

COURSE CODE: 1151EE109	COURSE TITLE: POWER ELECTRONICS	L	T	P	C
		2	2	0	3
COURSE CATEGORY:					
Program Core					
PREAMBLE :					
<p>This course being a core of power and energy control. It forms the basis for understanding the efficient conversion, control and conditioning of electric power from its available input into the desired electrical output. Form by using electronic devices, the key component of which is a switching power converter i.e., rectifiers, inverters, ac and dc converters, choppers. Moreover it contributes to learn the design of circuits and equipment based on power electronic components.</p>					
PREREQUISITE COURSES:					
Electronic Devices & Circuits					
RELATED COURSES:					
LED Lighting Technology					
COURSE EDUCATIONAL OBJECTIVES :					
<p>The objectives of the course are to make the students,</p> <ul style="list-style-type: none"> • To get an overview of different types of power semi-conductor devices and their switching characteristics. • To understand the operation, characteristics and performance parameters of controlled rectifiers. • To study the operation, switching techniques and basic topologies of DC-DC switching regulators. • To learn the different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction methods. • To know the practical application for power electronics converters in conditioning the power supply. 					
COURSE OUTCOMES :					
Upon the successful completion of the course, students will be able to:					
CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's taxonomy)			
C01	Explain different types of power semi-conductor devices and their switching characteristics.	K2			
C02	Explain the operation, characteristics and performance parameters of controlled rectifiers.	K2			
C03	Explain the operation, switching techniques and basic topologies of DC-DC switching regulators.	K2			
C04	Compare different techniques of pulse width modulated inverters and to understand the harmonic reduction methods.	K2			
C05	Identify similar practical or theoretical situations where AC voltage controller & Cycloconverter find their applications.	K3			

CORRELATION OF COs AND POs												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H				L						M	
CO2	L		H		H	H	H					
CO3										L		
CO4			M		H		L				L	
CO5	H		M		H	M					L	
COURSE CONTENT:												
UNIT I	POWER SEMI CONDUCTOR DEVICES										9	
Power switching devices overview: ideal & real switching characteristics - power diode, BJT, SCR, TRIAC, MOSFET, GTO, IGBT- VI characteristics, Turn-on, Turn-off methods; protection - di/dt, dv/dt, over current, over voltage, specifications, losses, thermal characteristics, series and parallel operation, triggering circuits.												
UNIT II	CONTROLLED RECTIFIERS										9	
Operation and analysis of single and three phase rectifiers – half and fully controlled converters with R, RL and RLE loads with and without free wheeling diodes; converter and inverter operation – wave forms, gate time control, output voltage, input current, power factor, effect of load and source inductance. Commutation Techniques- Power factor and harmonic improvement methods – multi-phase width controlled, symmetrical angle controlled; series converter; dual converter modes – four-quadrant operation with and without circulating current modes; firing circuits.												
UNIT III	CHOPPERS										9	
Principles of high power chopper circuits – voltage commutated, current commutated chopper, multi-phase chopper, multi-quadrant operation, switch mode regulators – principle of operation of buck, boost and buck boost regulators; time ratio control, variable frequency control, duty cycle.												
UNIT IV	INVERTERS										9	
Principles of high power VSI and CSI inverters, Modified McMurray, auto sequential inverter,– waveforms at load and commutating elements, analysis of three phase inverter circuits with star and delta loads; control and modulation techniques; unipolar, bipolar inverters – voltage and frequency control; harmonics study.												
UNIT V	AC CHOPPER AND CYCLOCONVERTERS										9	
Principle of single phase and three-phase AC voltage controller – ON/OFF and phase angle control; principle of single phase and three phase cyclo converters circuits, different control techniques and firing pulse generation. Applications-VVVF, UPS, Fan Regulator.												
												TOTAL: 45 PERIODS
TEXT BOOKS:												
<ol style="list-style-type: none"> 1. Muhammad H. Rashid, "Power Electronics: Circuits, Devices and Applications", 3rd Edition, Pearson Education/Prentice Hall, 2004. 2. Singh, M.D. and Khanchandani, K.B., "Power Electronics", 2nd Edition, Tata McGraw Hill, 2004. 												
REFERENCE BOOKS:												
<ol style="list-style-type: none"> 1. Bhimbra, P. S., "Power Electronics", 4th Edition, Dhanpat Rai and Sons, 2000. 2. Bimal K. Bose, "Modern Power Electronics and AC Drives", Pearson Education, 2003. 3. Ned Mohan, Tore M. Undeland, William P. Robbins, "Power Electronics Converters 												

Applications and Design”, 3rd Edition, John Wiley and Sons, 2003.

4. Cyril W.Lander, “ Power Electronics”, McGraw-Hill, International edition, New Delhi, 1993.