GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Power Electronics

Course / Subject Code: DI03024051

Course / Subject Name: DC Power Electronic Converters

w. e. f. Academic Year:	2024-25
Semester:	3rd
Category of the Course:	PCC

Prerequisite:	Basic Knowledge of Power electronic switches.
Rationale:	DC power electronic converter is a subject that concerns with the power electronic converters based on DC power processing. Many converter devices are available for the most important application in speed control of DC drives in industries. An effort is made in this course to provide understanding of the various DC power electronic converters to enable the students to acquire some core skills related to DC power electronic converters.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Operate and Maintain 1- Ø AC-DC converter.	R,U,A
02	Operate and Maintain 3- Ø AC-DC converter.	R,U,A
03	Operate and Maintain Non isolated DC-DC Converters.	R,U,A
04	Use relevant thyristor commutation techniques for specific applications.	R,U,A

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA(M)	PA(I)	ESE (V)	
2	0	2	3	70	30	20	30	150

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**1- PHASE AC- DC CONVERTERS** Uncontrolled converters. 1-Phase Half wave diode rectifier for R, RL Load with and without freewheeling diode. 1-phase full wave diode rectifier with R, RL load. Controlled Converters. 1-Phase Half wave-controlled rectifier for R, RL load with and without freewheeling diode. 1-phase full wave mid-point-controlled rectifier for R, RL load with and without freewheeling diode. 1-phase full wave bridge type-controlled rectifier with R, RL load. 1-phase semi converter with R, RL load.	13	28%
2.	**3- PHASE AC- DC CONVERTERS** Uncontrolled converters. 3-Phase Half wave diode rectifier with R-load 3-phase mid-point six pulse diode rectifier with R-load. 3-Phase diode bridge rectifier with R-load. Controlled Converters. 3-Phase Half wave-controlled rectifier with R-load 3-phase mid-point six pulse-controlled rectifier with R-load. 3-Phase fully controlled bridge rectifier with R-load.	7	16%
3.	**NON-ISOLATED DC-DC CONVERTER** Classifications, three basic converters: step down (buck), step up(boost), step up/down (buck-boost) converter. Control strategies: Time ratio control, current limit control.	5	22%
4.	**COMMUTATION TECHNIQUE** Need for commutation technique Load, Resonant pulse(current), Complementary (voltage), Impulse and Line commutation.	5	18%
	Total	**30**	**100%**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**60**	**20**	**0**	**0**	**0**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

S. No.	Title of Books	Author	Publication/Year
1.	Power Electronics	Singh M.D., Khanchandani K.B.	Tata McGraw-Hill New Delhi, latest edition
2.	Power electronics	Bimbhra P. S.	Khanna Publishers, New Delhi, latest edition
3.	Power Electronics Essentials & Applications	L Umanand	Wiley
4.	Power Electronics: Converters, Applications, and Design	Ned Mohan, Tore M. Undemand, William P. Robbins	Wiley

(b) Open-source software and website:

1. https://www.vlab.co.in
2. https://nptel.ac.in
3. https://www.classcentral.com
4. https://swayam.gov.in/
5. https://shodhganga.inflibnet.ac.in/
6. https://onlinecourses.nptel.ac.in/

Suggested Course Practical List:

S. No.	Practical List:
1.	Test 1-phase half wave diode rectifier with R, and RL (with and without freewheeling diode) load.
2.	Test 1-phase full wave diode rectifier with R and RL load.

3.	Test 1-phase half wave-controlled rectifier with R and RL load.
4.	Test 1-phase full wave-controlled rectifier with R and RL load.
5.	Test 1-phase semi converter with R and RL load.
6.	Test 3-phase half wave diode rectifier with R load.
7.	Test 3-phase six pulse full wave diode rectifier r with R load.
8.	Test 3-phase bridge type diode rectifier with R load.
9.	Test 3-phase half wave-controlled rectifier with R load.
10.	Test 3-phase six pulse full wave-controlled rectifier r with R load.
11.	Test 3-phase bridge type full wave-controlled rectifier with R load.
12.	Test buck converter.
13.	Test boost converter.
14.	Test buck boost converter.
15.	Test voltage and current commutation circuit.
16.	Test load commutation circuit.
17.	Test impulse commutation circuit.

List of Laboratory/Learning Resources Required:

1) High voltage power electronics lab.
2) SCR- commutation circuit kit.
3) Non-Isolated chopper kit.

Suggested Project List:

1. Make a presentation of various 1-Phase/3-Phase uncontrolled and controlled rectifier circuits.
2. Make a presentation of various chopper circuits.
3. Design triggering circuit for controlled rectifier and chopper.

Suggested Activities for Students:

1. Make a chart of classification of rectifiers and choppers.
2. Make a chart of applications of rectifiers and choppers.

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