NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OUTLINE TEMPLATE			
Course Title	SYNCHRONOUS AND INDUCTION MACHINES LABORATORY		
Course Code	EELR13	No. of Credits	2
Department	Electrical and Electronics Engineering	Faculty	Dr. S. Senthil Kumar
Pre-requisite Course	DC MACHINES AND TRANSFORMERS LABORATORY		
Course Coordinator	Dr. S. Senthil Kumar		
E-mail	dcmteeebsection@gmail.com	Telephone No.	0431 – 2503261
Course Type	Core course		

COURSE OVERVIEW

Most industries today are being equipped with electrical drives and locomotives thanks to the easy controllability and modular structure. This creates an urge among the electrical engineers to know about the basics of electrical machines in particular ac machines since they are used in most industrial drives. These electric drives are well known for the flexible and effective controllability. Hence it also becomes important to know about the methods of implementing various speed control techniques and braking mechanisms for these machines.

Such requirements have motivated to frame this course as core course for electrical engineering students. This course syllabus has been framed such that the initial topics deal with the constructional details and working principle of the rotating ac machines and upon completion would help the students to choose appropriate machine for various industrial applications. After designing any machine, it becomes inevitable to validate the design and hence an appropriate model for any machine becomes necessary. Hence equivalent circuit model is also being given focus in this course and further analysis of the performance of the machine is also given focus.

Hence on completion of this course a B.Tech. Student upon graduating as Electrical Engineer would have a basic knowledge on choice of appropriate ac machine drive for various industrial applications with appropriate control strategy.

COURSE OBJECTIVES

To expose the students to the basic concepts of various types of electrical machines such as AC insduction and Synchronous Machines and their applications. The students will be exposed to the relevant performance characteristics and their control techniques of such electrical machines.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
Upon completion of the course, the students will be able to	
1. Estimate or test the performance of induction and synchronous machines by conducting suitable experiments and report the results.	PO_1, PO_2, $PO_8 - PO_{14}$
2. Simulate / Experiment and analyse the speed control techniques for three phase induction motors.	PO_1, PO_2, $PO_8 - PO_{14}$
3. Evaluate the different modes of operating the induction generators and justify their usage in wind power generation.	PO_1, PO_2, $PO_8 - PO_{14}$
4. Simulate / Experiment synchronization of alternators and power exchange with the grid to get convinced with their usage at conventional power generation stations	PO_1, PO_2, $PO_8 - PO_{14}$
5. Develop simulation models and prototype modules in view of implementing any control technique upon single phase and three phase induction motors for various applications	PO_1, PO_2, $PO_8 - PO_{14}$

COURSE TEACHING AND LEARNING ACTIVITIES

S. No.	Week	Topic (simulation & demo)	Mode of Delivery (Online)
1.	Week -1 29th – 31st December 2021, **3 hrs**	Course plan details General introduction	Lecture PPT / Experimentation /Simulation /analysis
2.	Week -2 3rd – 7th January 2022, **3 hrs**	Load test on three phase induction motor	

3.	Week -3 10th – 13th January 2022, **3 hrs**	No-load and Blocked rotor test on three phase induction motor – determination of machine parameters	Experimentation /Simulation /analysis
4.	Week - 4 17th – 21st January 2022, **3 hrs**	Speed control of a three-phase induction motor	
5.	Week - 5 24th – 28th January 2022, **3 hrs**	Load test on Single phase induction motor	
6.	Week - 6 31st January – 4th February 2022, **3 hrs**	Load test on three phase alternators	
7.	Week - 7 7th – 11th February 2022, **3 hrs**	**Assessment - 1**	
8.	Week - 8 14th – 18th February 2022, **3 hrs**	Synchronization of three phase alternator with infinite bus bar	
9.	Week - 9 21st – 23rd February 2022, **3 hrs**	V and inverted V curves – synchronous motor	
10.	Week - 10 1st -4th March 2022, **3 hrs**	Load test on grid connected induction generator	
11.	Week - 11 7th – 11th March 2022, **3 hrs**	**Assessment - 2**	Report submission and viva for three phase Synchronous Machine experiments
12.	Week - 12 14th– 17thMarch 2022, **3 hrs**	Load test on self-excited induction generator	Experimentation /Simulation /analysis
13.	Week - 13 21st– 25thMarch 2022, **3 hrs**	Voltage regulation of three phase alternators	

14.	Week - 14 28th March– 1st April 2022, 3 hrs	**Assessment - 3**	Mini Project / Group Activity / Technical quiz related induction and synchronous machine experiments
15.	Week - 15 4th – 8th April 2022, 3 hrs	Introduction to Virtual Lab / Compensation Lab Sessions	Experimentation /Simulation /analysis
16.	Week - 16 11th – 13th April 2022, 3 hrs	Final Assessment for Lab Courses starts **Assessment - 4**	

COURSE ASSESSMENT METHODS

S. No.	Assessment	Type of assessment	Duration	% Weightage
1.	**Assessment - 1**	Interim assessment – report submission and viva – voce for induction motors	One session	**25% (15% +10%)**
2.	**Assessment - 2**	Interim assessment – report submission and viva – voce for synchronous machines	One session	**25% (15% +10%)**
3.	**Assessment - 3**	Mini – project – Group activity	One session	**20% (10% +10%)**
4.	**Assessment - 4**	Technical quiz related to experiments done during regular lab sessions	One hour	**30%**

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

1. Dr. P.S. Bhimbra, 'Electrical Machinery', Khanna Publications, 7th Edition, 2007.
2. Nagrath, I.J.and Kothari, D.P., 'Electrical Machines', Tata McGraw Hill Education Private Limited Publishing Company Ltd., 4th Edition, 2010.
3. M. G. Say, 'Performance and design of Alternating Current Machines', John Wiley and Sons Publications, 3rd Edition ,1983.
4. Arthur Eugene Fitzgerald and Charles Kingsley, 'Electric Machinery', Tata McGraw Hill

Education Publications, 6th Edition, 2002.

5. Miller, T.J.E., 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press- Oxford, 1989.
6. Parkar Smith, N.N., 'Problems in Electrical Engineering', CBS Publishers and Distributers, 9th Edition, 1984.

COURSE EXIT SURVEY

1. Students' feedback through class committee meetings
2. Feedback questionnaire from students – twice during the semester
3. Feedback from students on Course Outcomes at the end of the semester

COURSE POLICY

1. All the students are expected to attend all the laboratory sessions.
2. Students who are absent for regular laboratory sessions have to take steps to redo the particular experiments by their own efforts and no extra laboratory sessions would be arranged
3. Relative grading with a passing minimum is as per our institute norms.

ADDITIONAL COURSE INFORMATION

1. The Course Coordinator is available for consultation during the time intimated to the students then and there.
2. All correspondence will be sent to the webmail id of the students alone. Hence all students are advised to check their webmail ids regularly.
3. The students will communicated through the email id : dcmteeebsection@gmail.com for any academic related issues (including sharing of study materials) with respect to this course.

FOR SENATE'S CONSIDERATION

[Dr. S. Senthil Kumar, AP/EEE]
Course Faculty

CC-Chairperson

HoD/Dept. of EEE (i/c)
25/01/2022

Guidelines

a) The number of assessments for any theory course shall range from 4 to 6.

b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.

c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.

d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.

f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.

g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.