Department of Electrical and Electronics

Number of programmes where syllabus revision was carried out

SL. NO.	COURSE CODE	COURSE OFFERED
1	SEE1307	Special Electrical Machines

SEE1307	SPECIAL ELECTRICAL MACHINES	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To study the concepts of stepper motors and its applications
- To study the operating principle and characteristics of switched reluctance motors
- To impart knowledge on the fundamental concepts and control of permanent magnet brushless DC motors
- To introduce the concepts and control methods of permanent magnet brushless synchronous motors and synchronous reluctance motors.

UNIT 1 STEPPING MOTORS **9 Hrs.**

Constructional features, principle of operation, types, modes of excitation, Torque production in Variable Reluctance (VR) stepping motor, Static and Dynamic characteristics, Introduction to Drive circuits for stepper motor, suppressor circuits, Closed loop control of stepper motor- Applications.

UNIT 2 SWITCHED RELUCTANCE MOTORS **9 Hrs.**

Principle of Operation, Constructional features, Torque equation, Power Semi Conductor Switching Circuits, frequency of variation of inductance of each phase winding - Control circuits of SRM-Torque - Speed Characteristics, Microprocessor based control of SRM Drive, Applications.

UNIT 3 SYNCHRONOUS RELUCTANCE MOTORS **8 Hrs.**

Constructional features: axial and radial air gap Motors. Operating principle, reluctance torque - Phasor diagram, Speed torque characteristics, Applications.

UNIT 4 PERMANENT MAGNET BRUSHLESS DC MOTORS **9 Hrs.**

Commutation in DC motors, Electronic Commutation- Difference between mechanical and electronic commutators Hall sensors, Optical sensors, Construction and principle of PMBL DC Motor, Torque and E.M.F equation, Torque-speed characteristics, Power Controllers-Drive Circuits, Applications.

UNIT 5 PERMANENT MAGNET SYNCHRONOUS MOTORS **10 Hrs.**

Construction and types, Principle of operation, EMF and Torque equation, Phasor diagram- Torque Speed Characteristics, Power controllers- Self control, Vector control, Microprocessor based Control, Applications.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend the operation of various types of stepper motors.
CO2 - Analyze the operation and characteristics of switched reluctance motors.
CO3 - Evaluate the performance of synchronous reluctance motors..
CO4 - Identify power controllers and driver circuits for permanent magnet brushless DC motor.
CO5 - Justify best speed control for permanent magnet synchronous motor.
CO6 - Develop control methods for Permanent magnet synchronous motor on real time applications.

TEXT / REFERENCE BOOKS

1. Miller, T.J.E. “Brushless permanent magnet and reluctance motor drives”, Clarendon Press, Oxford, 1989.
2. Kenjo.T, “Stepping motors and their microprocessor control”, Oxford University Press, 1995.
3. R.Krishnan, “Electric Motor Drives - Modeling, Analysis and Control”, Prentice-Hall of India Pvt. Ltd., New Delhi, 2015.
4. Kenjo.T and Naganori, S “Permanent Magnet and Brushless DC motors”, Clarendon Press, Oxford, 1989.
5. B.K. Bose, “Modern Power Electronics & AC drives”, Dorling Kindersley India, 2006.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 80 **Exam Duration: 3 Hrs.**

PART A: 10 questions of 2 marks each - No choice **20 Marks**

PART B: 2 questions from each unit of internal choice, each carrying 12 marks **60 Marks**