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

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

Pre requisites: This course requires Knowledge of different Power Semiconductor Devices and Power Converters and should possess an in-depth understanding of operational aspects of dc/ ac rotating machines.

Course Educational Objectives:
It is to help understand the modeling analysis and performance of electric drive systems fed from PE converters as per system design concepts.

Course Outcomes: At the end of the course, the student will be able to get

1. Knowledge in modeling and analysis of Power semiconductor devices and Power Electronic converters.
2. Knowledge in Power Electronic Converter fed DC & AC drives system and their application to different Industrial needs.

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.