SCHEME OF COURSE WORK

Course Details:

Course Title	**:SOLID STATE CONTROL OF AC DRIVES**		
Course Code	**:13EE2215**	**L P C**	**:4 0 3**
Program:	**: Master of Technology.**		
Specialization:	**: Power Electronics & Drives**		
Semester	**: II**		
Prerequisites	**: Power Electronics and Power Electronics and Drives**		
Courses to which it is a prerequisite	**: Research**		

Course Outcomes (COs):
After Completion of the course the student will be able to

1	Explain the Operation of induction motor and analyze speed control of AC Drives by VSI fed drives.
2	Analyze speed control of AC Drives by CSI fed drives and by slip power recovery drives
3	Analyze vector control of Induction motors
4	Analyze various control schemes to control speed of synchronous motor drives
5	Analyze various control schemes to control speed of PMSM drives and VRM Drives

Program Outcomes (POs):
The Graduates of will be able to:

1	Develop in depth knowledge in the areas of "Static Power Electronics Converters", "Power Electronic Converter fed Electrical Drives" and "Power Quality"
2	Apply soft computing techniques for Power Electronic Systems and Electric Drives
3	Understand large scale Power Electronic Converter Systems, Electric Drives and issues involved through Modeling, Analysis and Simulation
4	Apply present day techniques and tools to solve Power electronic and electric drives problems relevant to India and other countries
5	Use state-of-the-art simulation tools such as PLEXIM, SABER, OPAL-RT Lab, DSPACE, MULTISIM, LABVIEW and other Tools
6	Contribute positively to collaborative and multidisciplinary research to achieve common goals
7	Demonstrate knowledge and understanding of power engineering and management principles and apply the same for efficiently carrying out projects with due consideration to economical and financial factors
8	Communicate confidently, make effective presentations and write good reports to engineering community and society
9	Recognize the need for life-long learning and have the ability to do it independently
10	Acquire knowledge on social issues and shall contribute to the community for sustainable development
11	Predict and examine critically the outcomes of actions, apply corrective measures subsequently and move forward positively through a self corrective approach

Course Outcome Versus **Program Outcomes:**

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	S	S	S	S	S	M	S	W	S		S
CO-2	S	S	S	S	S	S	S	W	S		S
CO-3	S	S	M	S	S	S	S	W	S		S
CO-4	S	S	M	S	S	S	S	W	S		S
CO-5	S	S	S	S	W	W	W	W	S		S

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Review of steady-state operation of Induction motor, Equivalent circuit analysis, torque-speed characteristics.	CO-1	Explain the equivalent Circuit of an Induction Motor. Explain the speed torque Characteristics of Induction Motor.	▫ Lecture through Black Board & LCD Discussion	Seminar/Mid Test (Week 9-10)
2	Scalar control- Voltage fed Inverter control-Open loop volts/Hz control-Speed control with slip regulation	CO-1	Explain the Scalar methods of speed Control	▫ Lecture through Black Board & LCD ▫ Discussion	Seminar/Mid Test (Week 9-10)
3	Speed control with torque and Flux control-Current controlled voltage fed Inverter Drive.	CO-1	Explain the Speed control with torque and Flux control-Current controlled voltage fed Inverter Drive.	▫ Lecture through Black Board & LCD ▫ Discussion	Seminar/Mid Test (Week 9-10)
4	Current-Fed Inverter control-Independent current and frequency control	CO-2	Explain the Current-Fed Inverter control of Induction Motor. Explain the Independent current and frequency control of Induction Motor.	▫ Lecture through Black Board & LCD ▫ Discussion	Seminar/Mid Test (Week 9-10)
5	flux control in Current-Fed Inverter drive-Volts/Hz control of Current Fed Inverter drive-Efficiency optimization control by flux program,	CO-2	Explain the flux control in Current-Fed Inverter drive of Induction Motor Explain the Volts/Hz control of Current Fed Inverter drive Induction Motor Explain the Efficiency optimization control by flux program of Induction Motor.	▫ Lecture through Black Board & LCD ▫ Discussion	Seminar/Mid Test (Week 9-10)
6	Slip Power Recovery Drives-Static Kramer Drive-Phasor Diagram-Torque Expression-Speed Control of Kramer Drive	CO-2	What is Slip Power and how it is recovered? Explain the Static Kramer Drive-Phasor Diagram-Torque Expression-Speed Control of Kramer Drive	▫ Lecture through Black Board & LCD ▫ Discussion	Seminar/Mid Test (Week 9-10)
7	Static Scherbius Drive Modes of Operation	CO-2	Explain the Static Scherbius Drive Modes of Operation	▫ Lecture through Black Board & LCD ▫ Discussion	Seminar/Mid Test (Week 9-10)
8	Principles of vector control	CO-3	What is the Principle of vector control	▫ Lecture through Black Board & LCD Discussion	Seminar/Mid Test (Week 9-10)
9	**Seminar by the Students**				Seminar (Week 9)
10	**Mid-Test 1**				Week -10
11	Direct vector control, derivation of indirect vector control implementation block diagram of indirect vector control	CO-3	Explain the Direct vector control of Induction Motor. Explain and Derive indirect vector control of Induction Motor	▫ Lecture through Black Board & LCD Discussion	Seminar/Mid Test (Week 17-18)
12	estimation of flux, flux weakening operation	CO-3	How the estimation of flux, flux weakening operation is done in the Induction motor	▫ Lecture through Black Board & LCD ▫ Discussion	Seminar/Mid Test (Week 17-18)
13	Synchronous motor and its characteristics-Control strategies Constant torque angle control- power factor control, constant flux control, flux weakening operation	CO-4	Explain the operation of an Synchronous motor Explain the Various control strategies of Synchronous motor	▫ Lecture through Black Board & LCD ▫ Discussion	Seminar/Mid Test (Week 17-18)
14	Load commutated inverter fed synchronous motor drive, motoring and regeneration, phasor diagrams.	CO-4	Explain Load commutated inverter fed synchronous motor drive ,motoring and regeneration, phasor diagrams	▫ Lecture through Black Board & LCD Discussion	Seminar/Mid Test (Week 17-18)
15	Characteristics of permanent magnet, synchronous machines with permanent magnet, vector control of PMSM- Motor model and control scheme.	CO-5	Explain the characteristics of permanent magnets Explain the operation and control Schemes of PMSM Explain the vector control of PMSM	▫ Lecture through Black Board & LCD Discussion	Seminar/Mid Test (Week 17-18)
16	Variable Reluctance motor drives- Torque production in the variable reluctance motor - Drive characteristics and control principles Current control variable reluctance motor servo drive	CO-5	Explain the operation of VRM Explain the Drive characteristics and control principles of VRM Explain the control principles of Current control variable reluctance motor servo drive in detail	▫ Lecture through Black Board & LCD Discussion	Seminar/Mid Test (Week 17-18)
17	**STUDENTS SEMINAR**				Seminar (Week 18)
18	**Mid-Test 2**				Week-19
19/20	**END EXAM**				Week-20