GUJARAT TECHNOLOGICAL UNIVERSITY

POWER ELECTRONICS (24)
POWER ELECTRONICS APPLICATIONS
SUBJECT CODE: 2182401
B.E. 8TH SEMESTER

Type of course: Science (Electronics)

Prerequisite: 1) DC MACHINE AND TRANSFORMER
2) 2142404 - BASIC POWER SYSTEMS
3) 2152407 – POWER ELECTRONIC CIRCUITS-I
4) 2162404 - INDUSTRIAL DRIVES & CONTROL-I
5) 2162407 - ELECTRICAL POWER UTILIZATION & TRACTION
6) 2162409 - POWER ELECTRONIC CIRCUITS – II
7) 2172404 - INDUSTRIAL DRIVES AND CONTROL – II
8) 2172408 - ADVANCED POWER ELECTRONICS DEVICES & INTERFACE CIRCUITS
9) 2172410 – POWER ELECTRONICS DESIGN

Rationale: Students of Power Electronics engineering should have conceptual understanding of power electronics applications. In industry, house, buildings and many other places, use of power electronics systems is becoming more and more common. Therefore, the person who wants to work in power electronics field, must have application level study, understanding in this area and knowledge of how power electronics can be used for various applications. This course gives details required for power electronics applications in this context

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	20	10	150

Content:

Sr. No.	Topic	Teaching Hrs.	Module Weightage%
1	Introduction Review of power electronics and power electronic system, Role of power electronics in today's energy systems used in various field of human life, requirements of power electronics, advantages and disadvantages of power electronics	**2**	**5**
2	Residential: Air conditioning, cooking, lighting, refrigerators, electric-door openers, dryers, fan regulator, BLDC fan, personal computers, vacuum cleaners, washing machine, food mixers, Audio Power amplifiers, Role of power electronics in these applications.	**4**	**10**
3	Commercial:	**4**	**10**

	Advertising, heating, air-conditioning power supplies, computer, office equipment and power supply for the same, On board power supply for low voltage microprocessors and graphics processors, elevators, escalator, light dimmer, uninterruptible power supplies, central refrigeration, Role of power electronics in these applications.		
4	Utility systems: High voltage DC Transmission, Excitation systems, VAR compensators, reactive power compensation, Static circuit breakers, fans and boiler feed pumps, supplementary energy systems (solar, wind), Power Factor correction, harmonic elimination etc., Role of power electronics in these applications.	**8**	**20**
5	Industrial Applications: Arc and Industrial furnaces, blowers and fans, pumps and compressors, industrial lasers, transformer tap changers, rolling mills, textile mills, excavators, cement mills, welding, conveyer belt, industrial robots, Role of power electronics in these applications.	**8**	**20**
6	Motion and position control: Speed and position control of large motors for industrial and traction applications (with power measured in megawatts), small electric motors in consumer electronic equipment, e.g. drive motors in tape recorders, toys, drone, quod copters etc., motor control applications for printers, CNC machines, etc., Automatic gates for water canals, homes etc., Role of power electronics in these applications.	**8**	**20**
7	Vehicular Power Electronics: Electric vehicles, Battery operated vehicles, battery operated wheel chairs for physically challenged persons, control, advantages, requirements, role of power electronics in these applications.	**4**	**5**
8	Miscellaneous: Aerospace applications like Space shuttle power supplies, Satellite power supplies, Aircraft power system, Reliability of power supply for aerospace systems Green Energy related applications like interface of mains supply with solar power, wind turbine, tidal power, ocean wave power etc., Power electronics in IoT applications Role of power electronics in these applications.	**4**	**10**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks (%)					
R Level	U Level	A Level	N Level	E Level	C Level
30	**25**	**25**	**10**	**10**	**-**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

Reference Books:

1 Power Electronics Hand Book, M H Rashid,

2 Power Electronics and its Applications, Alok Jain, Penram International

3 Power Electronics: Circuits, Devices and Applications, M H Rashid, Pearson Publishing House

Course Outcome:

After learning the course, the students should be able to:

1. The students will be able to apply power electronics knowledge to real world applications.

List of Experiments:

Directions for Laboratory work:
- The list of experiments is given as a sample.
- The laboratory report should be prepared in digitized form.
- Minimum 10 experiments should be carried out.

1. To study applications of power electronics in solar energy connected to grid

2. To study applications of power electronics in wind power

3. To study applications of power electronics in tidal power

4. To study applications of power electronics in house hold appliances

5. To study applications of power electronics in industrial heating applications

6. To study applications of power electronics in motion control and position control applications

7. To study application of power electronics in electrical vehicles

8 To study power electronics applications for utility supply.

9. To study power electronics applications for aerospace applications

10. To study power electronics application in High voltage DC Transmission

11. To study UPS and its applications

Major Equipment:

Computers, simulation software

List of Open Source Software/learning website:

Learning website:
- http://nptel.iitm.ac.in/courses.php
- http://coep.vlab.co.in/?sub=33&brch=97
- http://www.plcdev.com/book/export/html/9

- http://www.plcmanual.com/
- http://literature.rockwellautomation.com/
- http://www.automation.siemens.com/
- http://www.abb.com
- http://www.schneider-electric.co.in
- http://www.ge.com

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.