INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

AC MACHINES LABORATORY								
IV Semester: EEE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AEEE14	**Core**	0	0	2	1	40	60	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 36**				**Total Classes: 36**		
Prerequisite: Electrical Circuits								

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 analyze 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 ac machines and transformers tests.

II. COURSES OBJECTIVES:

Thestudentswilltrytolearn

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. COURSEOUTCOMES:

Attheendofthecoursestudentsshouldbeableto:

CO1 Select suitable testing strategies for evaluating the performance characteristics of transformers.
CO2 Determine the performance parameters of induction motor by conducting direct and indirect tests
CO3 Explain the parallel operation of alternators for load sharing under various loading conditions.
CO4 Distinguish EMF and MMF methods for the computation of voltage regulation of an alternator
CO5 Estimate voltage and current swings in salient pole alternator for determination of direct and quadrature axis reactance.
CO6 Apply programmable logic controllers for limiting the starting current of poly-phase induction motors.

IV. COURSE CONTENT:

EXERCISE-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

EXERCISE -2: SUMPNER'S TEST

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

EXERCISE -3: LOAD TEST ON SINGLE PHASE TRANSFORMERS

Determination of efficiency by load test on a single-phase transformer

EXERCISE -4: SCOTT CONNECTION OF TRANSFORMERS

Conversion of three phases to two phase using single phase transformers

EXERCISE -5: SEPERATION OF CORE LOSSES IN SINGLE PHASE TRANSFORMER

Find out the eddy current and hysteresis losses in single Phase Transformers

EXERCISE -6: HEAT RUN TEST ON SINGLE PHASE TRANSFORMERS.

Determine the temperature rise in three single phase transformers set

EXERCISE -7: BRAKE TEST ON THREE PHASE SQUIRREL CAGE INDUCTION MOTOR

Plot the performance characteristics of three phase Induction Motor

EXERCISE -8: 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

EXERCISE -9: REGULATION OF ALTERNATOR BY EMF METHOD

Determine the regulation of alternator using synchronous impedance method

EXERCISE -10: REGULATION OF ALTERNATOR BY MMF METHOD

Determine the regulation of alternator using amperes turns method

EXERCISE -11: SLIP TEST ON THREE PHASE SALIENT POLE SYNCHRONOUS MOTOR

Determination of Xd and Xq in a three-phase salient pole synchronous motor

EXERCISE -12: 'V' AND INVERTED 'V' CURVES OF SYNCHRONOUS MOTOR

Plot V and inverted V curves to study the effect of power factor in synchronous motor

EXERCISE -13: EQUIVALENT CIRCUIT PARAMETERS OF SINGLE-PHASE INDUCTION MOTOR

Determine the equivalent circuit parameters of a single-phase induction motor

EXERCISE -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

V. TEXTBOOKS:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I.J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

VI. REFERENCEBOOKS:

1. Prithwiraj Purkait, Indrayudh Bandyopadhyay, "Electrical Machines", Oxford, 2017.

2. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.
4. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers, 2004.

VII. ELECTRONICSRESOURCES:

1. https://nptel.ac.in/courses/108102146
2. https://nptel.ac.in/courses/108105131

VIII. MATERIALS ONLINE

1. Course Outline Description
2. Lab Manual