22EEHO206	PWM CONVERTERS AND APPLICATIONS	SEMESTER			
PREREQUISITES	CATEGORY	PEC	Credit		3
		L	T	P	TH
Power Electronics.	PEC	3	0	0	3

Course Objectives:

1.	To provide a strong foundation of fundamental concepts in basic operation of PWM converters like solid state drives and power quality.
2.	To enable the student to apply these techniques in applications including basic circuit operation and design
3.	To enable understand the steady-state and dynamic analysis of PWM converters applications

UNIT I	INTRODUCTION	9	0	0	9

Power conversion Overview of applications of voltage source converters and current source converters. DC to AC Converters: Classification of inverters, operation of each type, design of commutating circuits, Analysis of voltage and current waveforms, voltage and frequency control, current source inverter and pulse width modulated inverter .

UNIT II	PWM TECHNIQUES	9	0	0	9

Pulse width modulation techniques for bridge converters Bus clamping PWM. Space vector based PWM. Advanced PWM techniques. DC to DC Converters: Classification of choppers, operating principle and control circuits for each type. Analysis of voltage and current waveforms.

UNIT III	PERFORMANCE ANALYSIS OF LINE CURRENT RIPPLE	9	0	0	9

Analysis of line current ripple: Synchronously revolving reference frame; error between reference voltage and applied voltage; integral of voltage error; evaluation of line current ripple; hybrid PWM for reduced line current ripple. **Analysis of dc link current**: Relation between line-side currents and dc link current; dc link current and inverter state; rms dc current ripple over a carrier cycle; rms current rating of dc capacitors.

UNIT IV	PERFORMANCE ANALYSIS OF TORQUE RIPPLE AND LOSS	9	0	0	9

Analysis of torque ripple: Evaluation of harmonic torques and rms torque ripple, hybrid PWM for reduced torque ripple

Analysis for inverter's loss: Simplifying assumptions in evaluation of inverter loss, dependence of inverter loss on line power factor, influence of PWM techniques on switching loss, design of PWM for low inverter loss.

UNIT V	PWM FOR MULTILEVEL INVERTER AND APPLICATIONS	9	0	0	9

PWM for multilevel inverter -Extensions of sine-triangle PWM to multilevel inverters, voltage space vectors, space vector based PWM, analysis of line current ripple and torque ripple . Applications Active power filtering, Reactive power compensation, Constant Volt Per hertz drives, PWM Rectifier etc.

Total (45L+0T)= 45 Periods

Test Books:

1.	D. G. Holmes, T. A. Lipo, 'Pulse Width Modulation For Power Converters: Principles and Practice', John Wiley and Sons., 2003.
2.	Bin Wu, "High Power Converters and AC Drives", John Willey & sons, Inc., 2006.
3.	Ned Mohan, Undeland and Robbins, "Power Electronics: Converters, Applications and Design", John's Wiley and Sons.

Reference Books

1.	Euzeli Cipriano dos Santos Jr. and Edison Roberto Cabral Da Silva "Advanced Power Electronic Converters - PWM Converters Processing AC Voltages", Willey – IEEE Press, 2014.
2.	M.H.Rashid, "Power Electronics", Prentice Hall of India

E -References

1.	NPTEL Lecture series by Prof. G. Narayanan, Department of Electrical Engineering, IISC Bangalore on the web-course . http://www.digimat.in/nptel/courses/video/108108035/

Course Outcomes: Upon completion of this course, the students will be able to:			**Bloom's Taxonomy Mapped**
CO1	:	Explain the need of PWM	L1: Remembering
CO2	:	Compare the PWM techniques on different aspects	L2: Understanding
CO3	:	Analyze parameter current ripple for different PWM approaches.	L5: Analyzing
CO4	:	Analyze parameters like losses, torque ripple for different PWM approaches.	L4: Analyzing
CO5	:	Develop suitable Pulse Width Modulation method for power converter used for different applications	L3: Applying

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**	**PS O1**	**PS O2**	**PSO3**
CO1	2	2	2	1	1			1	1	2	1	2	1	2
CO2	3	1	1	2	2			1	2	2	1	1	1	1
CO3	1	1	1	2	1			2	2	2	2	2	1	2
CO4	1	2	2	3	3			2	1	1	1	1	1	1
CO5	1	1	1	1	1			1	2	1	1	2	1	2
Avg	1.6	1.4	1.4	1.8	1.6	0	0	1.4	1.6	1.6	1.2	1.6	1	1.6