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

Course Code: 13EE2106                    L  P  C
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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
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:
2. V. Rajagopalan, “Modeling & Simulation of PE systems”, Marcel Dekker Inc.

REFERENCES: