

KADI SARVA VISHWAVIDYALAYA

B.E. Semester: VI
Electronics & Communication Engineering
Subject Name: Power Electronics
Subject Code: EC-603

W.E.F2014-15

A. Course Objective:

The educational objectives of this course are

- To present a problem oriented introductory knowledge of Power Electronics.
- To address the underlying concepts and methods behind Power Electronics.

B. Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs	Hrs	Marks	Marks	Marks	Marks	Marks	
EC-603	Power Electronics	3	0	2	5	4	3	70	30	20	30	150

C. Detailed Syllabus:

1. **Introduction:** Introduction to thyristor family, Basic structure, IV characteristics, switching characteristics and operation of devices like power diode, power Bipolar Junction Transistor, Power MOSFET, Thyristors, Gate Turn off thyristor, Insulated Gate Bipolar Transistor, GTO, IGBT, SIT, etc.
2. **Introduction to SCR:** Basic structure, IV characteristics, switching characteristics and operation of SCR, Series and Parallel operation of SCR. Turn ON Turn OFF methods and Circuits, Protections, Ratings and applications, Handling precautions and power dissipation of SCR.
3. **Controlled Rectifiers:** Introduction, Principle of operation of Controlled Rectifiers, Single phase power circuits, three phase controlled rectifier circuits, Analysis of Controlled Rectifiers with resistive and inductive load.
4. **DC Chopper:** Introduction, Principle of operation, analysis with waveforms of Step-Down and Step-Up choppers, buck, boost and buck-boost Converter. Chopper classifications.
5. **Cycloconverter:** Introduction, Basic principle of frequency conversion, types of cycloconverter.
6. **Invertors:** Introduction, Principal of Operation of Pulse Width Modulated Inverters, Performance Parameters, Single Phase and Three Phase Bridge Inverters.
7. **Applications:** Uninterruptible Power Supply, Switched mode Power Supply, RF Heating, Battery Charger.

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D. Lesson Planning:

SR. No.	No. of Hours	% Weight-age in Exam	Topics
1	07	15	Introduction: Introduction to thyristor family, Basic structure, IV characteristics, switching characteristics and operation of devices like power diode, power Bipolar Junction Transistor, Power MOSFET, Thyristors, Gate Turn off thyristor, Insulated Gate Bipolar Transistor, GTO, IGBT, SIT, etc.
2	06	15	Introduction to SCR: Basic structure, IV characteristics, switching characteristics and operation of SCR, Series and Parallel operation of SCR. Turn ON Turn OFF methods and Circuits, Protections, Ratings and applications, Handling precautions and power dissipation of SCR
3	07	15	Controlled Rectifiers: Introduction, Principle of operation of Controlled Rectifiers, Single phase power circuits. Three phase controlled rectifier circuits, Analysis of Controlled Rectifiers with resistive and inductive load.
4	07	15	DC Chopper: Introduction, Principle of operation, analysis with waveforms of Step-Down and Step-Up choppers, buck, boost and buck-boost Converter. Chopper classifications.
5	06	15	Cycloconverter: Introduction, Basic principle of frequency conversion, types of cycloconverter.
6	07	15	Invertors: Introduction, Principal of Operation of Pulse Width Modulated Inverters, Performance Parameters, Single Phase and Three Phase Bridge Inverters.
7	05	10	Applications: Uninterruptible Power Supply, Switched mode Power Supply, RF Heating, Battery Charger.
TOTAL	45	100	

E. Instructional Method & Pedagogy (ANNEXURE-I)

F: Suggested list of Experiments

1. To perform the SCR operation and plot VI characteristics.
2. To perform the SCR as an alarm circuit.
3. To perform the operation of UJT and plot characteristics of it.
4. To perform UJT as relaxation oscillator and generate corresponding waveforms.
5. To perform half-wave controlled rectifier with resistive load.
6. To perform full-wave controlled rectifier (mid- point configuration) with resistive load.
7. To perform resistor triggering gate circuit.
8. To perform the resistor – capacitor triggering circuit (half wave).

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9. To perform the resistor – capacitor triggering circuit (full wave).
10. To perform unidirectional A.C. controller with necessary waveforms.
11. To perform bidirectional A.C. controller with necessary waveforms.

G: Students Learning Outcomes:

On successful completion of the course

- The student can identify different areas of Power Electronics. Can find the applications of all the areas in day to day life. Can identify the operations, working, construction, material etc. Aspects of Power electronics ckt, power rectifiers, inverters, DC chopper, cycloconverter etc.

H :Recommended Study Materials:

- **Text &Reference Books:**

1. Power electronics–circuit, Devices and applications, M. Rasid, Pearson Education.
2. Power electronics , Dr. P.S. Bimbra , khanna publishers.
3. Power electronics,M.D.singh and Khanchandani , Tata McGraw Hill Publications.
4. Power electronics: Essential and Applications, L. Umanand , wiley India pvt. Ltd.
5. Power electronics: Joseph Vithyathil , Tata McGraw Hill Publications.

