SPECIAL ELECTRICAL MACHINES FOR INDUSTRIAL APPLICATIONS

(Open Elective)

Subject Code: 15EE1152 **L T P C**

Pre requisites*:Mathematics, AC and DC Electrical Machines.* **3 0 0 2**

COURSE OUTCOMES:

At the end of the course, student will be able to

CO1: Describe construction, working principle and characteristics of Switched Reluctance Motor (SRM).

CO2: Understand the open loop and closed loop systems for Servo Motors and Stepper Motors.

CO3: Analyze the torque speed characteristics and transfer function of Permanents Magnet Synchronous Motors (PMSM).

CO4: Describe construction, working principle and characteristics of Permanents Magnet Brushless DC (BLDC) Motor.

CO5: Understand the dynamic characteristics, drive system, open loop systems for Linear motors.

UNIT-I (10 LECTURES)

SWITCHED RELUCTANCE MOTORS (SRM): Introduction, Constructional features, Principle of operation. Torque equation,Characteristics, Control Techniques and Drive – Concept, Mathematical model and analysis.

UNIT-II (10 LECTURES)

SERVOMOTORS & STEPPER MOTORS: Introduction, Constructional features, Principle of operation, Modes of excitation, Torque production in Variable Reluctance (VR) motor, dynamic characteristics, Drive system and circuit for open loopcontrol, closed loop control, Stability and areas of applications.

UNIT-III (10 LECTURES)

PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM): Introduction, Permanent magnet materials and motors, Principle of operation, EMF and torque equation, Torque speed characteristics,Power Controllers, Comparisons of conventional and PM synchronous motor, Transfer function of PMSM and control Schemes of PMSM.

UNIT-IV (10 LECTURES)

PERMANENT MAGNET BRUSHLESS DC (BLDC) MOTORS: Introduction, Constructional features, Principle of operation, Commutation in DC motors, Difference between mechanical andelectronic commutators, Hall sensors, Optical sensors, Types of BLDC motors, EMF and torque equation, Torque-speed characteristics, Drives - concept and Control of BLDC motors.

UNIT-V (10 LECTURES)

LINEAR MOTOR:Linear Induction Motor (LIM), Construction features, Principle of operation, Thrust equation, Concept of Current sheet, Goodness factor, Equivalent circuit, Performance characteristics, Control strategies. Linear Synchronous Motors (LSM) Construction features, Principle of operation, Thrust equation, Control strategies, Applications. Linear Levitation Machines (LLM), Principle of operation, Attraction and repulsion types of LLM, Goodness factor and Levitation stiffness.

TEXT BOOKS:

1. K. Venkataratnam, "Special Electrical Machines", Universities Press (India) Private Limited, Hyderabad, First Edition reprinted in 2013.
2. E.G. Janardanan, "Special Electrical Machines", PHI Learning Private Limited, Delhi First Edition reprinted in 2014.

REFERENCE BOOKS:

1. R.S.Krishnan, *"Switched Reluctance Motor Drives: Modeling Simulation Analysis, Design and Application"* CRC press2001.
2. Miller, T.J.E. *"Brushless Permanent Magnet and Reluctance Motor Drives"*, Clarendon Press, Oxford, 1989.
3. R.S.Krishnan, *"Permanent Magnet Synchronous Motor and Brushless DC Motor Drives"*, RC press,2002.
4. NaserA and Boldea I, *"Linear Electric Motors: Theory, Design and Practical Application"*, Prentice Hall Inc., New Jersey, 1987.
5. Kenjo T, *" Stepping Motor and their Microprocessor control*", Clarendon press Oxford,1989