ANALYSIS OF SPECIAL MACHINES

Course Code:13EE2212 **L P C**
4 0 3

Pre requisites: Knowledge of Mathematics, Electric Networks and Electrical Machines.

Course Outcomes:
At the end of the course, a student will be able to evaluate the performance of
CO1: Stepper Motors.
CO2: Switched Reluctance Motor (SRM) and Servo Motor.
CO3: Permanents Magnet Synchronous Motors (PMSM).
CO4: Permanents Magnet Brushless DC (BLDC) Motor.
CO5: Linear Motor.

UNIT-I
STEPPER MOTORS
Constructional features, Principle of operation, Modes of excitation torque production in Variable Reluctance (VR) stepping motor. Dynamic characteristics, Drive systems and circuit for open loop control, closed loop control of stepping motor.

UNIT-II
SWITCHED RELUCTANCE MOTORS & SERVOMOTORS
Switched Reluctance Motor Constructional features, Principle of operation. Torque equation, Characteristics, Control Techniques, and Drive Concept. Servomotor – Types – Constructional features – Principle of Operation – Characteristics - Control – Microprocessor based applications.

UNIT-III
PERMANENT MAGNET BRUSHLESS DC MOTORS
Commutation in DC motors, Difference between mechanical and electronic commutators, Hall sensors, Optical sensors, Multiphase Brushless motor, Square wave permanent magnet brushless motor drives, Torque and emf equation, Torque-speed characteristics, Controllers-Microprocessors based controller.

UNIT-IV

PERMANENT MAGNET SYNCHRONOUS MOTORS

Principle of operation, EMF, power input and torque expressions, Phasor diagram, Power Controllers, Torque speed characteristics, Self control, Vector control, Current control Schemes.

UNIT-V

LINEAR MOTORS & AC TACHOMETERS

Linear Motors: Linear Induction Motor (LIM) Classification – Construction – Principle of operation – Concept of Current sheet – Goodness factor – DC Linear Motor (DCLM) types – Circuit equation – DCLM control-applications. Schematic diagram, AC Tachometer Operating principle, numerical problems.

Text Books:

1. Kenjo, T, "*Stepping Motors and their Microprocessor control*", Clarendon Press, Oxford, 1989.
2. Kenjo, T and Naganori, S, "*Permanent Magnet and brushless DC motors*", Clarendon Press, Oxford, 1989.
3. M. Gopal, "*Control Systems-Principle and Design*", Tata McGraw-Hill Publishing Company Limited, Second reprint 1999.

Reference Books:

1. Miller, T.J.E. "*Brushless Permanent Magnet and Reluctance Motor Drives*", Clarendon Press, Oxford, 1989.
2. Naser A and Boldea I, "*Linear Electric Motors: Theory, Design and Practical Application*", Prentice Hall Inc., New Jersey,1987
3. Floyd E Saner,"*Servo Motor Applications*", Pittman USA, 1993.
4. P. S. Bimbra, "*Generalized Theory of Electrical Machines*", Khanna publications-5th edition-1995.