

GUJARAT TECHNOLOGICAL UNIVERSITY

POWER ELECTRONICS & ELECTRICAL DRIVES (45)

ENHANCED POWER QUALITY AC/DC CONVERTERS

SUBJECT CODE: 2724503

SEMESTER: II

Type of course: Engineering Science (Electrical)

Prerequisite: NA

Rationale: NA

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
				PA	ALA	ESE	OEP			
3	2#	0	4	70	20	10	30	0	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Improved power quality converters: Single-phase & three-phase improved power quality ac-dc converters: Buck, boost, buck-boost, PWM VSC (Voltage source converters), multilevel VSCs, PWM CSC (Current voltage source converters), Harmonic analysis of phase controlled converters	10	25
2	Power factor correction (PFC) circuits: Operation of single phase PFC, control of PFC, designing current loop & voltage loop	10	25
3	Multi-pulse converters: Multi-pulse converters using delta/ zigzag/ Fork /Polygon transformers, analysis and harmonic calculations.	5	12.5
4	Front-end converter: Concept, diode-rectifier bridge front-ends, elimination of transient inrush current, Active front-end - Introduction, rectifier model, predictive current control in active front-end.	10	25
5	Power Quality standards: IEEE standards - 493, 519, P1100, 1159, 1250 & 14535 IEC standards - 38, 1000-3-2, 1000-3-6, EN 50160	5	12.5

Reference Books:

- Rashid, M. H., "Power Electronics Handbook", Academic Press, 2001.
- Ned Mohan, Tore M. Undeland and William P. Robbins, "Power Electronics Converters, Applications, and Design", John Willey & Sons, Inc., 2nd Edition, 1995.
- Arindam Ghosh "Power Quality Enhancement Using Custom Power Devices", Kluwer Academic Publishers, 2002
- Jose Rodriguez, Patricio Cortes, "Predictive Control of Power Converters and Electrical Drives", Wiley-IEEE Press, April 2012.
- Rashid M. H., "Power Electronics Circuits Devices and Applications", 3rd Ed., Pearson Education.
- Dubey G.K., Doradla S.R., Joshi A. and Sinha R.M.K., "Thyristorised Power Controllers", New Age International Private Limited.
- Lander Cyril W., "Power Electronics", Prentice Hall of India Private Limited.
- Paice D. A., "Power Electronic Converter Harmonics – Multipulse Methods for Clean Power", IEEE press.
- Kazmierkowski M. P., Krishnan R. and Blaabjerg F., "Control in Power Electronics – Selected Problems", Academic Press.

Course Outcome:

After learning the course the students should be able to:

- Understand operation of various power electronic converters
- Know various control techniques for power electronic converters
- Develop power electronic converter based systems

List of Open Source Software/learning website:

- E-materials available at the website of NPTEL- <http://nptel.ac.in/>
- PSIM (Demo version): Software is useful for simulation and analysis of electronic circuits.
- MATLAB (Trial version): Software is useful for simulation and analysis of electrical systems

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website