SEMESTER: S4

ELECTRICAL MACHINES

Course Code	**PEICT414**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None/ (Course code)	**Course Type**	Theory

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. Analyse the performance of Synchronous and special machines

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SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	DC Machines-principle of operation-e.m.f equation-types of Excitations. General idea of armature reaction, OCC and load characteristics - simple numerical problems.Principles of DC motors-Back e.m.f and its significance, motors-torque and speed equations-Characteristics of DC motor	**9**
2	Transformers – principles of operations – emf equation-losses and efficiency – OC and SC tests. Equivalent circuits-efficiency calculations-maximum efficiency – all day efficiency –simple numerical problems. Auto transformers	**7**
3	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. Starting of Induction motor. Relation between Torque, Mechanical Power and Rotor Output Single phase motors- principle of operation of single-phase induction motor – split phase motor – capacitor start motor- stepper motor-universal motor	**11**

4	Synchronous machines types –construction- emf equation of alternator – regulation of alternator by emf method- Principles of operation of synchronous motors- methods of starting- V curves-synchronous condenser Stepper motors: Principle of Operation, multitask variable reluctance motors, single stack variable reluctance motors, Hybrid stepper motors, Linear stepper motor, comparison, Torque speed characteristics	**9**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

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End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the principles of operation, e.m.f equations, types of excitations, armature reaction, OCC and load characteristics, back e.m.f, torque and speed equations, and characteristics of DC motors.	**K2**
CO2	Understand the principles of operation, e.m.f equation, losses, efficiency, OC and SC tests, equivalent circuits, and solve efficiency-related numerical problems.	**K2**
CO3	Understand the principles of operation, types, torque-slip characteristics, no load and blocked rotor tests, starting methods, relationship between torque, mechanical power, and rotor output for three-phase induction motors, and understand the principles and types of single-phase motors, including split phase, capacitor start, stepper, and universal motors.	**K2**
CO4	Understand the construction, e.m.f equations of alternators, regulation by emf method, principles of synchronous motors, starting methods, V curves, synchronous condensers, and understand the principles of operation, types and torque-speed characteristics..	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			2						2
CO2	3	2				2						2
CO3	3	2	2			2						2
CO4	3	2	2			2						2

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Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Electrical Machinery	Bimbra P. S.,	Khanna Publishers,	2nd edition 2011
2	Theory of AC Machines,	Nagrath J. and D. P. Kothari,	Tata McGraw Hill	5th edition 2017

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	The Performance and Design of AC Machines,	Say M G	CBS Publishers, New Delhi	3rdedition, 2002.
2	Electric Machines	Ashfaq Husain, HaroonAshfaq,	DhanpatRai and Co	3rd edition, 2002.
3	Theory and Performance of Electrical Machines	Gupta J B,	S K Kataria& Sons	14thedition, 2013
4	Electrical Technology	B. L. Theraja	,S.Chand Publications.	Vol II

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Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://onlinecourses.nptel.ac.in/noc24_ee103/preview
2	https://onlinecourses.nptel.ac.in/noc24_ee103/preview
3	https://nptel.ac.in/courses/108108076
4	https://nptel.ac.in/courses/108108076

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