DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Course Title	SYNCHRONOUS AND INDUCTION MACHINES LABORATORY		
Course Code	EE212	No. of Credits	2
Course Code of Pre-requisite subject(s)			
Session	January 2018	Section (if, applicable)	B
Name of Faculty	Dr. S. Senthil Kumar	Department	Electrical and Electronics Engineering
Email	skumar@nitt.edu	Telephone No.	0431-2503261
Name of Course Coordinator(s) (if, applicable)			
Email		Telephone No.	
Course Type	☑ Core course	☐ Elective course	

Syllabus (approved in BoS)

A demonstration of the static and rotational electrical machines (constructional details) is ought to be done in an introductory class.

1. Load test on 3 phase induction motor
2. No load and blocked rotor test on 3 phase induction motor
3. Load test on grid connected induction generator
4. Load test on self-excited induction generator
5. Load test on single phase induction motor
6. Regulation of three phase alternator by E.M.F and M.M.F methods
7. Load test on three phase alternator
8. Synchronisation of three phase alternator with infinite bus bar
9. V and inverted V-curves of synchronous motor
10. Speed Control on three phase induction motor

Mini project

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 PLAN – PART II
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 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 – voice for synchronous machines	One session	**30%**
4	**Assessment 4**	Technical quiz related to experiments done during regular lab sessions	One hour	**10%**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Feedback from the students during class committee meetings
Anonymous feedback through questionnaire

COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, , academic honesty and plagiarism etc.)

MODE OF CORRESPONDENCE (email/ phone etc)

1. All the students are advised to check their NITT WEBMAIL regularly. All the correspondence (schedule of classes/ schedule of assessment/ course material/ any other information regarding this course) will be done through their webmail.
2. Queries (if required) may be emailed to me / contact me during 4.00 pm to 5.00 pm on Monday and Friday with prior intimation for any clarifications.

ATTENDANCE

1. Attendance will be taken by the faculty in all the contact hours. Every student should maintain minimum 75 % physical attendance in these contact hours to attend the end semester examination.
2. Any student, who fails to maintain 75% attendance needs to appear for the compensation assessemnt (CPA). Student who scores more than 60 % marks in the CPA will be eligible for attending the end semester examination.
3. Students not having 75% minimum attendance at the end of the semester and also fail in CPA (scoring less than 60%) will have to RE DO the course.

COMPENSATION ASSESSMENT

1. If any student is not able to attend any one of the assessments due to genuine reasons, student is permitted to attend the compensation assessment (CPA).

ACADEMIC HONESTY & PLAGIARISM

1. All the students are expected to be genuine during the course work. Taking of information by means of copying simulations, assignments, looking or attempting to look at another student's paper or bringing and using study material in any form for copying during any assessments is considered dishonest.
2. Tendering of information such as giving one's program, simulation work, assignments to another student to use or copy is also considered dishonest.
3. Preventing or hampering other students from pursuing their academic activities is also considered as academic dishonesty.
4. Any evidence of such academic dishonesty will result in the loss of marks on that assessment. Additionally, the names of those students so penalized will be reported to the class committee chairperson and HoD for necessary action.
5. Students who honestly producing ORIGINAL and OUTSTANDING WORK will be REWARDED.

ADDITIONAL INFORMATION

FOR APPROVAL

Course Faculty _____ **CC-Chairperson** _____ 19/01/18 **HOD** _____ 19/01/2018