NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OUTLINE TEMPLATE			
Course Title	SYNCHRONOUS AND INDUCTION MACHINES LABORATORY		
Course Code	EE212	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	senthhilanitha@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. Th ese 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

The main objective of the course is to give the students an insight into the constructional details of the induction and synchronous machines with a view of better understanding of their working principles. The course also equips the students to test and evaluate the performance of induction and synchronous machines by conducting appropriate experiments.

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. 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. 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	Mode of Delivery
1.	I week of January (4^{th} – 6^{th}) **1 hr**	Introduction to the course and flexible mode of course delivery	**Discussion in class**
2.	II week of February (6^{th} – 10^{th})	Load test on three phase induction motor	**Experimental analysis**

3.	III week of February (13^{th} – 17^{th})	No-load and Blocked rotor test on three phase induction motor – determination of machine parameters	**Experimental analysis**
4.	IV week of February (20^{th} – 24^{th})	Speed control of a three-phase induction motor	**Demonstration by students**
5.	II week of March (6^{th} – 10^{th})	**Assessment 1 (Interim)**	**Report submission and viva for three phase induction motor experiments**
6.	III week of March (13^{th} – 17^{th})	Load test on grid connected induction generator	**Experimental analysis**
7.	V week of March (27^{th} – 31^{st})	Single phase induction motor – different connections in practical applications	**Demonstration by students**
8.	I week of April (3^{rd} – 7^{th})	**Assessment 2**	**Mini – project Group activity**
9.	II week of April (10^{th} – 14^{th})	Load test and voltage regulation of three phase alternators	**Experimental analysis**
10.	III week of April (17^{th} – 21^{st})	Synchronization of three phase alternator with infinite bus bar	**Demonstration by students**
11.	III week of April (17^{th} – 21^{st})	V and inverted V curves – synchronous motor	**Experimental analysis**
12.	IV week of April (24^{th} – 29^{th})	**Assessment 3**	**Report submission and viva for three phase synchronous machine experiments**

13.	IV week of April (24^{th} – 29^{th})	**Assessment 4**	**Technical quiz related to experiments done during regular lab sessions**

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	**30%**
2.	**Assessment 2**	Mini – project – Group activity	One session	**30%**
3.	**Assessment 3**	Interim assessment – report submission and viva – voce for synchronous machines	One session	**30%**
4.	**Assessment 4**	Technical quiz related to experiments done during regular lab sessions	One hour	**10%**

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 : senthhilanith@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]		**HoD/Dept. of EEE**
Course Faculty	**CC-Chairperson** 7/1/17	