



National Institute of Technology Meghalaya

An Institute of National Importance

CURRICULUM

Programme	Bachelor of Technology in Electrical and Electronics Engineering	Year of Regulation	2019-20
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Department	Electrical Engineering	Semester	V
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Course Code	Course Name	Credit Structure				Marks Distribution				
		L	T	P	C	INT	MID	END	Total	
EE 303	Power Electronics	3	1	0	4	50	50	100	200	
Course Objectives	To understand the operation of different power electronic switches and their applications	Course Outcomes	CO1	Understand the operation of different power electronics switches and their usage for different applications						
	To know about on load operation of converters		CO2	Design power electronics converters to convert the ac supply into dc						
	To understand control strategies of converter operation		CO3	Design power electronics converters to convert fixed dc supply into variable dc						
	To perform steady state analysis of different converters		CO4	Design power electronics converters to convert dc supply into ac						
			CO5	Design power electronics converters to convert fixed ac supply into variable ac supply						

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	3	2	2	0	1	0	0	0	0	0	0	1	3	1	0
2	CO2	3	3	2	1	1	0	0	0	0	0	0	1	3	1	0
3	CO3	3	3	2	1	1	0	0	0	0	0	0	1	3	1	0
4	CO4	3	3	2	1	1	0	0	0	0	0	0	1	3	1	0
5	CO5	3	3	2	1	1	0	0	0	0	0	0	1	3	1	0
6	CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SYLLABUS

No.	Content	Hours	COs
I	Introduction Power Electronics Scope and Applications, Interdisciplinary Nature of Power Electronics, Types of power electronics circuits, Introduction to power electronic devices like Thyristor (SCR), Power BJT, Power MOSFET, GTO, IGBT, Thyristor Characteristics, Two transistor analogy, Gate Characteristics, Methods of triggering and commutation, Ratings and protection of devices, Series and parallel operation of thyristor, Protection of dv/dt &	06	CO1

	di/dt for semiconductor switches		
II	<p>Phase Controlled Rectifiers / AC-DC Converter</p> <p>Principle of phase control, half wave controlled rectifiers, half wave controlled rectifiers with R, R-L, R-L with Freewheeling Diode, R-L-E load, single phase full wave controlled converters, 2-pulse mid-point converters, 2-pulse half and fully controlled bridge converters with R, R-L, R-L-E load, Three phase converter system with diodes, 3 phase half and fully controlled bridge converters, triggering scheme, Effect of source impedance on the performance or the converters, Dual converters.</p>	11	CO2
III	<p>Choppers / DC-DC Converter</p> <p>Basic principle of chopper operation, Different methods of classification, Control strategies – Duty Ratio Control and Frequency Control, Types of idealized chopper circuit, Steady state time domain analysis of Class - A choppers, Thyristor Chopper Circuits.</p>	10	CO3
IV	<p>Inverters / DC-AC Converter</p> <p>Voltage Source Inverter (VSI)- Single phase voltage source inverters, Half bridge inverters, full bridge inverters, Steady state analysis, Voltage control in single phase inverters, 3-phase bridge inverters; 180° mode VSI, 120° mode VSI, Pulse Width Modulated (PWM) inverters; single pulse, multiple pulse, sinusoidal pulse modulation, Current Source Inverter (CSI), Series and parallel inverter, Reduction of harmonics in output voltage, Control of output voltage.</p>	11	CO4
V	<p>Cyclo-converter / AC-AC Converter</p> <p>Principle of AC Voltage Controllers – Integral Cycle Control and Phase Control, Types of AC voltage controllers, Analysis of 1-phase & 3-phase voltage controllers with R and R-L load.</p> <p>Principle of operation of cyclo-converters, circulating and non circulating mode of operation, single phase to single phase step up and step down Cyclo-converters, three phase to single phase Cyclo-converters, three phase to three phase Cyclo-Converter .</p>	10	CO5
Total Hours		48	
Essential Readings			
1. M. H Rashid, “Power Electronics Circuits, Devices, and Applications”, Prentice-Hall of India Pvt. Ltd, 3 rd Edition, 2014.			
2. L. Umanand, “Power Electronics Essential and Applications”, Willey, 1 st Edition, 2009.			
Supplementary Readings			
1. P. S. Bimbhra, “Power Electronics”, Khanna Publishers, 5 th edition, 1990.			
2. M. D. Singh and K. B. Khanchandani, “Power Electronics”, Tata McGraw-Hill Publishing Co. Ltd, 2 nd Edition, 2006.			
3. M. Ned and T. M. Undeland, “Power Electronics Converters Applications and Design”, John Willey Inc, 3 rd Edition, 2002.			

4. J. P. Agrawal, "Power Electronic Systems: Theory and Design", Addison Wesley Longman Pte. Ltd, 1st Edition, 2001.

5. V. R. Moorthi, "Power Electronics Devices, Circuits and Applications", Oxford University Press, 1st Edition, 2005.