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

COURSE PLAN – PART I			
Name of the programme and specialization	**B.Tech. / Electrical and Electronics Engineering**		
Course Title	**DC MACHINES AND TRANSFORMERS**		
Course Code	**EEPC12**	**No. of Credits**	**4**
Course Code of Pre-requisite subject(s)	**NIL**		
Session	**July 2018**	**Section (if, applicable)**	**B**
Name of Faculty	**P. RAJA**	**Department**	**EEE**
Email	**dcmctrans@gmail.com**	**Telephone No.**	**0431-250 3264 9942680653**
Name of Course Coordinator(s) (if, applicable)	**NA**		
E-mail		**Telephone No.**	
Course Type	[x] **Core course** [ ] **Elective course**		

Syllabus (approved in BoS)

Principles of Energy conversion – basic magnetic circuit analysis, Faraday's law of electromagnetic induction – singly and doubly excited magnetic field systems – torque production in rotating machines and general analysis of electro mechanical system.

DC Generator – construction, principle of operation – emf equation– types, Characteristics, commutation - armature reaction.

DC motor – principle of operation – torque equation – types – electrical & mechanical characteristics– starting – speed control – various testing – braking.

Transformers – principle of operation – types – basic construction – equivalent circuit - regulation and efficiency – auto transformer.

Three-phase transformer connection-Scott connection – all day efficiency - Sumpner's test - parallel operation of transformers.

Text/Reference Books:

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 Distributers, 9 th Edition, 2003.

COURSE OBJECTIVES	
This course aims to equip the students with a basic understanding of DC machines and Transformer fundamentals, machine parts and help to gain the skills for operating DC machines and Transformers . The course also equips students with ability to understand and analyze the equivalentcircuits of DC machines and Transformers.	
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 PLAN – PART II

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 mechnaical 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 electical 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 *transfomer* is an electrical device that transfoms 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 filed to accomplish the change in voltage level, they are usually studied together with electrical machines. Morevover 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 performace 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 TEACHING AND LEARNING ACTIVITIES			
S.No.	**Week/Contact Hours**	**Topic**	**Mode of Delivery**
1.	Week 1 22-07-19 & 26-07-19 (**3 Contact Hours)**	Course plan details General introduction Principles of energy conversion Basics of Magnetic circuit	Lecture PPT and C&T
2.	Week 2 29-07-19 & 02-08-19 (**4 Contact Hours)**	Magnetic circuit analysis Introduction to AC circuits introduction to Transformer	Lecture C&T
3.	Week 3 05-08-19 & 09-08-19 (**4 Contact Hours)**	Operation of transformer Types and construction (phasor diagram)	Lecture C&T
4.	Week 4 12-08-19 & 16-08-19 (**3 Contact Hours)**	Transformer – equivalent circuit Testing of transformers	Lecture C&T PPT
5.	Week 5 19-08-19 & 23-08-19 (**4 Contact Hours)**	Performance analysis – voltage regulation and efficiency	Lecture C&T
6.	Week 6 26-08-19 & 30-08-19 (**4 Contact Hours)**	Auto-transformer and three-phase transformer (connection) ***QUIZ – I***	Lecture C&T ***Written test***
7.	Week 7 02-09-19 & 06-09-19 (**3 Contact Hours)**	All day efficiency Sumpner's test and parallel operation of transformers	Lecture C&T
8.	Week 8 09-09-19 & 13-09-19 (**3 Contact Hours)**	Principle of electro-mechanical energy conversion system Singly and doubly excited magnetic field system	Lecture C&T
9.	Week 9 16-09-19 & 20-09-19 (**4 Contact Hours)**	Torque production in rotating machines Introduction to DC machine – construction and operation	Lecture C&T
10.	Week 10 23-09-19 & 27-09-19 (**4 Contact Hours)**	Armature winding Classification of DC generator	Lecture C&T Video
11.	Week 11 01-10-19 & 05-10-19 (**3 Contact Hours)**	emf equation Characteristics of DC generators	Lecture C&T
12.	Week 12 07-10-19 & 11-10-19 (**3 Contact Hours)**	Characteristics of DC generators (applications) Process of commutation ***QUIZ - II***	Lecture C&T ***Written Test***
13.	Week 13 14-10-19 & 18-10-19 (**4 Contact Hours)**	Armature reaction DC motor – operation	Lecture PPT and C&T
14.	Week 14 21-10-19 & 25-10-19 (**4 Contact Hours)**	Types and torque equation Characteristics Starting characteristics	Lecture C&T

15.	Week 15 28-10-19 & 01-11-19 (**4 Contact Hours)**	Electrical and mechanical characteristics Speed control methods	Lecture C&T PPT
16.	Week 16 04-11-19 & 08-11-19 (**4 Contact Hours)**	Braking Various testing on DC motors	Lecture C&T
17.	Week 17 11-11-19 & 15-11-19 (**4 Contact Hours)**	Concluding remarks and overview of the entire syllabus	Lecture C&T

**Mostly 4th contact hour of every week would be a tutorial class*
**If any contact hour is NOT handled on the particular day due to unseen reasons, an extra class will be scheduled on the same week based on the time available.*

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Quiz I	Week – 6	60 minutes	20
2	Quiz II	Week – 12	60 minutes	20
3	Tutorial problem submission (on-line)	Throughout the course		10
5	Surprise tests	Two instances	10 Minutes	10
CPA	Compensation Assessment ***(Written Test – for Quiz-I and II only)***	3rd Week of October	60 Minutes	Maximum of 20
6	Descriptive Type Examination	18th – 22nd November 2019	120 Minutes	40

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 (Mid of the semester & End of the semester)
- End semester feedback on Course Outcomes

COURSE POLICY

MODE OF 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 **dcmctrans@gmail.com**

COMPENSATION ASSESSMENT POLICY

- CPA will be offered only for the students who could not appear for Assessments 1 and 2.

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.
- For more details refer https://www.nitt.edu/home/academics/rules/BTech_Regulations_2018.pdf (page-18)
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL 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 dcmctrans@gmail.com

FOR APPROVAL

Course Faculty 22/07/2019 **CC-Chairperson** 25/7/2019 **HOD** S. Sudha

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.