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**
AEED13	**Core**	0	0	2	1	40	60	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 45**				**Total Classes: 45**		
Pre-requisite: Electrical Circuits, Linear Algebra and Calculus								

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.

II. COURSE OBJECTIVES:
The students will try to learn:

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:

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 the synchronous impedance and ampere turns methods for the computation of voltage regulation of an alternator.
CO5 Estimate the 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:

Week–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

Week–2: SUMPNER'STEST
Predetermine the efficiency and regulation of two identical single phase transformers

Week–3: LOADTESTON SINGLE PHASE TRANSFORMERS
Determination of efficiency by load test on a single phase transformer

Week–4: SCOTTCONNECTIONOFTRANSFORMERS
Conversion of three phase to two phase using single phase transformers

Week–5: SEPERATION OF CORE LOSSES IN SINGLE PHASE TRANSFORMER
Find out the eddy current and hysteresis losses in single Phase Transformers

Week–6: HEAT RUN TEST ON SINGLE PHASE TRANSFORMERS
Determine the temperature rise in three single phase transformers set

Week–7: BRAKE TEST ON THREE PHASE SQUIRREL CAGE INDUCTION MOTOR
Plot the performance characteristics of three phase Induction Motor

Week–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

Week–9: REGULATION OF ALTERNATOR BY EMF METHOD
Determine the regulation of alternator using synchronous impedance method

Week–10: REGULATION OF ALTERNATOR BY MMF METHOD
Determine the regulation of alternator using amperes turns method

Week–11: SLIP TEST ON THREE PHASE SALIENT POLE SYNCHRONOUS MOTOR
Determination of Xd and Xq in a three phase salient pole synchronous motor

Week–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.

Week–13: EQUIVALENT CIRCUIT PARAMETERS OF SINGLE PHASE INDUCTION MOTOR
Determine the equivalent circuit parameters of a single phase induction motor

Week–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. REFERENCE BOOKS:

1. P S Bimbhra, "Electrical Machines", Khanna Publishers,2nd edition,2008.
2. M G Say, E O Taylor, "Direct Current Machines", Longman Higher Education,1st edition,1985.
3. Hughes,"ElectricalTechnology",PrenticeHall,10th edition,2015.
4. Nesimi Ertugrul, "LabVIEW for Electric Circuits, Machines, Drives, and Laboratories", Prentice Hall, 1st edition, 2002.
5. Gupta, Gupta &John,"VirtualInstrumentationUsingLabVIEW",TataMcGraw-Hill,1st edition,2005.

VI. WEBREFERENCES:

1. https://www.ee.iitkgp.ac.in
2. https://www.citchennai.edu.in
3. https://www.iare.ac.in/

VII. REFERENCEBOOKS:

1. P S Bimbhra, "Electrical Machines", Khanna Publishers, 2nd edition,2008.
2. M G Say, E O Taylor,"Direct Current Machines", Longman Higher Education, 1st edition,1985.
3. Hughes, "Electrical Technology", PrenticeHall, 10th edition,2015.
4. NesimiErtugrul, "LabVIEW for Electric Circuits, Machines, Drives, and Laboratories", Prentice Hall, 1st edition, 2002.
5. Gupta, Gupta & John,"Virtual Instrumentation Using Lab VIEW", Tata McGraw-Hill, 1st edition,2005.

VIII. WEBREFERENCES:

1. https://www.ee.iitkgp.ac.in
2. https://www.citchennai.edu.in
3. https://www.iare.ac.in/