IV Semester

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	B.Tech- Mechanical Engineering		
Course Title	APPLIED ELECTRICAL AND ELECTRONICS ENGINEERING (Theory & Practical)		
Course Code	MEPC13	No. of Credits	4
Course Code of Pre-requisite subject(s)	EEIR11		
Session	July 2020	Section	2nd year A & B
Name of Faculty	Mr. Sreenu Sreekumar	Department	EEE
Official Email	sreekumarsreenu@gmail.com sreenu@nitt.edu	Telephone No.	8094131762
Name of Course Coordinator(s) (if, applicable)			
Official E-mail		Telephone No.	
Course Type (please tick appropriately)	Core course	Elective course	

Syllabus (approved in BoS)

Theory:

Three-phase induction motor - Cage and slip ring motors -torque slip characteristics –equivalent circuit - starting and speed control of induction motors – applications.

Single phase induction motors and universal motors- applications. Synchronous motors – principle of operation, starting and applications.

Electric drive for general factory, textile mill, cement mill - pump, blowers, hoists, traction etc. - group and individual drives. Choice of motors for various applications – drive characteristics and control of drives.

Introduction to operational amplifiers – applications in control circuits. Combinational logic - representation of logic functions – SOP and POS forms K-map representations – minimization using K maps - simplification and implementation of combinational logic – multiplexers and demultiplexers – Introduction to micro-processors and micro-controllers

Control systems – introduction – block diagram reduction – Routh Hurwitz Criterion based stability analysis – implementation of control logics to drives.

List of experiments:

1. Speed control of three phase induction motor
2. Load test on three phase induction motor

3. Load test on single phase induction motor
4. Realization of integrator and differentiator using operational amplifiers
5. Simulation of performance of three phase induction motor using control blocks

COURSE OBJECTIVES

To provide the key concepts about AC motors and thereby able to choose the appropriate drives for various applications.

To equip students to understand and apply the basic concepts of control techniques used for drives in industries and to appraise the implementation of various control circuits

MAPPING OF COs with Pos

Course Outcomes	Programme Outcomes (PO)
At the end of the course student will be able to 1. Analyse the performance of AC motors under various operating conditions using their various characteristics. 2. Choose appropriate motor for various applications in industries 3. Design and analyse combinational logic circuits. 4. Understand the architecture and instruction set of 8085. 5. Analyse the various control logics for industrial drive applications	

PO	CO_1	CO_2	CO_3	CO_4
1	H	H	H	H
2	H	H	H	H
3	L	L	L	L
4	M	M	M	M
5	H	H	H	H
6	L	M	L	M
7	M	H	L	L
8	H	H	H	H
9	H	M	H	H
10	H	H	H	H
11	M	M	H	H
12	L	H	L	L
13	L	H	H	L
14	M	H	H	H

COURSE PLAN – PART II

COURSE OVERVIEW

Electrical as well as electronic equipments such as electrical motors, control systems, microprocessors and digital controllers are widely used in mechanical engineering applications and a mechanical engineer have to identify the related equipment being used in the industry with respect to their working, major characteristics and major faults that could occur. Therefore, this course will help the student to acquire the requisite knowledge and skills.

COURSE TEACHING, LAB EXPERIMENTS AND LEARNING ACTIVITIES

S.No	Week/Contact Hours	Topic	Mode of Delivery
1.	Week 1 06-10 January 2020 (4 Contact hours)	Basic AC fundamentals and Transformer (pre-requisites)	Chalk & Talk/PPT
2.	Week 2 13-17 January 2020 (4 Contact hours)	Three-phase induction motor - Cage and slip ring motors	Chalk & Talk/PPT

3.	Week 3 20-24 January 2020 (3 Contact hours)	Torque slip characteristics – equivalent circuit - starting and speed control of induction motors – applications	Chalk & Talk/PPT
4.	Week 4 27-31 January 2020 (4 Contact hour)	Single phase induction motors	Chalk & Talk/PPT
5.	Week 5 03 - 07 Feb 2020 (4 Contact hours)	Universal motors- applications.	Chalk & Talk/PPT
6.	Week 6 10 - 14 Feb 2020 (4 Contact hours)	Lab Session (Experiments: 1 and 2)	Experiment
7.	Week 7 17 - 21 Feb 2020 (4 Contact hours)	Synchronous motors – principle of operation, starting and applications.	Chalk & Talk/PPT
8.	Week 8 24 - 28 Feb 2020 (4 Contact hour)	Electric drive for general factory, textile mill, cement mill - pump, blowers, hoists, traction etc. - group and individual drives.	Chalk & Talk/PPT
9.	Week 9 02 – 06 Mar 2020 (4 Contact hours)	Choice of motors for various applications – drive characteristics and control of drives	Chalk & Talk/PPT
10.	Week 10 11 - 12 Mar 2020 (2 Contact hours)	Introduction to operational amplifiers – applications in control circuits.	Chalk & Talk/PPT
11.	Week 11 16 - 20 Mar 2020 (4 Contact hours)	Lab Session (Experiments: 3)	Experiment
12.	Week 12 23 - 27 Mar 2020 (4 Contact hours)	Combinational logic - representation of logic functions – SOP and POS forms K-map representations – minimization using K maps	Chalk & Talk/PPT
13.	Week 13 30 Mar – 03 Apr 2020 (4 Contact hours)	Simplification and implementation of combinational logic – multiplexers and demultiplexers	Chalk & Talk/PPT
14.	Week 14 06 - 10 Apr 2020 (3 Contact hours)	Introduction to micro-processors and micro-controllers	Chalk & Talk/PPT

15.	Week 15 13 - 17 Apr 2020 (4 Contact hours)	Control systems – introduction – block diagram reduction, Routh Hurwitz Criterion based stability analysis, Implementation of control logics to drives.	Chalk & Talk/PPT
16.	Week 16 20 - 24 Apr 2020 (4 Contact hours)	Lab Session (Experiments: 4 &5)	Experiment
17.	Week 16 20 - 24 Apr 2020 (45 minutes)	*Compensation Assessment (CPA)*	
18.	Week 17 27 Apr – 13 May 2020 (90 minutes)	*End Semester Examination* (Final *Assessment*)	

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week	Duration	% Weightage
1	Ist Class Test	Week 7 17 – 21 Feb 2020	45 minutes	15
2	IInd Class Test	Week 14 06 - 10 Mar 2020	45 minutes	15
3	Surprise test/ Assignments/Seminar/Home works/Other leraning activities	Continuous evaluation (Throughout the semester)		20
4	Lab experiments (5)	Continuous evaluation (Throughout the semester) Viva -2 marks, Experiment and record-2 marks for each experiment		20
CPA	Compensation Assessment	Week 16 20 - 24 Apr 2020	45 minutes	15
4	Final Assessment	Week 17/18 27 Apr – 08 May 2020	90 minutes	30

ESSENTIAL READINGS: Textbooks, Refernce books, website address, journals,etc

Text Books:

1. Mehta V K and Rohit Mehta, 'Principles of Electrical Machines', S Chand and company Ltd., 2006.
2. Dubey G K , 'Fundamentals of Electric drives', Narosa book distributors pvt. ltd , 2nd edition, 2012.
3. Ramesh S. Gaonkar, 'Microprocessor Architecture Programming and Applications with 8085', Penram Intl. Publishing, 6th edition, 2013.
4. Morris Mano, Michael D Ciletti, 'Digital Design', Pearson Education, 4th edition, 2008.
5. Theraja B L,'A TextBook of Electrical Technology', vol 2,S Chand,23rd edition,2007.
6. Vincent Del Toro, 'Electrical Engineering Fundamentals', PHI, 2nd edition, 2009.
7. Subrahmanyan V, 'Thyristor control of Electric Drives', Tata McGraw Hill, 1st edition.

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COURSE EXIT SURVEY

- Feedback from the students during class committee meetings
- Anonymous feedback through questionnaire (Mid of the semester & End of the semester)
- End semester feedback on course outcomes

COURSE POLICY (including compensation assessment to be specified)

1. Attending all the assessments mandatory for every student
2. One compensation assessment will be conducted for those students who are being physically absent for the assessment 1 and/or 2, only for the valid reason.
3. At any case CPA will not be considered as an improvement test.
4. Absolute/Relative grading will be adopted for the course.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

FOR APPROVAL

Course Faculty 07/01/2020 CC- Chairperson Jan. 7, 2020 Dr. R.B. Anand HOD

Head
Department of Mechanical Engg.
National Institute of Technology,
Tiruchirappalli 620 015.

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.