LESSON PLAN

Course Code	Course Title	Year/Sem	Branch	Contact Hrs/Week	Section
R20	POWER ELECTRONICS	**III/I**	**EEE**	**5**	**EEE**

COURSE OBJECTIVES:

1: To know the characteristics of various power semiconductor devices.
2: To learn the operation of single phase full–wave converters and perform harmonic analysis of input current.
3: To learn the operation of three phase full–wave converters and AC/AC converters.
4: To learn the operation of different types of DC-DC converters.
5: To learn the operation of PWM inverters for voltage control and harmonic mitigation.

Unit No.	Out Comes		TOPIC(S)	BOOK Reference	Total periods	Delivery Method	GATE / IES
	UNIT I - Power Semi-Conductor Devices						
1	CO1:Illustrate the static and dynamic characteristics of SCR, Power-MOSFET and Power-IGBT	1.1	Introduction	**T1**	**16**	Chalk & Talk, PPT, Active Learning, Smart board & Tutorial	
		1.2	Silicon controlled rectifier (SCR)	**T1**			
		1.3	Two transistor analogy	**T1**			
		1.4	Static and Dynamic characteristics	**T1**			
		1.5	Turn on and Turn off Methods	**T1**			
		1.6	Turn on and Turn off Methods	**T1**			
		1.7	Triggering Methods (R, RC and UJT)	**T1**			
		1.8	Triggering Methods (R, RC and UJT)	**T1**			
		1.9	Triggering Methods (R, RC and UJT)	**T1**			
		1.10	Snubber circuit design.	**T1**			
		1.11	Static and Dynamic Characteristics of Power MOSFET	**T1**			
		1.12	Static and Dynamic Characteristics of Power IGBT	**T1**			
		1.13	Gate Driver Circuits for Power MOSFET and IGBT	**T1**			
		1.14	Gate Driver Circuits for Power MOSFET and IGBT	**T1**			
		1.15	Numerical problems	**T2**			

		1.16	Numerical problems	**T2**			
	UNIT II - Single-phase AC-DC Converters						
2	CO2: Analyze the operation of phase-controlled rectifiers.	2.1	Single-phase half-wave controlled rectifiers	**T1**	**16**	Chalk & Talk, PPT Tutorial, Active Learning Smart board &Case Study	
		2.2	Single-phase half-wave controlled rectifiers - R and RL loads	**T1**			
		2.3	Single-phase half-wave controlled rectifiers - R and RL loads	**T1**			
		2.4	Single-phase half-wave controlled rectifiers - R and RL loads with and without freewheeling diode	**T1**			
		2.5	Single-phase fully controlled mid-point and bridge converter with R load	**T1**			
		2.6	RL load and RLE load	**T1**			
		2.7	Continuous and Discontinuous conduction	**T1**			
		2.8	Effect of source inductance in Single-phase fully controlled bridge rectifier	**T1**			
		2.9	Expression for output voltages	**T1**			
		2.10	Single-phase Semi-Converter with R load	**T1**			
		2.11	RL load and RLE load	**T2**			
		2.12	Continuous and Discontinuous conduction	**T1**			
		2.13	Harmonic Analysis	**T1**			
		2.14	Dual converter and its mode of operation	**T1**			
		2.15	Numerical Problems	**T1**			
		2.16	Numerical Problems				
	UNIT III – Three-phase AC-DC Converters & AC – AC Converters						
3	CO3: Analyze the operation of three-phase full–wave converters, AC Voltage Controllers and Cycloconverters.	3.1	Three Phase AC–DC Bridge Converters	**T1**	**14**	Chalk & Talk, PPT, Smart board‘ Lab, Tutorial	
		3.2	Three-phase half-wave Rectifier with R and RL load	**T1**			
		3.3	Three-phase half-wave Rectifier with R and RL load	**T1**			
		3.4	Three-phase fully controlled rectifier with R and RL load	**T2**			
		3.5	Three-phase fully controlled rectifier with R and RL load	**T2**			
		3.6	Three-phase semi converter with R and RL load	**T1**			
		3.7	Expression for Output Voltage	**T1**			
		3.8	Harmonic Analysis	**T1**			
		3.9	Numerical Problems	**T1**			

		3.10	Single-phase AC-AC power control by phase control with R and RL loads	**T1**			
		3.11	Single-phase AC-AC power control by phase control with R and RL loads	**T1**			
		3.12	Expression for rms output voltage	**T2**			
		3.13	Single-phase step down and step up Cycloconverter	**T1**			
		3.14	Numerical Problems	**T1**			
	UNIT IV- DC–DC Converters						
4	CO4: Examine the operation and design of different types of DC-DC converters.	4.1	Operation of Basic Chopper	**T2**	**9**	Chalk & Talk, PPT, Active Learning, Smart board & Tutorial	
		4.2	Analysis of Buck, Boost and Buck-Boost converters	**T1**			
		4.3	Analysis of Buck, Boost and Buck-Boost converters in Continuous Conduction Mode (CCM)	**T1**			
		4.4	Analysis of Buck, Boost and Buck-Boost converters in Discontinuous Conduction Modes (DCM)	**T1**			
		4.5	Output voltage equations using volt-sec balance in CCM & DCM	**T2**			
		4.6	Expressions for output voltage ripple and inductor current ripple – control techniques	**T2**			
		4.7	Introduction to PWM control	**T2**			
		4.8	Numerical Problems	**T2**			
		4.9	Numerical Problems	**T2**			
	UNIT V - DC–AC Converters						
5	CO5: Analyse the operation of PWM inverters for voltage control and harmonic mitigation.	5.1	Introduction	**T1, T2**	**10**	Chalk & Talk, PPT Tutorial, Active Learning & Seminars	
		5.2	Single-phase half-bridge and full-bridge inverters with R and RL loads	**T1, T2**			
		5.3	Phase Displacement Control	**T2**			
		5.4	PWM with unipolar voltage switching	**T2**			
		5.5	Three-phase square wave inverters	**T2**			
		5.6	120_0 conduction and 180_0 conduction modes of operation	**T2**			
		5.7	Sinusoidal Pulse Width Modulation	**T2**			
		5.8	Current Source Inverter (CSI)	**T2**			
		5.9	Numerical Problems	**T2**			
		5.10	Numerical Problems	**T2**			
		TOTAL			**65**		

Course Outcomes:

After the completion of the course the student should be able to:

CO1	Illustrate the static and dynamic characteristics of SCR, Power-MOSFET and Power-IGBT	UNDERSTAND	K2
CO2	Analyze the operation of phase-controlled rectifiers.	ANALYZE	K4
CO3	Analyze the operation of three-phase full–wave converters, AC Voltage Controllers and Cycloconverters.	ANALYZE	K4
CO4	Examine the operation and design of different types of DC-DC converters.	REMEMBER	K1
C05	Analyse the operation of PWM inverters for voltage control and harmonic mitigation.	ANALYZE	K4

CO-PO MAPPING: (1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High]]; '-': No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1-K2	3	3	3	3	3	-	-		3	2	2	3
CO2-K4	3	3	2	2	2	2	-		2	2	3	3
CO3-K4	3	3	2	3	3	-	-		2	-	2	2
CO4-K1	3	3	2	3	2	3	-		2	2	2	3
CO5-K4	3	3	2	3	2	-	2		3	-	2	2

S.NO	GRADUATE ATTRIBUTION	ACTION VERBS	LEVEL
1	ENGINEERING KNOWLEDGE	APPLY	K3
2	PROBLEM ANALYSIS	ANALYZE	K4
3	DESIGN DEVELOPMENT OF SOLUTIONS	APPLY	K3
4	INVESTIGATION OF COMPLEX PROBLEMS	APPLY, ANALYZE	K3,K4
5	MODERN TOOL USAGE	APPLY	K3
6	ENGINEER AND SOCIETY	UNDERSTANDING	K2
7	ENVIRONMENT AND SUSTAINABILITY	UNDERSTANDING	K2
8	ETHICS		
9	INDIVIDUALS AND TEAM WORK	APPLY, ANALYZE	K3,K4
10	COMMUNICATION	APPLY	K3
11	PROJECT MANAGEMENT AND FINANCE	APPLY	K3
12	LIFE LONG LEARNING	UNDERSTANDING	K2

Text Books:	
S.No.	**AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION**
1.	Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
2.	Power Electronics: converters, applications & design -by Nedmohan, Tore M. Undeland, Robbins by Wiley India Pvt. Ltd.
3.	Power Converter Circuits -by William Shepherd, Li zhang, CRC Taylor & Francis Group.
Reference Books:	
S.No.	**AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION**
1.	Elements of Power Electronics–Philip T.Krein.oxford.
2.	Power Electronics – by P.S.Bhimbra, Khanna Publishers.
3.	Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K.Sinha,

	New Age International (P) Limited Publishers, 1996.
4.	Power Electronics handbook by Muhammad H. Rashid, Elsevier

		Name	Signature with Date
i.	Faculty	Siyyadri Jyothi Rani	
ii.	Course Coordinator		

HOD **PRINCIPAL**