

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3152410

Semester – V

Subject Name: Power Electronics in Consumer Products

Type of course: Professional Elective Course (Professional Elective – I)

Prerequisite: Basic Electrical Engineering, Basic Electronics, Basic Power Electronics Devices

Rationale: Power Electronics is an emerging field/technology and it has found many applications ranging from residential and commercial to industrial sector. This course is aimed to get an insight of the applications of Power Electronics in the consumer products in various sectors and its importance in day to day life.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Introduction Review of power electronics and power electronic systems – Role and Importance of power electronic converters in day to day life – Requirements, advantages and disadvantages, Various consumer product applications in residential, commercial and industrial sector	6
2	Lighting Applications Power Electronics in lighting applications like Florescent Tube Light Chokes, CFL Lamps, LED based tube lights and lamps, Rechargeable and portable lights, solar based lights, Home automation, IOT based controllable/dimmable lights; PE Converters used in the above applications, their working and advantages/disadvantages over conventional lighting systems, Residential, commercial and industrial scope of these products.	12
3	Motor Based Applications Power Electronics in various motor-based consumer products like Washing Machine, Refrigerators, Air Conditioners, Elevators, BLDC fans (table top, ceiling mounted, exhaust, etc.), Vacuum cleaners, Air purifier, Automatic curtains, Electronic safe, Toys, Drones, Quadcopters, etc.; PE converters used in the above applications, their working and advantages/disadvantages over conventional products.	12
4	Applications Requiring Regulated supply: Power Electronics converters in applications like LED/LCD TV, Personal Computers, Laptops, Tablets and Cellular Phones, mobile and wireless charging, Microwave Oven, Induction water heaters, Induction cook tops & plats, induction cooker, room heater, Printers, Internet Routers/Switches, IOT based devices.	10

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5	Other Applications Introduction to power electronic converters used in other residential and commercial applications like Uninterruptible power supplies (UPS), Solar Inverters, Solar based agricultural pumps, Advertising, Automatic gates/doors, Battery chargers, Small roof top Solar and Wind power plants, Electric vehicles; their basic block diagrams and working, Stabilizer-Static & Relay Based, ELCB & MCB'S	8
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Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
40	30	30	0	0	0

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: Circuits, Devices and Applications, Third edition by M. H. Rashid, PHI. Handbook
2	Power Electronics: Converters, Applications and Design by Mohan, Undeland and Robbins, Wiley India.
3	Power Electronics: Essentials and Applications by L. Umanand, Wiley India.
4	Power Electronics by Dr. P. S. Bhimbra, Khanna Publishers.
5	Power Electronics by Philips T. Krein, Oxford.
6	Power Electronics by M. S. Jamil Asghar, PHI.

Course Outcomes:

At the end of the course, student should be able to:

Sr. No.	CO statement	Topics Mapped	Marks % weightage
CO-1	Integrate the basic blocks required for power electronic circuits in various consumer products.	1, 2, 3, 4, 5	30%
CO-2	Explain the basic working of power electronic converters in various consumer products.	1, 2, 3, 4, 5	30%
CO-3	Compare conventional and power electronics-based consumer products and their performance.	1, 2, 3, 4, 5	25%

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CO-4	Select appropriate PE converter for day to day life consumer products and applications in residential, commercial and industrial sector.	1, 2, 3, 4, 5	15%
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List of Experiments:

Lab experiments shall contain practical/Lab Sessions related to study of various Consumer Products/applications where in power electronic technology is used. The experiments enhancing the depth knowledge of working of Consumer Products/applications can be included.

Major Equipment:

Oscilloscope, Isolated Channel Power Scope, Power Converter Trainer Kits, Multi-meters, Variable Power Supply etc.

List of Open Source Software/learning website:

- **Learning website:**

- <http://nptel.iitm.ac.in/courses.php>
- <http://ocw.mit.edu/>
- <https://swayam.gov.in/>