

University of Mumbai			
CLASS: T.E. (Electronics Engineering)		Semester - VI	
SUBJECT: Power Electronics			
Periods per week (each of 60 min.)	Lecture	4	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical /Oral examination	3	25
	Oral Examination	-	
		Term Work	25
		Total	150

Objective	To teach the basic concepts of power electronics. Also to study the important power devices in detail along with basic application of SCR as controlled rectifier. To get skill of developing and design related to power electronics circuits.	
Pre-requisite	Concept of semiconductor, rectification, behavior of inductor, capacitor, harmonics, Fourier analysis.	
Module	Contents	Hours
1	Semiconductor Power Devices: - Characteristics of power diodes, power transistors, power MOSFET, IGBT, SCRs, TRIACs, DIAC and GTO. Rating of power devices, series and parallel connections of SCRs.,	10
2	SCR protections- dv/dt, di/dt, over voltage and over current protection, cooling of semiconductor devices, Isolation circuits using optocoupler and transformer.	04

3	Turn ON and Turn OFF Circuits: - Turn ON Methods- study of single phase firing circuits using UJT, ramp and pedestal, cosine inverse , microprocessor/microcontroller based Turn OFF Methods- Forced commutation circuits- Parallel Capacitance, resonant turn off, external pulse commutation, auxiliary thyristors and load commutation. (Class A to F)	10
4	Applications of Thyristors: - Static circuit breakers, over voltage protectors, zero voltage switch, integral cycle triggering , time delay method, soft start method.	06
5	Controlled Rectifier Circuits: - Single Phase: - Half wave, full wave, half controlled and full controlled converters with R & RL Load, effect of Freewheeling diode. Calculations of performance parameters expected.	12
6	Controlled Rectifier Circuits: Three Phase: - Half wave, full wave, fully controlled converters with Resistive Load only.	06

Text Books:

- 1) General Electric: SCR manual, USA.
- 2) Ned Mohan: Power electronics; John Willey Pub.
- 3) M.H. Rashid , Power electronics, PHI India .
- 4) M.D. Singh and K.B. Khanchandani, power electronics, Tata McGraw Hill
- 5) P.C. Sen , Power Electronics, TMH.
- 6) Dr. P.S. Bimbhra , Power Electronics, Khanna Publications.

Additional Reading:

- 1)Chute and Chute: Electronics in Industry; MGH
- 2)B.W. Williams: Power Electronics, Jhon Willey,1975.

Suggested Laboratory Experiments

- 1) To study SCR Characteristics. Also calculate Values of holding and latching current
- 2) To study Diac / Triac Characteristics. Also calculate Break over voltage of diac and Traic
- 3) Application of diac and triac as light dimmer and fan regulator.
- 4) To study different turn on Methods of SCR
1)R 2)R-C 3)UJT
- 5) To study different turn off Methods of SCR (Class A to Class F)
- 6) To Study A-C power control using double R-C Network
- 7) To study single phase full controlled Rechfier with R and R-L Load (with and without Free wheeling diode)
- 8) To study single phase half controlled Rechfier with R Load .
- 9)To study single phase full controlled Rechfier (Semi converter) with R and R-L Load (with and without Free wheeling diode)
- 10) Triggering circuits
 - i) Ramp and Pedestal
 - ii) Cosine inverse

Note :- Students are expected to perform minimum 8 experiments

Practical/ Oral Examination:

Practical Examination will be based on experiments performed from the list of experiment given in the syllabus and the evaluation based on the same experiment.

Oral will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus

Term work:

Term work shall consist of minimum eight experiments, Two Assignments and a written test.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal)	: 10 marks.
Test (at least one)	: 10 marks.
Attendance (Practical and Theory)	: 05 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
 2. Only 5 questions need to be solved.
 3. Question number 1 will be compulsory and will cover all modules.
 4. Remaining questions will be from the same module or mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
 5. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
 6. No question should be asked from pre-requisite module
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