Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

Syllabus for B. Tech in Electrical Engineering

(Applicable from the academic session 2018-2019)

Name of the course		**POWER ELECTRONICS**	
Course Code: PC-EE-504		**Semester: 5th**	
Duration: 6 months		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs./week		Mid Semester Exam: 15 Marks	
Tutorial: 0hr/week		Assignment & Quiz: 10 Marks	
Practical: hrs./week		Attendance: 05 Marks	
Credit Points: 3		End Semester Exam: 70 Marks	
Objective:			
1.	To understand the functioning and characteristics of power switching devices.		
2.	To understand the principle of operation of converters.		
3.	To understand different triggering circuits and techniques of commutation of SCR		
4.	To find external performance parameter of converters.		
5.	To analyze methods of voltage control, improvement of power factor and reduction of harmonics of the converter		
6.	To solve numerical problems of converters		
Pre-Requisite			
1.	Electric Circuit Theory (PC-EE-301)		
2.	Analog Electronics (PC-EE-302)		
3.	Electromagnetic field theory (PC-EE-303)		
4.	Digital Electronics (PC-EE-402)		
Unit	**Content**	**Hrs**	**Marks**
1	**Introduction:** Concept of power electronics, application of power electronics, uncontrolled converters,advantages and disadvantages of power electronics converters, power electronics systems,power diodes, power transistors, power MOSFETS, IGBT and GTO.	04	
2	**PNPN devices:** Thyristors, brief description of members of Thyristor family with symbol, V-Icharacteristics and applications. Two transistor model of SCR, SCR turn on methods,switching characteristics, gate characteristics, ratings, SCR protection, series and paralleloperation, gate triggering circuits, different commutation techniques of SCR.	05	
3	**Phase controlled converters:** Principle of operation of single phase and three phase half wave, half controlled, full controlled converters with R, R-L and RLE loads, effects of freewheeling diodes and source inductance on the performance of converters. External performance parameters of converters, techniques of power factor improvement, single phase and three phase dual converters	06	
	DC-DC converters:		

4	Principle of operation, control strategies, step up choppers, types of choppers circuits based on quadrant of operation, performance parameters, multiphase choppers.	05	
5	**Inverters:** Definition, classification of inverters based on nature of input source, wave shape of outputvoltage, method of commutation & connections. Principle of operation of single phase andthree phase bridge inverter with R and R-L loads, performance parameters of inverters,methods of voltage control and harmonic reduction of inverters.	10	
6	**Resonant Pulse Converters:** Introduction, Series Resonant inverter, Parallel Resonant inverter, Zero-Current Switching Resonant converters, Zero-Voltage Switching Resonant converter, Two quadrant Zero-Voltage Switching Resonant converter, Resonant DC link inverter.	05	
7	**Applications:** Speed control of AC and DC motors. HVDC transmission. Static circuit breaker, UPS,static VAR controller.	05	

Text books:

1. Power Electronics, M.H. Rashid,4th Edition, Pearson
2. Power Electronics, P.S. Bhimra, , 3rd Edition, Khanna Publishers
3. Power Electronics, V.R. Moorthi, Oxford.
4. Power Electronics, M.D. Singh and K.B. Khanchandani, Tata Mc Graw Hill.

Reference books

1. Modern Power Electronics & AC drives, B.K. Bose, Prentice Hall
2. Power Electronics, Mohan,Undeland&Riobbins, Wiley India
3. Element of power Electronics, Phillip T Krein, Oxford.
4. Power Electronics systems, J.P. Agarwal, Pearson Education.
5. Analysis of Thyristor power conditioned motor, S.K. Pillai, University Press.
6. Power Electronics, M.S. Jamal Asgha, PHI.
7. Power Electronics : Principles and applications, J.M. Jacob, Thomson

Course Outcome:

After completion of this course, the learners will be able to

1. differentiate between signal level and power level devices.
2. construct triggering and commutation circuits of SCR.
3. explain the principle of operation of AC-DC, DC-DC and DC-AC converters.
4. analysethe performance of AC-DC, DC-DC and DC-AC converters.
5. apply methods of voltage control and harmonic reduction to inverters.
6. solve numerical problems of switching devices, AC-DC, DC-DC and DC-AC converters.

Special Remarks (if any)

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.