachometer	0-9999 RPM
12	Rheostats	0-400Ω / 1.7A
13	Three phase Induction Motor	415V, 7.8A, 5HP
14	Single phase Induction Motor	230V, 4.5
15	Three phase Alternator set	415V, 3A, 3 KW
16	Three phase Synchronous motor	415V, 7.8A, 5 HP
17	Resistive Load	5 KW
18	Three phase Transformers	3 KVA