

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Power Electronics Engineering

SEMESTER IV

Subject Name:- Harmonics and Filtration Methods

Subject Code:- 742901

Sr No	Course Content
1	Harmonics Basics: Linear & Non Linear Loads, Power Quality Indices, Power Quantities under Non sinusoidal situations, Harmonic Sources, Traditional and future sources of harmonics, Standardization of harmonics levels, Fundaments of Power Losses in Harmonic Environments.
2	Measurement and Analysis of Voltage Events : Monitoring of Voltage Events, Performance of the IEC Standard Method in the Detection and Evaluation of Voltage Events, Other Methods for the Detection & Evaluation of Voltage Events, Effects of Voltage Events on Equipment, Voltage Tolerance of Equipment, Measurement System, Effect of Harmonic Distortion.
3	Power-quality Factor for Electrical Networks: Quality of electrical signal, Quantitative Formulations of power-quality aspects, system-frequency variations , Total current & voltage harmonic distortion , Degree of unbalance , Phase displacements between corresponding fundamental Voltage and Currents , Voltage-Quality Factor & Power-Quality Factor and its Measurement and usage, , Quantitative Formulations of Power-quality aspects under transient state conditions , Fourier Analysis Versus Time Frequency analysis for power-quality ,Time Frequency-based transient quality aspects, Procedure to Obtain the transient quality aspect , Application Example of transient disturbance. Power quality measuring devices. Power quality standards.
4	Effects of harmonics on Distribution systems: Effects on capacitors, Transformers, Rotating machines, Lighting Devices, cables, relays, Telephone Interference, Solid state Devices .
5	Harmonic Analysis and Measurement: Harmonic source representation, Harmonic Propagation facts, flux of harmonic currents, Interrelation between AC system and Load Parameters Analysis methods , Necessity of harmonic measurement, Measurement procedure.
6	Harmonic Filtering Techniques: Passive filter design, single tuned filter, Band pass filter, Tuned harmonic filter design, other methods to decrease harmonic distortion Limits.
7	Active Power line filters:- General description of Shunt Active filters, 3-phase, 3-wire shunt active filters, Active filters for current minimization, Active filters for harmonic damping, 3-phase, 4-wire shunt active filters, Hybrid and series active filters, comparison with pure active filters, Combined series and shunt power conditioners, Unified Power Flow Controller (UPFC), Unified Power Quality Controller (UPQC)- basic concepts

Reference Books:-

1. Harmonics and Power systems By Francisco C. De La Rosa Taylor& Francis group, CRC Press.
2. Instantaneous Power Theory and Application to Power Conditioning By Hirofumi Akagi et al., IEEE Press, Wiley-Interscience A Jhon Willey & Son Publication.
3. Power Quality by C.Sankaran , CRC Press.
4. Power Quality A.Moreno , Springer