

SCHEME OF COURSE WORK

Course Details:

Course Title	: POWER ELECTRONICS		
Course Code	:13EE1113	L T P C	:4 1 0 3
Program:	: B.Tech.		
Semester	: V		
Prerequisites	: Basic Network Analysis, Electronic Devices & Circuits		
Courses to which it is a	: PED ,HVDC & FACTS		

Course Outcomes (COs):

1	Distinguish between different types of power semiconductor devices and their characteristics
2	Analyze Phase controlled converters.
3	Analyze AC voltage controllers and Cycloconverters.
4	Analyze DC –DC Choppers.
5	Analyze DC-AC Inverters.

Program Outcomes (POs):

1	Apply the knowledge of basic sciences and electrical and electronics engineering fundamentals to solve the problems of power systems and drives.
2	Analyze power systems that efficiently generate, transmit and distribute electrical power in the context of present Information and Communication Technology
3	Design and develop electrical machines and associated controls with due considerations to societal and environmental issues.
4	Design and conduct experiments, analyze and interpret experimental data for performance analysis.
5	Apply appropriate simulation tools for modeling and evaluation of electrical systems.
6	Apply the electrical engineering knowledge to assess the health and safety issues and their consequences.
7	Demonstrate electrical engineering principles for creating solutions for sustainable development.
8	Develop a techno ethical personality that help to serve the people in general and Electrical and Electronics Engineering in particular.
9	Develop leadership skills and work effectively in a team to achieve project objectives.
10	Communicate effectively in both verbal and written form.
11	Understand the principles of management and finance to manage project in multi disciplinary environments.
12	Pursue life-long learning as a means of enhancing the knowledge and skills.

Course Outcome Versus Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	S	M	M		M							M
CO-2	S	M	M		M							M
CO-3	S	M	M		M							M
CO-4	S	M	M		M							M
CO-5	M	M	M		M							M

S - Strongly correlated, *M* - Moderately correlated, *Blank* - No correlation

Assessment Methods:	Assignment / Quiz / Mid-Test / End Exams
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SCHEME OF COURSE WORK
Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	POWER SEMICONDUCTOR DEVICES: Power Diode, Power BJTs, Power MOSFETs, Power IGBTs	CO-1	1. Explain the dynamic characteristics Power diode? 2. Explain the switching characteristics of Power BJT? 3. Differentiate PMOSFET & Power BJT. 4. Explain the Static & dynamic characteristics Power IGBT?	Lecture/Discussion	Mid-1 / August Assignment-1/ August
2	GTOs and their characteristics. Basic principle of operation of SCR, Static characteristics, Two transistor model of SCR, SCR Turn on and SCR turn off characteristics	CO-1	1 Explain the Static & dynamic Characteristics of GTO? 2. Explain the Turn on and turn off characteristics of SCR?	Lecture/Discussion	Mid-1/August Assignment -1/ August
3	Series and parallel connections of Thyristors	CO-1	1 . Explain Series connections of Thyristors? 2 Explain Series connections of Thyristors?	Lecture/Discussion	Mid-1/August Assignment -1 August
4	di/dt protection, dv/dt protection of SCRs, MOSFET gate drive circuit, BJT base drive circuit, Isolation of gate and base drive, Thyristor firing circuits.	CO-2	Explain the di/dt protection, dv/dt protection of SCRs. 1. Explain MOSFET gate drive circuit, BJT base drive circuit. 2. What is the need of isolating gate and base drive? 3. What are the different types of SCR firing?	Lecture/Discussion	Mid-1/August Assignment -1/ August
5	1- PHASE, PHASE- ANGLE CONTROLLED THYRISTOR CONVERTERS: Principle of phase angle control: Single phase full converter with R-L load	CO-2	1. Explain the principle of phase angle control? 2. Explain and draw the output waveforms of single phase full converter with R-load.	Lecture/Discussion	Mid-1/August simulation based Assignment/ August
6	Single phase dual converter, Single phase semi-controlled converter with R-L load.	CO-2	1. Explain circulating and non circulating modes of dual converter 2. Explain and draw the output waveforms of single phase semi converter with RL-load.	Lecture/Discussion	Mid-1/August simulation based Assignment/ August
7	3-PHASE, PHASE-ANGLE CONTROLLED THYRISTOR CONVERTERS: Three phase half wave converter with R-L load, Three phase Full wave converter with R-L load, Three phase dual converter,	CO-2	1. Explain and draw the output waveforms of three phase half wave converter with RL-load. 2. Explain and draw the output waveforms of three phase full wave	Lecture/Discussion/Graphs	Mid-1/August Quiz-1/August simulation based Assignment
8	Mid Exam-1				

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9	AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS: Principle of on-off control, Principle of phase control, Single phase bidirectional controllers with resistive load,	C0-3	1. Explain Principle of on-off control & phase control. 2. Explain Principle of phase control.	Lecture/Discussion	Mid-II/ October Quiz- II/October
10	Single phase controllers with inductive load, 1-phase / 3-phase cyclo-converters.	C0-3	1. Explain and draw the output waveforms of single phase AC voltage controller with inductive -load. 2. Explain and draw the output waveforms of single phase cyclo converter.	Lecture/Discussion/ Power point presentation	Mid-II/ October
11	Principle of step down chopper, Generation of duty cycle, Step down converters with and without back e.m.f load,	C0-4	1. Explain the principle of step down chopper. 2. Explain Step down converters with and without back e.m.f load?	Lecture/Discussion	Mid-II/ October Assignment-2/ October
12	Principle of step up chopper, Performance of step down/ up choppers, Converter classifications.	C0-4	1. Explain the principle of step up chopper. 2)What are the various types of DC-DC converters	Lecture/Discussion	Mid-II/ October Assignment-2/ October
13	INVERTERS: Single phase half bridge inverter, Single phase full bridge inverter, Three phase voltage source inverters (180 and 120 degree modes).	C0-5	1.Explain Single phase half bridge inverter 2. Explain Single phase full bridge inverter 3. Explain Three phase voltage source inverters (180 and 120 degree modes).	Lecture/Discussion/ Power point presentation	Mid-II/ October Assignment-2/ October
14	VOLTAGE CONTROL TECHNIQUES OF INVERTERS: Single Pulse Width Modulation, Multiple Pulse-width Modulation.	C0-5	1. What are the various voltage control techniques? 2. Explain the principle of Multiple Pulse-width Modulation.	Lecture/Discussion	Mid-II/ October Quiz-2/ October
15	Sinusoidal Pulse width Modulation, Modified Sinusoidal Pulse Width Modulation	C0-5	1. Explain the principle of sinusoidal Pulse-width Modulation 2.Differentiate Sinusoidal Pulse width Modulation & Modified Sinusoidal Pulse Width Modulation	Lecture/Discussion	Mid-II/ October Quiz-2/ October
16	Mid-2				
17	(No Class work)				
18 & 19	END EXAM				