

## AC MACHINES LABORATORY

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

### OBJECTIVES:

**The course should enable the students to:**

1. Evaluate losses and determine the efficiency of single phase and three phase electrical machines
2. Determine the voltage regulation, efficiency and temperature rise in various transformers
3. Apply PLC and digital simulation software to gain practical knowledge.

### COURSE LEARNING OUTCOMES (CLOs)

**At the end of the course, the student will have the ability to:**

1. Calculate the efficiency and regulation of single phase transformer by conducting open circuit and short circuit test
2. Calculate the efficiency of single phase transformer by conducting sumpner's test
3. Classify the different types of losses occurred in transformers and separate the each loss from other loss by conducting a suitable test.
4. Describe the operation of scott connection to convert three phase supply to two phase supply or vice versa.
5. Examine the rise in temperature of a transformer by heat run test
6. Determine the efficiency of single phase transformer by load test
7. Draw the circle diagram to find the efficiency of three phase induction motor by conducting no load and blocked rotor tests.
8. Determine the efficiency and slip by brake test on three phase squirrel cage induction motor
9. Estimate the regulation of an alternator by different methods of testing.
10. Determination of  $X_d$  and  $X_q$  in a three phase salient pole synchronous motor
11. Draw the 'V' and 'inverted-V' curves of synchronous motor
12. Determine the equivalent parameters of single phase induction motor by suitable tests.
13. Determine the efficiency of single phase transformer by digital simulation.
14. Describe the operation of scott connection to convert three phase supply to two phase supply or vice versa by digital simulation

### LIST OF EXERCISES

<b>Week - 1</b>	<b>OC AND SC TEST ON SINGLE PHASE TRANSFORMER</b>
Determine the equivalent circuit parameters; predetermine the efficiency and regulation by open circuit and short circuit test in a single phase transformer.	
<b>Week - 2</b>	<b>SUMPNER'S TEST</b>
Predetermine the efficiency and regulation of two identical single phase transformers.	
<b>Week - 3</b>	<b>SCOTT CONNECTION OF TRANSFORMERS</b>
Conversion of three phases to two phase using single phase transformers.	

<b>Week - 4</b>	<b>SEPARATION OF CORE LOSSES IN 1 - <math>\phi</math> TRANSFORMER</b>
Find out the Eddy current and Hysteresis losses in single phase transformer	
<b>Week - 5</b>	<b>HEAT RUN TEST ON 1- <math>\phi</math> TRANSFORMER</b>
Determine the temperature rise in a 1- $\phi$ transformer using back-back test.	
<b>Week - 6</b>	<b>LOAD TEST ON SINGLE PHASE TRANSFORMER</b>
To determine the efficiency and regulation of single phase transformer by conducting load test.	
<b>Week - 7</b>	<b>BRAKE TEST ON 3- <math>\phi</math> SQUIRREL CAGE INDUCTION MOTOR</b>
Plot the performance characteristics of three phase induction motor.	
<b>Week - 8</b>	<b>CIRCLE DIAGRAM OF 3 - <math>\phi</math> SQUIRREL CAGE INDUCTION MOTOR</b>
Plot the circle diagram and predetermine the efficiency and losses of 3 - $\phi$ squirrel cage induction motor	
<b>Week - 9</b>	<b>REGULATION OF ALTERNATOR</b>
Determine the regulation of alternator using synchronous impedance method.	
<b>Week - 10</b>	<b>SLIP TEST ON 3- <math>\phi</math> SALIENT POLE SYNCHRONOUS MOTOR</b>
Determination of $X_d$ and $X_q$ in a three phase salient pole synchronous motor.	
<b>Week - 11</b>	<b>‘V’ AND ‘INVERTED –V’ CURVES OF SYNCHRONOUS MOTOR</b>
Plot ‘V’ and ‘inverted –V’ curves to study the effect of power factor in synchronous motor.	
<b>Week - 12</b>	<b>NO-LOAD AND BLOCKED ROTOR TEST ON 1 - <math>\phi</math> INDUCTION MOTOR</b>
Determine the equivalent circuit parameters of a single phase induction motor.	
<b>Week - 13</b>	<b>DETERMINATION OF LOSSES IN 1- <math>\phi</math> TRANSFORMER USING DIGITAL SIMULATION</b>
Determine the efficiency and regulation by open circuit and short circuit test in a single phase transformer using digital simulation.	
<b>Week - 14</b>	<b>THREE PHASE TO TWO PHASE CONVERSION IN 1- <math>\phi</math> TRANSFORMER USING DIGITAL SIMULATION</b>
Scott connection of transformer using digital simulation.	
<b>Text books</b>	
<ol style="list-style-type: none"> <li>1. P S Bimbra, “Electrical Machines”, Khanna Publishers, 2<sup>nd</sup> Edition, 2008.</li> <li>2. Kothari, “Electrical Machines”, TMH publication, 3<sup>rd</sup> Edition, 2010.</li> <li>3. B. L Thereja, A.K Thereja Charles Kingsley JR., Stephen D U mans, “Electric Machinery”, McGraw-Hill, 6<sup>th</sup> Edition, 1985.</li> </ol>	
<b>References</b>	
<ol style="list-style-type: none"> <li>1. J B Gupta, “Theory and Performance of Electrical Machines”, S K Kataria &amp; Sons Publication, 14<sup>th</sup> Edition, 2010</li> <li>2. M G Say, “Alternating Current Machines”, Pitman Publishing Ltd, 4<sup>th</sup> Edition, 1976.</li> <li>3. S K Bhattacharya, “Electrical Machines”, TMH publication, 2<sup>nd</sup> Edition, 2006.</li> </ol>	
<b>Web References:</b>	
<ol style="list-style-type: none"> <li>1. <a href="https://www.ee.iitkgp.ac.in">https://www.ee.iitkgp.ac.in</a></li> <li>2. <a href="https://www.citchennai.edu.in">https://www.citchennai.edu.in</a></li> <li>3. <a href="https://www.iare.ac.in">https://www.iare.ac.in</a></li> </ol>	