



**Kadi Sarva Vishwavidyalaya**  
**Faculty of Engineering & Technology**  
**Third Year Bachelor of EC Engineering**  
 (Academic Year 2019-20)

<b>Subject Code: EC603 N</b>	<b>Subject Title: Power Electronics</b>
<b>Pre-requisite</b>	

**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.

**Teaching Scheme (Credits and Hours)**

Teaching scheme				Total Credit	Evaluation Scheme					Total Marks
L	T	P	Total		Theory		IE	CIA	Pract.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
03	00	02	05	04	03	70	30	20	30	150

**Outline of the Course:**

Sr. No.	Title of the Unit	Hours
1.	Introduction to Power devices	7
2.	Phase Controlled Rectifiers:	6
3.	Chopper	5
4.	Cycloconverter:	6
5.	Invertors	6
6.	Control of DC drives	6
7.	Control of AC drives:	6
8.	Application of thyristor	6
		<b>48</b>

**Total hours (Theory): 48**

**Total hours (Lab): 16\*2=32**

**Total hours: 80**



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**Detailed Syllabus:**

Unit No.	Topic	Lecture Hours	Weight age(%)
1.	<b>Introduction to Power devices:</b> Construction, operation and characteristics of SCR, Diac, Triac, SUS, SBS, RCT, LASCR, SITS, SITH, GTOs, IGBT, MCT etc. Two transistor analogy of SCR. Turn On and Commutation methods of SCR. Triggering circuits of SCR. UJT relaxation oscillator and PUT. Series and parallel operation of Thyristor. Thyristor protection.	7	15
2.	<b>Phase Controlled Rectifiers:</b> Single phase, half wave, Full wave, half controlled bridge and Full controlled bridge rectifiers with resistive and inductive loads. Effect of freewheeling diodes. Three phase controlled rectifiers.	6	15
3.	<b>Chopper:</b> Principle of chopper operation, control strategies, Step-Up, Stepdown and Step-Up/Down chopper. Type-A, Type-B, Type-C, Type-D and Type-E chopper. Voltage and current commutated chopper. Jones, Morgan and AC choppers.	5	15
4.	<b>Cycloconverter:</b> Basic principle of operation. Single phase to single phase, Three phase to single phase Cycloconverter. Three phase to three phase cycloconverter.	6	10
5.	<b>Invertors:</b> Thyristor inverter classification, Voltage and current source inverters, Series, Parallel and Bridge Inverters. The McMurray and McMurray Bedford inverters. PWM inverters,	6	15
6.	<b>Control of DC drives:</b> Introduction, Basic machine equations. Braking modes. Single phase separately excited drives. Single phase series DC motor drives. DC chopper drives. Closed loop control of DC drives. PLL control of DC drives.	6	10
7.	<b>Control of AC drives:</b> Basic principle of operation. Torque-speed characteristic of induction motor. Speed control of induction motor. Stator voltage control. Variable frequency control. Rotor resistance control. Slip power recovery scheme	6	10
8.	<b>Application of thyristor:</b> Over voltage protection, Zero voltage switch. SMPS, Online and Off line UPS, Induction heating, Dielectric heating, Switch mode welding, Battery charger, Static circuit breakers.	6	10
	<b>Total</b>	<b>48</b>	<b>100</b>



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**Instructional Method and Pedagogy (Continuous Internal Assessment (CIA) Scheme)**

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. ual weightage should be given to all topics while teaching and conduction of all examinations.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

**Learning Outcomes:**

At the end of this course, the student would be able.

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.

**TEXT BOOKS:**

1. Power Electronics, By Dr. P.S. Bimbira, khanna publishers.
2. Power Electronics Circuits Devices And Application By Muhammad Rashid (PHI)

**REFERENCE BOOKS:**

1. Power Electronics, M.D.singh and Khanchandani, Tata McGraw Hill Publications.
2. Power Electronics: Joseph Vithyathil , Tata McGraw Hill Publications.
3. Power Electronics And Controls By Samir K Datta (PHI)

**List of Experiments** (Not limited to following. Subject teacher may modify the same):

Sr. No.	Experiment Title
1.	To perform the SCR operation and plot VI characteristics.
2.	To perform the SCR as an alarm circuit.
3.	To perform the triggering of SCR and observe the wave form.



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<b>4.</b>	To perform UJT as relaxation oscillator and generate corresponding waveforms.
<b>5.</b>	To perform half-wave controlled rectifier with resistive load.
<b>6.</b>	To perform full-wave controlled rectifier (mid- point configuration) with resistive load.
<b>7.</b>	To perform the operation of DIAC and plot characteristics of it.
<b>8.</b>	To perform the operation of TRIAC and plot characteristics of it.
<b>9.</b>	To perform unidirectional A.C. controller with necessary waveforms.
<b>10.</b>	To perform bidirectional A.C. controller with necessary waveforms.