22EEHO202	MULTILEVEL POWER CONVERTERS				SEMESTER			
PREREQUISTIES		CATEGORY			PEC	Credit		3
Power electronics		Hours/Week			L	T	P	TH
					3	0	0	3

Course Objectives:

1. To introduce the fundamentals of multilevel voltage source inverters and multilevel current source inverters with its modulation control

UNIT I	DIODE-CLAMPED MULTILEVEL INVERTERS	9	0	0	9

Three-Level Inverter - Converter Configuration and Switching State, Space Vector Modulation - Stationary Space Vectors, Dwell Time Calculation and Switching Sequence Design, Neutral-Point Voltage Control 164 Discontinuous Space Vector Modulation, SVM Based on Two-Level Algorithm, High-Level Diode-Clamped Inverters - Four- and Five-Level Diode-Clamped Inverters

UNIT II	MULTILEVEL VOLTAGE SOURCE INVERTERS	9	0	0	9

Introduction, NPC/H-Bridge Inverter, Inverter Topology and Modulation Scheme, Waveforms and Harmonic Content, Multilevel Flying-Capacitor Inverters, Inverter Configuration, Modulation Schemes

UNIT III	CASCADED MULTILEVEL INVERTERS	9	0	0	9

H-Bridge Inverter, Bipolar Pulse-Width Modulation and Unipolar Pulse-Width Modulation, CHB Inverter with Equal DC Voltages, H-Bridges with Unequal DC Voltages, Carrier Based PWM Schemes, Phase-Shifted Multicarrier Modulation, Level-Shifted Multicarrier Modulation, Comparison Between Phase- and Level-Shifted PWM Schemes

UNIT IV	MODULAR MULTILEVEL INVERTER	9	0	0	9

Five level Modular Multilevel Inverter- Power circuit , operation and applications, DC Voltage balance control, Carrier Based PWM for Modular Multilevel Inverter

UNIT V	PWM TECHNIQUES	9	0	0	9

Trapezoidal Modulation, Selective Harmonic Elimination, Space Vector Modulation-Switching States, Space Vectors, Dwell Time Calculation, Switching Sequence, Harmonic Content

Total (45L+0T)= 45 Periods

Text Books:

1. Bin Wu, Mehdi Narimani, 'High-Power Converters and AC Drives, 2nd Edition, Wiley-IEEE Press, 2017

Reference Books:

1. N. Mohan, T. M. Undeland, et al., Power Electronics—Converters, Applications and Design, 3rd edition, John Wiley & Sons, New York, 2003

E-Reference

1. https://archive.nptel.ac.in/courses/108/102/108102157/

Course Outcomes: Upon completion of this course, the students will be able to:			Bloom's Taxonomy Mapped
CO1	:	Understand the configurations for multilevel voltage source inverters.	L1: Remembering
CO2	:	Describe the working principle of multilevel current source inverters	L2: Understanding
CO3	:	Draw the topology structure of different types of multilevel inverters	L3: Applying
CO4	:	Understand the principle of space vector modulation for multilevel inverters	L1: Remembering
CO5	:	Select an appropriate modulation scheme for multilevel inverters	L4: Analyzing

COURSE ARTICULATION MATRIX															
COs/ POs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	2	2	2	2				1	2	2		2	2	2	2
CO2	1	3			2				2	2		1	1	3	
CO3	1	1		1	1	1	2						1	1	
CO4	1	1		1	1		2	2	1		2	2	1	1	
CO5	2	2	3	1	2	2	1			1	3		2	2	3
Avg	1.4	1.8	2.5	1.25	1.5	1.5	1.67	1.5	1.67	1.67	2.5	1.67	1.4	1.8	2.5
3/2/1-indicates strength of correlation (3- High, 2-Medium, 1- Low)															