

SOLID STATE ELECTRIC MOTOR DRIVES LABORATORY

VI Semester: EEE																																										
Course Code	Category	Hours / Week			Credits	Maximum Marks																																				
AEE109	Core	L	T	P	C	CIE	SEE	Total																																		
		-	-	3	2	30	70	100																																		
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 42			Total Classes: 42																																					
<p>I. COURSE OVERVIEW: The aim of this course is to conduct experiments on AC and DC drives. Control of DC motor drives with single phase and three phase converters and choppers are to be studied. The control of AC motor drives with variable frequency converters and variable voltage are to be conducted.</p> <p>II. OBJECTIVES: The course should enable the students to: I. Apply principles of power electronics in speed control of various drives. II. Demonstrate the concept of four quadrant operations of drives. III. Discuss various drives used in industries to control torque and speed.</p> <p>III. COURSE OUTCOMES: After successful completion of the course, students should be able to:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">CO 1</td> <td style="width: 70%;">Make use of single phase and three phase rectifiers for Speed control of DC shunt motor.</td> <td style="width: 20%;">Apply</td> </tr> <tr> <td>CO 2</td> <td>Analyze operation of PMDC motor using thruster drive and chopper for measuring speed.</td> <td>Apply</td> </tr> <tr> <td>CO 3</td> <td>Demonstrate various speed control methods of AC Motors using AC voltage controller and Variable Frequency Drive..</td> <td>Analyze</td> </tr> <tr> <td>CO 4</td> <td>Examine operation of DC Jones Chopper circuit and potentiometer for different load conditions</td> <td>Apply</td> </tr> <tr> <td>CO 5</td> <td>Analyze speed characteristics of special machines using MATLAB</td> <td>Evaluate</td> </tr> <tr> <td>CO 6</td> <td>Examine operation of Simulation of BLDC motor drive using MATLAB</td> <td>Apply</td> </tr> </table> <p>IV. SYLLABUS:</p> <p style="text-align: center;">LIST OF EXPERIMENTS</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Expt. 1</td> <td>SINGLE PHASE RECTIFIER FED DC SHUNT MOTOR</td> </tr> <tr> <td colspan="2">Speed control of DC shunt motor using single phase rectifier.</td> </tr> <tr> <td>Expt. 2</td> <td>THREE PHASE RECTIFIER FED DC SEPARATELY EXCITED MOTOR</td> </tr> <tr> <td colspan="2">Speed control of DC separately excited shunt motor using three phase rectifier.</td> </tr> <tr> <td>Expt. 3</td> <td>SPEED MEASUREMENT AND CLOSED LOOP CONTROL OF PMDC MOTOR</td> </tr> <tr> <td colspan="2">Speed measurement and closed loop control of PMDC motor using thyristorized and MOSFET based chopper drive.</td> </tr> <tr> <td>Expt. 4</td> <td>FOUR QUADRANT CHOPPER DRIVE</td> </tr> <tr> <td colspan="2">Four quadrant operation of PMDC motor using chopper.</td> </tr> </table>									CO 1	Make use of single phase and three phase rectifiers for Speed control of DC shunt motor.	Apply	CO 2	Analyze operation of PMDC motor using thruster drive and chopper for measuring speed.	Apply	CO 3	Demonstrate various speed control methods of AC Motors using AC voltage controller and Variable Frequency Drive..	Analyze	CO 4	Examine operation of DC Jones Chopper circuit and potentiometer for different load conditions	Apply	CO 5	Analyze speed characteristics of special machines using MATLAB	Evaluate	CO 6	Examine operation of Simulation of BLDC motor drive using MATLAB	Apply	Expt. 1	SINGLE PHASE RECTIFIER FED DC SHUNT MOTOR	Speed control of DC shunt motor using single phase rectifier.		Expt. 2	THREE PHASE RECTIFIER FED DC SEPARATELY EXCITED MOTOR	Speed control of DC separately excited shunt motor using three phase rectifier.		Expt. 3	SPEED MEASUREMENT AND CLOSED LOOP CONTROL OF PMDC MOTOR	Speed measurement and closed loop control of PMDC motor using thyristorized and MOSFET based chopper drive.		Expt. 4	FOUR QUADRANT CHOPPER DRIVE	Four quadrant operation of PMDC motor using chopper.	
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Expt. 5	AC VOLTAGE CONTROLLER FED INDUCTION MOTOR
Speed control of induction motor using AC voltage controller.	
Expt. 6	FOUR QUADRANT CHOPPER DRIVE
Study of closed loop speed control of DC motor using three phase fed four quadrant chopper drive.	
Expt. 7	SPEED CONTROL OF INDUCTION MOTOR
Speed control of induction motor using VVVF drive in three phase AC to three phase variable AC with 400V line voltage.	
Expt. 8	SPEED CONTROL OF INDUCTION MOTOR
Speed control of induction motor using VVVF drive with external contacts, potentiometer arrangement.	
Expt. 9	STATIC ROTOR RESISTANCE CONTROL
Speed control of three phase wound rotor induction motor using static rotor resistance control.	
Expt. 10	SYNCHRONOUS MOTOR SPEED CONTROL
Speed control of synchronous motor using VFD.	
Expt. 11	SVPWM CONTROL OF INDUCTION MOTOR USING DIGITAL SIMULATION
SVPWM VSI fed induction motor drive simulation using MATLAB.	
Expt. 12	DIRECT TORQUE CONTROL OF INDUCTION MOTOR DRIVE USING DIGITAL SIMULATION
Direct torque control of induction motor drive simulation using MATLAB.	
Expt. 13	FOUR QUADRANT OPERATION OF DC MOTOR USING DIGITAL SIMULATION
Four quadrant operation of DC drives with three phase converter simulation using MATLAB.	
Expt. 14	BLDC MOTOR DRIVE USING DIGITAL SIMULATION
Simulation of BLDC motor drive using MATLAB	
Reference Books:	
<ol style="list-style-type: none"> 1. G K Dubey, "Power semiconductor drives", Khanna Publishers, 5th Edition, 2012. 2. P S Bimbhra, "Power Electronics", Khanna Publishers, 5th Edition, 2012. 3. M D Singh, K B Kanchandhani, "Power Electronics", Tata McGraw-Hill Publishing Company, 7th Edition, 2007. 	
Web References:	
<ol style="list-style-type: none"> 1. https://www.ee.iitkgp.ac.in 2. https://www.citchennai.edu.in 3. https://www.iare.ac.in 	
Course Home Page:	

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS

S. No	Name of the Equipment	Range
1	Speed control of DC shunt motor using single phase rectifier trainer kit	--
2	Speed control of DC shunt motor using three phase rectifier trainer kit	--
3	Four quadrant operation of DC motor using dual converter trainer kit	--
4	Four quadrant operation of PMDC motor using chopper trainer kit	--
5	Speed control of induction motor using AC voltage controller trainer kit	--
6	Single phase AC voltage controller with built in 48V / 2A Isolation Transformer	--
7	VVVF drive with different inputs and outputs	--
8	Speed control of V / F drive using external contexts and potentiometer trainer kit	--
9	Speed control of VFD using PLC power circuit	--
10	Speed control of synchronous motor using VFD power unit	--
11	Hardware: Desktop Computers (04 nos) Software: MATLAB	