INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

POWER ELECTRONICS AND DRIVES LABORATORY

VI Semester: EEE

Course Code	Category	Hours / WEEK			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEED39	Core	0	0	2	1	40	60	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45	Total Classes: 45

Prerequisite: Power Electronics

I. COURSE OVERVIEW:
This course is intended for practical experience by conduction experiments on rectifiers, inverters, choppers, AC voltage controllers and cycloconverters. It provides hands-on experience by examining the electrical characteristics of various power converters. The power electronic converter applications have been analyzed with simulation tools.

II. COURSE OBJECTIVES:
The students will try to learn:
I.   The engineering skills by way of electrical circuit design with power electronic devices and components.
II. Simulation and testing the different power converter circuits using simulation tools.
III. The demonstration of basic power electronic circuits for developing complex power converter modules.

III. COURSE OUTCOMES:
After successful completion of the course, students should be able to:
CO1   Experiment the operation of SCR, MOSFET and IGBT for obtaining static voltage - current characteristics
CO2   Utilize the forced commutation circuits and gate firing circuits for turning off and on of the SCR.
CO3   Analyse the input and output waveforms of controlled rectifier circuits for determining the output voltages.
CO4   Construct the various inverter circuits for DC to AC conversion.
CO5   Analyze the speed control of DC Motor through four quadrant chopper drives.
CO6   Analyze the speed control of synchronous motor through voltage frequency drive.

IV. COURSE CONTENT:

WEEK - 1: SCR, MOSFET AND IGBT
Study the characteristics of SCR, MOSFET and IGBT.

WEEK - 2: GATE FIRING CIRCUITS
Study the operation of gate firing circuits of SCR.

WEEK - 3: FORCED COMMUTATION CIRCUITS
Plot the characteristics of forced commutation circuits (Class A, Class B, Class C, Class D and Class E)

WEEK - 4: SINGLE PHASE FULLY CONTROLLED BRIDGE CONVERTER WITH R AND RL LOADS
Study the characteristics of single phase fully controlled bridge converter with R and RL loads.

WEEK - 5: SINGLE PHASE AC VOLTAGE CONTROLLER WITH R AND RL LOADS
Study the characteristics of single phase AC voltage controller with R and RL loads.

WEEK - 6: SERIES INVERTER
Study the characteristics of single-phase series inverter for different loads.

WEEK -7: PARALLEL INVERTER
Study the characteristics of single-phase parallel inverter for different loads.

WEEK - 8: **SPEED MEASUREMENT AND CLOSED LOOP CONTROL OF PMDC MOTOR USING MOSFET/IGBT BASED FOUR QUADRANT CHOPPER**
Speed control of PMDC motor using MOSFET/IGBT based four quadrant chopper drive.

WEEK - 9: THYRISTERISED DRIVE FOR PMDC MOTOR WITH SPEED MEASUREMENT AND CLOSED LOOP CONTROL
Speed control of PMDC motor using thyristerised drive.

WEEK - 10: SPEED CONTROL OF SYNCHRONOUS MOTOR USING VFD
Speed control of synchronous motor using voltage frequency drive.

WEEK - 11: SIMULATION OF THREE PHASE FULL BRIDGE CONVERTER
Simulation of three phase full bridge converter with R and RL loads by using MATLAB.

WEEK - 12: SIMULATION OF DC-DC CONVERTERS
Simulation of boost, buck, buck - boost converter with R and RL loads by using MATLAB.

WEEK - 13: SIMULATION OF CLOSED LOOP CONTROL OF CHOPPER FED DC MOTOR
Draw the characteristic curve for the closed loop control of converter fed dc motor using MAT LAB Simulation.

WEEK - 14: SIMULATION OF THREE PHASE PWM INVERTER
Simulation of three phase PWM inverter with R and RL loads by using MATLAB.

V. REFERENCE BOOKS:
1. M D Singh, K B Kanchandhani, "Power Electronics", Tata McGraw 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.

VI. WEB REFERENCES:
1. https://www.ee.iitkgp.ac.in
2. https://www.iare.ac.in

VII. ELECTRONIC RESOURCES:
1. http://DVP-ES2/EX2/SS2/SA2/SX2/SE&TP Operation Manual - Programming (deltronics.ru)
2. http://DELTA_IA-PLC_DVP_TP_C_EN_20231023.pdf (deltaww.com)

VIII. MATERIALS ONLINE:
1. Course Content.
2. Lab manual