SOLID STATE ELECTRIC MOTOR DRIVES LABORATORY

VI Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
AEE109	**Core**	-	-	3	2	30	70	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 42**				**Total Classes: 42**		

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.

COURSE OUTCOMES (COs):

CO 1: Understand the speed control of DC motor with various converters
CO 2: Describe the Operation of Various chopper drives
CO 3: Explain the speed control of various AC motor drives with suitable converters
CO 4: Demonstrate the DC motor drives with various converters using digital simulation
CO 5: Describe the speed control of AC motor drives using digital simulation

COURSE LEARNING OUTCOMES (CLOs)

At the end of the course, the student will have the ability to:

1. Understand the speed control of DC shunt motor using single phase rectifier.
2. Analyze the speed control of DC separately excited shunt motor using three phase rectifier.
3. Demonstrate the speed measurement and closed loop control of PMDC motor using thyristorized drive.
4. Understand the four quadrant operation of PMDC motor using chopper.
5. Describe the speed control of induction motor using AC voltage controller.
6. Describe the study of DC Jones Chopper circuit
7. Analyze the speed control of DC motor with external contacts and potentiometer arrangement
8. Understand the speed control of Synchronous motor with Variable Frequency Drive
9. Analyze the stepper motor speed control using digital simulation
10. Demonstrate the universal motor speed control using digital simulation
11. Describe the SVPWM VSI fed induction motor drive simulation using MATLAB.
12. Understand the direct torque control of induction motor drive simulation using MATLAB.
13. Analyze the four quadrant operation of DC drives with three phase converter simulation using MATLAB.
14. Demonstrate the simulation of BLDC motor drive using MATLAB
15. Apply the concept of solid state electric drives to solve real time world applications
16. Explore the knowledge and skills of employability to succeed in national and international level competitive examination

LIST OF EXPERIMENTS	
Week-1	**SINGLE PHASE RECTIFIER FED DC SHUNT MOTOR**
Speed control of DC shunt motor using single phase rectifier	
Week-2	**THREE PHASE RECTIFIER FED DC SEPARATELY EXCITED MOTOR**
Speed control of DC separately excited shunt motor using three phase rectifier	
Week-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.	
Week-4	**FOUR QUADRANT CHOPPER DRIVE**
Four quadrant operation of PMDC motor using chopper	
Week-5	**AC VOLTAGE CONTROLLER FED INDUCTION MOTOR**
Speed control of induction motor using AC voltage controller	
Week-6	**DC JONES CHOPPER**
Verification of DC Jones chopper	
Week-7	**SPEED CONTROL OF DC MOTOR**
Speed control of DC motor with external contacts and potentiometer arrangement	
Week-8	**SYNCHRONOUS MOTOR SPEED CONTROL**
Speed control of synchronous motor using VFD	
Week-9	**SPEED CONTROL OF STEPPER MOTOR USING DIGITAL SIMULATION**
Stepper motor speed control using MATLAB	
Week-10	**UNIVERSAL MOTOR SPEED CONTROL USING DIGITAL SIMULATION**
Universal motor speed control using MATLAB	
Week-11	**SVPWM CONTROL OF INDUCTION MOTOR USING DIGITAL SIMULATION**
SVPWM VSI fed induction motor drive simulation using MATLAB	
Week-12	**DIRECT TORQUE CONTROL OF INDUCTION MOTOR DRIVE USING DIGITAL SIMULATION**
Direct torque control of induction motor drive simulation using MATLAB	
Week-13	**FOUR QUADRANT OPERATION OF DC MOTOR USING DIGITAL SIMULATION**
Four quadrant operation of DC drives with three phase converter simulation using MATLAB	
Week-14	**BLDC MOTOR DRIVE USING DIGITAL SIMULATION**
Simulation of BLDC motor drive using MATLAB	

Text Books:

1. PV Rao, "Power Semiconductor Drives", BS Publications, 1st Edition, 2014.
2. G K Dubey, "Fundamentals of Electric Drives", Narosa Publications, 2nd Edition, 2001.
3. SB Devan, GR Slemon, A Straughen, "Power semiconductor drives", Wiley Pvt. Ltd,. 4th Edition, 2001.
4. B K Bose, "Modern Power Electronics and AC Drives", Prentice Hall India Learning Private Limited, 2005

Reference Books:

1. P S Bimbhra, "Power Electronics", Khanna Publishers, 5th Edition, 2012.
2. M D Singh, K B Kanchandhani, "Power Electronics", Tata Mc Graw Hill Publishing Company, 7th Edition, 2007.

Web References:

1. https://www.ee.iitkgp.ac.in
2. https://www.citchennai.edu.in
3. https://www.iare.ac.in