SEMESTER S3

ELECTRICAL MACHINES & DRIVES

Course Code	**PCMRT302**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:1:0:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Course Objectives:

1. This course aims the students to learn about the introduction of basics of electrical machines and basic concept of power electronics and machine drives.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**DC MACHINES & TRANSFORMERS** **DC MACHINES** Essential parts of a DC machine – EMF equation – DC generator – working principle – types of DC generators – no load and load characteristics of DC generators – DC motor – working principle – back emf – types of DC motors – equations for torque and power (simple numerical problems) **TRANSFORMERS** Working principle - Construction - core and shell type - emf equation – voltage transformation ratio (simple numerical problems) – concept of ideal transformer- transformer on no-load, short circuit and open circuit test on transformer (basic concept only) – losses in transformer	**11**
2	**THREE PHASE & SINGLE PHASE INDUCTION MOTORS** **THREE PHASE INDUCTION MOTOR** Constructional details – operation – concept of rotating magnetic field – slip – torque equation - (simple numerical problems) - torque–slip characteristics – starting methods of 3- pahse induction motors **SINGLE PHASE INDUCTION MOTOR** Working principle – double revolving field theory – different types – split phase – capacitor start – capacitor start- run	**11**

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3	**SPECIAL ELECTRICAL MACHINES & INTRODUCTION POWER ELECTRONICS** **SPECIAL ELECTRICAL MACHINES** Universal motor – stepper motor -different types servomotor (mechanism only) - Synchronous motor **INTRODUCTION POWER ELECTRONICS** Introduction – SCR -symbol, construction and modes of operation – V-I characteristics- Basic concepts of Rectifier – single phase half-wave controlled rectifier with R load – fully controlled bridge rectifier with R load – basic concept of inverter	**11**
4	**ELECTRICAL DRIVES** Electrical Drives – Advantages - Parts of electrical drives - Choice of electric drives - Status of DC and AC drives - Dynamics of Electric drives - Fundamental torque equations – Speed torque conventions and multi-quadrant operation - Components of load torque - Nature and classification of load torque – Steady state stability – load equalization	**11**

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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**

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	Explain the basic concept of dc generator, motor and transformer	**K2**
CO2	The basic concepts of 3 phase and 1 phase induction motors.	**K2**
CO3	The basic concept of special electrical machines & introduction to power electronics	**K2**
CO4	The basic concept of machine drives	**K2**

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

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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	2	2	-	-	2	2	1	-	-	-	3
CO2	3	3	2	1	-	2	2	1	-	-	-	3
CO3	3	3	2	1	-	2	2	1	-	-	-	3
CO4	3	1	1	1	-	2	2	1	-	-	-	3

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	Theory and Performance of Electrical machines	J B Gupta	S K Kataria & sons	First Edition 1967; Fifteenth Edition 2015
2	Power Electronics	P.S. Bimbhra	Khanna Publishers, New Delhi	Fifth Edition 1990
3	Fundamentals of Electrical Drives	Gopal K. Dubey	Narosa Publishing House	Second Edition 2002

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Principles Of Electrical Machines	V.K. Mehta, Rohit Mehta	S Chand Publication	Reprint Edition 2006
2	A Text Book of Electrical Technology, Vol.II "AC & DC Machines"	Theraja B.L., Theraja A.K	publication division of Nirja construction & development (p) Ltd., New Delhi	First Edition 2005
3	Power Electronics Circuits, Devices and Applications	M. H. Rashid	Pearson Education	Fourth Edition 2017
4	Electric Drives, Concepts & Applications	VedamSubrahmanyam,	Tata McGraw Hill Education Pvt. Ltd, New Delhi	Second Edition 2017

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Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://nptel.ac.in/courses/108105017
2	https://onlinecourses.nptel.ac.in/noc22_ee06/preview
3	https://nptel.ac.in/courses/108101038
4	https://archive.nptel.ac.in/courses/108/104/108104140/