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	Understand the Operation and Control of AC Drives.
2	Model and Simulate the AC Drives.
3	Analyze different Scalar Control Methods
4	Analyze the current Fed Inverter control methods.
5	Analyze the equations governing the Vector Control

Program Outcomes (POs):

A graduate of Electrical & Electronics Engineering will be able to

1	Be a professional workforce in the area of Static Power Electronics Converters and power electronic converter fed electrical drives and power quality issues.
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	By using state-of-the-art simulation tools such as PLEXIM, SABER, OPAL-RT Lab, dSPACE, MULTISIM , LABVIEW and other Tools.
6	Collaborate with industries on problems of relevance to them while formulating graduate dissertations.
7	Improvise soft skills to students through seminars and organization of technology workshops, writing research/project reports as a part of graduate education
8	Engage in life-long learning through professional bodies such as IEEE. Institute of Engineers (India) ,etc.
9	Imbibe social responsibilities and ethical practices prevailing in a society through professional institutions.

Course Outcome Versus **Program Outcomes:**

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

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-1,2	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-1,2.	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-1,2	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-1,2,3,4	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-1,3,4	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-1	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-1	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-5	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-2,5	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-2,5	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-1,2	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-1,2	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-1,2,5	Explain the characteristics of permanent magnets Explain the operation and control Schemes of PMSM	▫ Lecture through Black Board & LCD Discussion	Seminar/Mid Test (Week 17-18)

			Explain the vector control of PMSM		
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-1,3	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