# GUJARAT TECHNOLOGICAL UNIVERSITY

## M.E Semester: 2

### Electrical Engineering

**Subject Name :** Advanced Power Converters (Power electronics)

| Sr.No | Course content |
|---|---|
| 1. | Resonant Converters<br>Introduction, Classification of resonant converters, basic resonant circuit concepts, load resonant converters, resonant switch converters, zero-voltage switching, clamped voltage topologies, resonant dc link inverters with zero voltage switching, high-frequency-link integral-half-cycle converters |
| 2. | Multi-level converters<br>Bridge inverters, Need for multi-level inverters, Concept of multi-level, Topologies for multi-level: Diode Clamped, Flying capacitor and Cascaded multi-level configurations; Features and relative comparison of these configurations; Switching device currents; DC-link capacitor voltage balancing, features of multi-level converters, Applications |
| 3. | Matrix converters<br>Fundamentals of matrix converter technology, Analysis of bi-directional switch topologies, Modulation techniques for matrix converters, Performance and control of matrix converters, commutation and protection issues |
| 4. | Flexible AC Transmission Systems<br>Introduction, Principle of power transmission, Principle of shunt compensation, Shunt compensators: Thyristor controlled reactor, Thyristor switched capacitor, Static VAR compensator; Principle of series compensation; Series compensators: Thyristor switched series capacitor, Thyristor controlled switched capacitor, Forced commutated controlled switched capacitor; Series static VAR compensator, Advanced SSVC, Phase angle compensator, UPFC. |
| 5. | Multi-pulse converters<br>Concept of multi-pulse, Types of multi-pulse converters, different transformer connections for multi-pulse converters, Applications of multi-pulse converters. |
| 6. | Converters for some special applications<br><br>Power electronic converters for renewable energies like solar and wind, Induction Heating, HVDC etc. |

**Activities:**

1. Comparison of harmonic spectrum of different configurations of multi-level converter and bridge converters.
2. Determination of the performance indices for 12, 24, 48 and 96 pulse converters.
3. Simulating a closed-loop scheme for reactive VAR compensation using static VAR compensation.
4. Presentation on any one course related topic from the recent literature.

**Reference Books:**


1. “Power Electronics – Converters, Applications and Design”, John Willey & sons, Inc., 3rd ed., 2003- Mohan, Undeland and Robbins
2. “Power Electronics - circuits, devices and applications”- Muhammad H. Rashid Prentice Hall of India, 3rd ed., 2009.
3. “Power Electronics Handbook”, Academic Press, California, 2001- Muhammad H. Rashid
4. “Control in Power - Marian P. Kazmierkowskim R. Krishnan and F. Blaabjerg Electronics”
5. “Modern Power Electronics ”, S. Chand and Co. Ltd., New Delhi, 2000- P.C.Sen
6. Recent Literature
7. Paice Derek A , “Power Electronic Converter Harmonics: Multi-Pulse Methods for Clean Power”, IEEE Press New York
8. Dubey G.K. Doradla S.R. Joshi A. Sinha R.M.K, “Thyristorised Power Controllers”, New age International ltd., New Delhi,1996.