POWER ELECTRONICS AND SIMULATION LABORATORY

V Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AEE108	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. Examine the characteristics of various devices and application of firing circuits used in power electronics.
II. Outline the performance characteristics of AC voltage regulators, choppers, inverters, rectifiers and cycloconverters.
III. Demonstrate the working principle of various power electronic devices and circuits using simulation.
IV. Design the simple power electronic circuits through digital simulation.

COURSE OUTCOMES (COs):

CO 1: Describe the operation and characteristics of SCR, MOSFET and IGBT.
CO 2: Explain the operation of Single phase and three phase controlled rectifiers and their commutating circuits.
CO 3: Discuss the operation of different types of Choppers, inverters.
CO 4: Illustrate the functioning of AC voltage controllers and cycloconverters.
CO 5: Design the different power electronic circuits using MATLAB/Simulation.

COURSE LEARNING OUTCOMES (CLOs):

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

1. Illustrate the characteristics of SCR, MOSFET and IGBT.
2. Demonstrate the operation of different gate firing circuits of SCR.
3. Analyze the operation Single phase half controlled converter with R and RL loads.
4. Describe the forced commutation circuits (Class A, Class B, Class C, Class D and Class E)
5. Demonstrate the operation of Single phase fully controlled bridge converter with R and RL loads.
6. Explain the operation of Single phase series inverter with different loads.
7. Outline the operation of Single phase parallel inverter with different loads
8. Describe the working principle and operation of single phase AC voltage controller with R and RL loads
9. Demonstrate the four quadrant operation of single phase dual converter with R and RL loads.
10. Discuss the operation of Single phase cycloconverter with R and RL loads.
11. Demonstrate the operation of three phase half converter with R and RL loads
12. Analyze the principle of Operation of step down chopper using MOSFET
13. Analyze the operation of three phase full converter & PWM inverter with R and RL loads by using MATLAB
14. Analyze the operation of boost, buck, buck boost converter with R and RL loads by 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	
Exp-1	**SCR, MOSFET AND IGBT**
Study the characteristics of SCR, MOSFET and IGBT.	
Exp-2	**GATE FIRING CIRCUITS**
Study the operation of gate firing circuits of SCR.	
Exp-3	**HALF CONTROLLED CONVERTER**
Study the performance characteristics of single phase half controlled converter with R and RL loads.	
Exp-4	**FORCED COMMUTATION CIRCUITS**
Plot the characteristics of forced commutation circuits (Class A, Class B, Class C, Class D and Class E).	
Exp-5	**FULLY CONTROLLED BRIDGE CONVERTER**
Study the characteristics of single phase fully controlled bridge converter with R and RL loads.	
Exp-6	**SERIES INVERTER**
Study the characteristics of single phase series inverter with different loads.	
Exp-7	**PARALLEL INVERTER**
Study the characteristics of single phase parallel inverter with different loads.	
Exp-8	**VOLTAGE CONTROLLER**
Plot the characteristics of Single phase AC voltage controller with R and RL loads.	
Exp-9	**DUAL CONVERTER**
Study the characteristics of single phase dual converter with R and RL loads.	
Exp-10	**CYCLOCONVERTER**
Study the characteristics of single phase cycloconverter with R and RL loads.	
Exp-11	**THREE PHASE CONVERTERS**
Plot the characteristics of three phase half converter with R and RL loads.	
Exp-12	**MOSFET BASED CHOPPERS**
Study the principle of operation of step down chopper using MOSFET.	
Exp-13	**SIMULATION OF THREE PHASE FULL CONVERTER AND PWM INVERTER**
Simulation of three phase full converter and PWM inverter with R and RL loads by using MATLAB.	
Exp-14	**SIMULATION OF BUCK – BOOST CHOPPER**
Simulation of boost, buck, buck boost converter with R and RL loads by using MATLAB.	
Text Books:	
1. M D Singh, K B Kanchandhani, “Power Electronics”, Tata Mc Graw Hill Publishing Company, 2nd Edition, 1998. 2. Dr. P S Bimbhra, “Power Electronics”, Khanna Publishers, 5th Edition, 2012. 3. Ned Mohan, Tore M Undeland, William P Robbins, “Power Electronics: Converters, Applications and Design”,	

3rd Edition, John Wiley and sons, 2002.
4. M H Rashid, “Power Electronics, Circuits, Devices and Applications”, Pearson, 3rd Edition, 2001.

Reference Books:

1. Vedam Subramanyam, “Power Electronics”, New Age International Limited, 2nd Edition, 2006.
2. P C Sen, “Power Electronics”, Tata McGraw-Hill Publishing, 1st Edition, 1987.
3. G K Dubey, S R Doradra, A Joshi, R M K Sinha, “Thyristorised Power Controllers”, New Age International Limited, 2nd Edition, 2008.
4. V R Moorthi, “Power Electronics Devices”, Oxford University Press, 4th Edition, 2005.

Web References:

1. https://www.nptel.iitm.ac.in
2. https://www.bookboon.com/en/introduction-to-power-electronics-ebook
3. https://onlinecourses-archive.nptel.ac.in/noc19_ee15/announcements?force=true