

Branch Name:	Electrical Engineering
ProgramCode:	ET213
CourseName:	Advanced Power Electronics
CourseCode:	2ET2130102T
Pre-requisiteCourse:	Fundamentals of Power Electronics

Course Objectives:

1. To understand the working, analysis and control of converter and inverter.
2. To identify different concepts and characteristics of different multilevel converter.
3. To understand various analytical concept of rectifier.
4. To identify characteristics and structure of 3-phase voltage controllers and cycloconverters.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	DC to DC Converters: Introduction, Switching voltage regulators; Review of basic dc-dc voltage regulator configurations -Buck, Boost, Buck-Boost converters and their analysis for continuous and discontinuous mode, Other converter configurations like Flyback converter, Forward converter, Half bridge, Full bridge configurations, Push-pull converter.	08	20%
2	DC to AC Converters (Inverters): Introduction and Classification, Concept of Unipolar and Bipolar PWM, Sine- triangular PWM, Space Vector Pulse Width Modulation, Selective Harmonics Elimination, Hysteresis Current Control, Harmonic reduction techniques, Current Source Inverters, Z- source inverters, Dead time for bridge inverters.	08	20%
3	Multilevel Inverters: Introduction, Classification and Application, Cascaded H-Bridge Multilevel Inverters, Diode-Clamped Multilevel Inverters, Flying-Capacitor Multilevel Inverters, Comparison of Power Topologies, Neutral-Point Voltage Control, Carrier Based PWM Schemes, Space Vector Modulation for MLI.	05	10%

4	AC to DC Converters (Rectifiers): Introduction, Single phase and three phase half wave and full wave, 1-phase and 3- phase half controlled and fully controlled converters, Analysis with R & RL load, Performance parameters for converters,, Operation in continuous and dis- continuous mode, Operation in conversion and inversion mode, Effect of source inductance, 12-Pulse SCR Rectifier, Power factor improvement techniques.	08	20%
5	Three phase AC voltage controllers and Cycloconverters: AC voltage controllers: Review of On-off and phase control; Single phase full wave controllers and their analysis with resistive loads; Three phase full wave controllers, Analysis with R-load, Three phase bi-directional delta-connected controllers Cyclo-converters: single-phase to single-phase cyclo-converter, 3-phase to 1-phase cyclo-converter, 3-phase to 3-phase cyclo-converter circuits; circulating current operation; non-circulating current operation; mean output voltage and harmonics in supply current waveform.	08	20%
6	Advance Electrical Drives:Brushless DC motor: Sinusoidal and Trapezoidal BLDC motor, Electronic Commutator, Torque production inBLDC motor, Control of Brushless DC drives.	05	10%

Text Books:

1. Muhammad H. Rashid, "Power Electronics - Circuits, Devices and Applications", Prentice Hall of India, 3rd ed.,2003.
2. Mohan, Undeland and Robbins, "Power Electronics – Converters, Applications and Design", John Willey & sons, Inc., 3rd ed.,2003.

Reference Books:

1. Bin Wu, "High Power Converters and AC Drives", IEEE Press, A John Wiley & Sons, Inc., Publication.2006.
2. P.C.Sen, "Modern Power Electronics ", S. Chand and Co. Ltd., New Delhi,2012.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom'sTaxonomyLevel
CLO1	Analyze and design of DC-DC converters, phase controlled converters.	4Analyze 6 Creating
CLO2	Understand the basic construction and principal of inverters and AC-ACconverters.	2 Understanding
CLO3	Understand the analysis and design of MultilevelInverters.	2 Understanding 4Analyze
CLO4	Know about control schemes of power electronicsconverters.	1Remembering
CLO5	Know about use of power electronics converters for powersystems.	1Remembering
CLO6	Analyze and design of various 3-phase voltage controllers and cycloconverters.	4Analyze 6 Creating

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1			L		M			M		L		M		M	H	
CLO2				M			L				M		M			L
CLO3		L		H		M	L				M	M	M			L
CLO4		L		H		M						M				L
CLO5				L		H			M			M				L
CLO6			L		M			M		L		M		M	H	

H: High, M: Medium, L: Low