Lok Jagruti Kendra University
University with a Difference

Diploma
In
Electronics Engineering

LJ Polytechnic

Course Code: 025030404
Power Electronics

Programme / Branch Name			Diploma in Electronics Engineering			
Course Name	Power Electronics				**Course Code**	025030404
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week / Credits				Evaluation Scheme			
L	**T**	**P**	**Total Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**Total Marks**
3	0	2	4	50	50	50	150

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisite

- ✓ Physics and Mathematics (Pre-university level)
- ✓ Measure basic electrical electronics quantities/parameters
- ✓ Use major electrical/electronic machines//instrument/equipment

3. Rationale

This course is one of the basic core courses, which is, must for every electrical engineer. Power electronic components and circuits are building blocks for any electronic device used in industries or in daily life. It is therefore necessary for electrical engineers to understand clearly the principles and functioning of the basic components and circuits. This course will enable the students to understand the basics of construction, working, and applications of various types of electronic components such as UJT, IGBT, SCR and inverter etc.

4. Objectives

- ✓ This course aims to help the students to attain the following industry-identified competency through various teaching-learning experiences.
  - Analyze power circuits consisting of SCR, IGBT etc components.
  - It will build technical background for the design of power electronics circuit & component value.

5. Contents

Unit No.	Topics	Sub-Topics	Learning Outcome	% Weightage	Hours
1	**Classification of Thyristor and Polyphase Controlled Rectifier**	1.1. Classify Thyristor family. 1.2. Explain the working of various power electronics devices with sketches 1.3. Explain various polyphase controlled rectifiers with sketches and waveforms 1.4. Explain the working Principle of A.C. load control & of pulse transformer	• Classification of Thyristor family. • Working, of SCR, IGBT , DIAC and TRIAC • Three phase half wave, full wave or bridge rectifier and Six phase half wave rectifier. • Working of pulse transformer. • Principle of A.C. load control.	20	12
2	**Thyristor Protection and Commutating Circuits**	2.1. Justify the need of SCR protections. 2.2. Describe working of snubber circuit, thermistor and heat sink for SCR. 2.3. State the need to turn off SCR. 2.4. Differentiate various types of commutation methods with sketches	• Need of SCR protections: Over voltage and over current protection. • Snubber circuit, Thermistor, heat sink. • Turn off (commutation) method and types-Natural commutation, Forced commutation, Series resonance/ current commutation, Voltage commutation. • Auxiliary SCR for commutation. • External pulse commutation.	30	16
3	**DC to DC Converter**	3.1. Explain the working principle of Chopper and its applications 3.2. Compare the salient features of different types of choppers	• Function and working of choppers • Types of chopper circuits: A type to E-type	10	6
4	**DC to AC Converter and Frequency Changer**	4.1. Explain basic working principle of inverter 4.2. Classify inverters 4.3. Distinguish the working of series and parallel inverters using SCR. 4.4. Describe pulse width modulation technique and its techniques	• Working principle of inverter • Classification of inverter-phase and 3-phase inverters, • Line commutated and forced commutated inverters	25	14

		4.5. Explain the working principle of cyclo-converter. 4.6. Compare the salient features of various types of cyclo-converters.	• Series, Parallel and bridge inverter • Series and parallel inverter using SCR • PWM method and PWM inverter • Single pulse width, Multiple pulse width and Sinusoidal pulse width modulation • Operating principle of cyclo converter. • types of cyclo-converters : • Single phase to single phase cyclo converter, • Single phase to bridge cyclo converter.		
5	**Industrial Use of SCR, TRIAC and Other Device**	5.1. With sketches, explain the speed control of - a DC series motor using SCR chopper circuit & D.C. Motor using armature voltage control, 5.2. With sketches, describe the use of power electronics for speed control methods of induction motor such as stator voltage control, frequency control, AC drives. 5.3. With sketches, describe the use of power electronics devices in static circuit breaker.	• Speed control of D.C. Motor using armature voltage control. • Speed control of D.C. Motor using SCR chopper circuit.. • Different types of speed control methods for induction motor such as stator voltage control, frequency control. • Static circuit breaker.	15	6
				Total Hours	**54**

6. List of Practical / Exercises

The practical/exercises should be properly designed and implemented in an attempt to develop different types of skills that students can acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

Sr. No	Practical / Exercises	Key Competency	Hours
1	Plot V/I Characteristics of SCR.	SCR	2

2	Plot V/I Characteristics of TRIAC	TRIAC	2
3	Plot V/I Characteristics of DIAC	DIAC	2
4	To construct the Single Phase AC Control Circuit using TRIAC for various values of firing angle.	AC Control Circuit	2
5	To Study And Perform The UJT as Relaxation Oscillator.	UJT as Relaxation Oscillator.	2
6	To Study and Perform the Triggering of SCR using UJT	Triggering of SCR using UJT	2
7	To Study The Photo Electric Relay.	Electric Relay	2
8	To study the resistor triggering circuit for SCR.	Resistor triggering	2
9	To study the performance & waveforms of HWR by using RC triggering Circuit.	HWR	2
10	To study the performance & waveforms of FWR by using RC triggering Circuit.	FWR	2
		Total Hours	**20**

7. Suggested Specification Table with Hours

Unit No.	Chapter Name	Teaching Hours	Distribution of Topics According to Bloom's Taxonomy					
			R %	U %	App %	C %	E %	An %
1	Classification of Thyristor and Polyphase Controlled Rectifier	12	20	20	20	10	10	20
2	Thyristor Protection and Commutating Circuits	16	10	30	20	10	10	20
3	DC to DC Converter	6	20	20	20	15	10	5
4	DC to AC Converter and Frequency Changer	14	20	20	15	20	10	15
5	Industrial Use of SCR, TRIAC and Other Device	6	20	20	20	0	10	30

Legends: R-Remembering C- Creating
U- Understanding E- Evaluating
App- Applying An- Analyzing

8. Textbooks

1) Power Electronics By P.S.Bimbhra, Khanna Publisher, New Delhi
2) Power Electronics Rashid, Muhammad H. PHI Learning, New Delhi latest edition

9. Open Sources (Website, Video, Movie)

1) www.nptel.iitm.ac.in
2) www.youtube (lectures on Power electronics)