

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE			
Course Title	DC MACHINES AND TRANSFORMERS		
Course Code	EEPC12	No. of Credits	04
Department	ELECTRICAL AND ELECTRONICS	Faculty	Dr. M. Venkata Kirthiga
Pre-requisites Course Code	NIL		
Course Coordinator(s) (if, applicable)	Not Applicable		
Other Course Teacher(s)/Tutor(s) E-mail	eeacmachines@gmail.com	Telephone No.	0431-250 3263 9942419772
Course Type	<input checked="" type="checkbox"/> Core course	<input type="checkbox"/> Elective course	

COURSE OVERVIEW

An Electrical Machine is an electro-mechanical energy converter. It is a device that converts either mechanical energy to electrical energy - *generator* or electrical energy to mechanical energy - *motor*. An electrical machine is a dual machine and hence each machine can be used as either generator or a motor. Almost all practical electrical machines convert energy from one form to another through the action of a magnetic field. Electrical machines provide green energy production and hence insight into such machines, their design and working principles become inevitable for an electrical engineer. Only machines using magnetic fields as medium of energy conversions are considered in this course.

The *transformer* is an electrical device that transforms AC electrical energy at one voltage level to another voltage level, operated at same frequency. Since transformers also operate on the principle of electromagnetic induction, similar to generators and motors, depending on the action of magnetic field to accomplish the change in voltage level, they are usually studied together with electrical machines. Moreover transformers play a major role in power transfer in large power systems. Hence transformers are also taught along with the electrical machines.

These three types of electric devices are ubiquitous in modern daily life. Electric motors are used widely in the home run refrigerators, freezers, vacuum cleaners, blenders, air conditioners, fans and many similar appliances. In the workplace, motors provide the motive power for all tools. Of course, generators are necessary to supply the power used by all these motors. Hence as an Electrical Engineer, it is essential to know the operating characteristics and relevant performance parameters of above said electrical machines.

In this course, the discussion is limited to Direct Current operated electrical machines (motors and generators). Prior to studying about various electro-mechanical systems, it is indispensable to understand about the basics of magnetic circuits and its relevant parameters.

COURSE OBJECTIVES			
To expose the students to the basic concepts of various types of electrical machines such as DC Machines and Transformers 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 would be able to			
1.	Understand the constructional details and principle of operation of DC machines and Transformers		2, 7, 9, 10,12
2.	Analyze the performance of DC machines under various operating conditions using their characteristics		2, 7, 8, 9, 10, 12
3.	Evaluate the performance of the transformers using phasor and equivalent circuit		2, 7, 8, 9, 10, 12
4.	Select an appropriate DC motor as well as to choose appropriate method of speed control for any industrial applications		2, 7, 5, 8, 9, 10, 12
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	Week	Topic	Mode of Delivery
1	2 nd Week of July (10 th to 14 th July) (4 Contact Hours)	Course plan details General introduction Basics of Electro-mechanical conversion	Lecture PPT and C&T
2	3 rd Week of July (17 th to 21 st July) (4 Contact Hours)	Magnetic circuit analysis Singly and doubly excited magnetic field system	Lecture C&T
3	4 th Week of July (24 th to 28 th July) (4 Contact Hours)	General Torque equation for Electrical Machines Introduction and Principle of Electric Generator	Lecture C&T
4	1 st Week of August (31 st July to 4 th August) (4 Contact Hours)	Construction and types of DC generators QUIZ I – Assessment 1	Lecture C&T PPT
5	2 nd Week of August (7 th to 11 th August) (4 Contact Hours)	Characteristics of DC generators and Commutation	Lecture C&T
6	3 rd Week of August (14 th to 18 th August) (3 Contact Hours)	Armature reaction Principle of operation of DC Motor	Lecture C&T PPT Video
7	4 th Week of August (21 st to 25 th August) (4 Contact Hours)	Torque expression and Types of DC Motor QUIZ II – Assessment 2	Lecture C&T

8	5 th Week of August (28 th August to 1 st Sep.) (4 Contact Hours)	Types and Electrical and Mechanical characteristics of DC Motors	Lecture C&T
9	1 st Week of Sep. (4 th to 8 th Sep) (4 Contact Hours)	Starting, Speed control and Testing techniques for DC Motors QUIZ III – Assessment 3	Lecture C&T
10	2 nd Week of Sep. (11 th to 15 th Sep.) (4 Contact Hours)	Braking techniques for DC Motor Principle of operation of Transformer Emf equation and types (under no-load and loading conditions) along with phasor	Lecture C&T Video
11	3 rd Week of Sep. (18 th to 22 nd Sep.) (2 Contact Hours)	Emf equation and types (under no-load and loading conditions) along with phasor	Lecture C&T
12	4 th Week of Sep. (25 th to 29 th Sep.) (2 Contact Hours)	Equivalent circuit of transformer	Lecture C&T
13	1 st Week of October (2 nd to 6 th Oct.) (4 Contact Hours)	Equivalent circuit of transformer Testing of transformers Numerical Test – Assessment 4	Lecture C&T
14	2 nd Week of October (9 th to 13 th Oct) (4 Contact Hours)	Auto transformer and Three-phase transformers (connections)	Lecture C&T PPT
15	3 rd Week of October (16 th to 20 th Oct) (2 Contact Hours)	All day efficiency	Lecture C&T
16	4 th Week of October (23 rd to 27 th Oct) (2 Contact Hours)	Sumpner's test	Lecture C&T
17	5 th Week of October (30 th Oct. to 3 rd Nov.) (4 Contact Hours)	Parallel operation of transformers <i>And any left out topics</i>	Lecture C&T PPT
18	2 nd Week of Nov. (13 to 17 th Nov.)	ASSESSMENT – 6	Descriptive Written Exam

C&T : Chalk and Talk
PPT : Power Point
All 4 contact hours include Tutorial Class.

COURSE ASSESSMENT METHODS

Assessment No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Quiz I	1 st Week of August	30 Minutes	10
2	Quiz II	4 th Week of August	30 Minutes	10
3	Quiz III	1 st Week of September	30 Minutes	10
4	Numerical Problems / Written Test	1 st Week of October	60 Minutes	20
5	Surprise test	--	10 Minutes	10
CPA	Compensation Assessment (Written Test)	3 rd Week of October	60 Minutes	Maximum of 20
6	Descriptive Type Examination	2 nd Week of November	120 Minutes	40

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. A.E. Fitzgerald and Charles Kingsley, 'Electric Machinery', Tata McGraw-Hill Education Publications, 6th Edition, 2002.
4. Vincent Del Toro, 'Electrical Engineering Fundamentals', 2nd Edition, Prentice Hall Publications, 2003.
5. Parker Smith, N.N., 'Parker Smith's Problems in Electrical Engineering', 9th Edition, CBS Publishers and Distributors, 9th Edition, 2003.

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

- 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 plagiarism, academic honesty, attendance, etc.)**CORRESPONDENCE**

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 only.
2. Queries (if required) to the course teacher shall only be emailed to eeacmachines@gmail.com

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ATTENDANCE

1. Attendance will be taken by the faculty in all the contact hours. All the students are expected to attend all the contact hours.
2. **Every student should maintain minimum 75 % attendance in these contact hours.**
3. Any student, who fails to maintain 75% attendance need to score more than 50% marks in the assessments 1to5 (in total) for attending the final assessment. Students fail to satisfy this criteria will have to REDO the course.

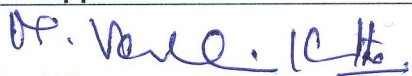
ACADEMIC HONESTY & PLAGIARISM

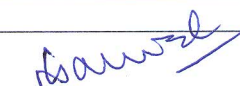
1. All the students are expected to be genuine during the course work. Taking of information by means of copying simulations, assignments, looking or attempting to look at another student's paper or bringing and using study material in any form (paper, mobile phone etc.), for copying during any assessments 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 of the concerned department.


ADDITIONAL COURSE INFORMATION

The faculty is available for consultation at times as per the intimation given by the faculty. Queries may also be emailed to the Course Coordinator directly at eeacmachines@gmail.com

For Approval


M. VENKATAKIRTHIGA
Course Faculty


Dr. S. ARUL DANIEL
CC-Chairperson


10/07/2017
HoD/EEE

PROF/EEE/NIT