MODELING AND SIMULATION OF POWER ELECTRONIC SYSTEMS (ELECTIVE-I)

Course Code: 13EE2106 **L P C**
4 0 3

Pre requisites: Electrical Machines, Power Electronics

Course Outcomes:

At the end of the course, a student will be able to**:**

CO 1: Derive a mathematical model of Power Electronic Devices and computer simulation techniques widely used for Power electronic Converters

CO 2: Derive a mathematical model and Simulation of AC-DC and DC-DC Converters

CO 3: Derive a mathematical model and Simulation of DC motor drive systems

CO 4: Derive a mathematical model and Simulation of Induction Drive Systems

CO 5: Derive a mathematical model and Simulation of Synchronous motor drive systems

UNIT-I

INTRODUCTION AND REVIEW OF MODELING OF POWER ELECTRONIC DEVICES:

Overview and modeling of Power Electronic (PE) devices: Diodes, Thyristors, IGBTs, MOSFET; Comparison of switching characteristics of various devices, Transient and Steady state behaviour of PE devices.

COMPUTER SIMULATION OF PE CONVERTERS:

Challenges in Computer Simulation; Solution techniques for time domain simulation; widely used circuits and / or system oriented simulators. Choice of a simulator

UNIT-II

SIMULATION OF AC/ DC CONVERTERS:

Modeling of controlled and uncontrolled ac/ dc converters; single-phase & 3- phase ac/dc converters; other topologies for ripple current minimization and power factor improvement.

SWITCH-MODE DC / DC POWER SUPPLIES:
Modeling & Simulation of dc/dc converters such as Buck, Boost, Buck-Boost, Cuk and Full bridge dc/dc Converters.

UNIT-III
MODELING & SIMULATION OF DC MOTOR DRIVE SYSTEMS:
Equivalent circuits for DC motors, DC motors with a separately excited field winding, DC servo drives and their control, Adjustable speed dc drives, Effect of discontinuous current, Field weakening effects.

UNIT-IV
MODELING & SIMULATION OF INDUCTION DRIVE SYSTEMS:
Induction motor characteristics at rated frequency and rated voltage, simulation of variable frequency voltage source square wave / PWM drives, CSI drive simulation

UNIT-V
MODELING & SIMULATION OF SYNCHRONOUS MOTOR DRIVE SYSTEMS:
Principles of synchronous motor operation; Brushless dc motor drive operation, synchronous motor servo drive simulation, Load commutated synchronous motor drive.

TEXT BOOKS:
1. M. B. Patil, V. Ramanarayanan, V.T.Ranganathan, M.C.Chandorkar" *Simulation of Power Converters"*,1st edition, Narosa Publishers,2010.
2. V. Rajagopalan, " *Modeling & Simulation of PE systems"*, Marcel Dekkar Inc.

REFERENCES:
1. Ned Mohan,T.M.Undeland and William P.Robbins: "*Power Electronics: Converters, Applications*", 3rd Edition, John Wiley&Sons,2009.