Course code.	Course Name	L-T-P - Credits	Year of Introduction
EE311	**ELECTRICAL DRIVES & CONTROL FOR AUTOMATION**	**3-0-0-3**	**2016**

Prerequisite : Nil

Course Objectives
1. To understand the basic concepts of different types of electrical machines and their performance.
2. To know the different methods of starting D.C motors and induction motors.
3. To introduce the controllers for automation
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Syllabus

DC Machines, transformers, three phase induction motor, single phase induction motor, stepper motor, controllers for automation.

Expected outcome .

The students will be able to
1. Select a drive for a particular application based on power rating.
2. Select a drive based on mechanical characteristics for a particular drive application.
3. Discuss the controllers used for automation

Text Books:
1. Kothari D. P. and I. J. Nagrath, Electrical Machines, Tata McGraw Hill, 2004.
2. Nagrath .I.J. & Kothari .D.P, Electrical Machines, Tata McGraw-Hill, 1998
3. Richard Crowder, Electrical Drives and Electromechanical systems, Elsevier, 2013
4. Mehta V. K. and R. Mehta, Principles of Electrical and Electronics, S. Chand & Company Ltd., 1996.
5. Theraja B. L. and A. K. Theraja, A Text Book of Electrical Technology, S. Chand & Company Ltd., 2008.
6. Vedam Subrahmaniam, Electric Drives (concepts and applications), Tata McGraw- Hill, 2001

References:
1. H.Partab, Art and Science and Utilisation of electrical energy, Dhanpat Rai and Sons, 1994
2. M. D.Singh, K. B. Khanchandani, Power Electronics, Tata McGraw-Hill, 1998
3. Pillai.S,K A first course on Electric drives, Wiley Eastern Limited, 1998

Course Plan			
Module	Contents	Hours	Sem. Exam Marks
I	DC Machines-principle of operation-emf equation-types of excitations. Separately excited, shunt and series excited DC generators, compound generators. General idea of armature reaction, OCC and load characteristics - simple numerical problems.	6	15%
II	Principles of DC motors-torque and speed equations-torque speed characteristics- variations of speed, torque and power with motor current. Applications of dc shunt series and compound motors. Principles of starting, losses and efficiency – load test- simple numerical problems.	6	15%
FIRST INTERNAL EXAMINATION			
III	Transformers – principles of operations – emf equation- vector	7	15%

	diagrams- losses and efficiency – OC and SC tests. Equivalent circuits-efficiency calculations- maximum efficiency – all day efficiency – simple numerical problems. Auto transformers constant voltage transformer- instrument transformers.		
IV	Three phase induction motors- slip ring and squirrel cage types-principles of operation – rotating magnetic field- torque slip characteristics- no load and blocked rotor tests. Circle diagrams-methods of starting – direct online – auto transformer starting	7	15%
SECOND INTERNAL EXAMINATION			
V	Single phase motors- principle of operation of single phase induction motor – split phase motor – capacitor start motor- stepper motor-universal motor Synchronous machines types – emf equation of alternator – regulation of alternator by emf method. Principles of operation of synchronous motors- methods of starting- V curves-synchronous condenser	8	20%
VI	Stepper motors: Principle of operation, multistack variable reluctance motors, single-stack variable reluctance motors, Hybrid stepper motors, Linear stepper motor, comparison, Torque-speed characteristics, control of stepper motors Controllers for automation, servo control, Digital controllers, Advanced control systems, Digital signal processors, motor controllers, Axis controllers, Machine tool controllers, Programmable Logic Controllers	8	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum marks: 100   **Time: 3 hrs**

The question paper should consist of three parts
Part A
There should be 2 questions each from module I and II
Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B
There should be 2 questions each from module III and IV
Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C
There should be 3 questions each from module V and VI
Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: in all parts each question can have a maximum of four sub questions