

Subject Code: 1ET2130105	Subject Title: Elective:1 - Power Quality Management
Pre-requisite Subject:	Fundamentals of Power Electronics

Course Objective: To know power quality problems and their mitigation techniques in power system.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	-	2	4	60	40	30	20	150

Subject Contents				
Sr. No.	Topic	Total Hours	Weight (%)	
1	Power quality terminologies Categories & characteristics of power system electromagnetic phenomena for power quality, transients – impulsive & oscillatory, long duration & short duration voltage variations, voltage imbalance, waveform distortion, power frequency variations, power quality terms. Power Quality Standards.	5	10%	
2	Harmonics Definition, number, odd and even harmonics, causes of harmonics, Individual & total distortion, Harmonics signatures, Guide lines for harmonic voltage & current limitation, Linear & Non Linear Loads, Harmonic Sources, Harmonic issues for uncontrolled and controlled rectifiers, Standardization of harmonics levels.	6	25%	
3	Effect of harmonics on electrical apparatus Effect of harmonic on Transformer - Harmonics in No-Load Exciting Current, Harmonics due to Inrush Current, DC Magnetization Effect on Capacitor, Induction Motor.	5	15%	
4	Passive harmonic filters Types, Ac network impedance, Design of filters – single tuned, double tuned & damped filter, filter component ratings.	6	20%	
5	Active harmonic filters Advantages, Types – shunt, series & hybrid, current control techniques – instantaneous reactive power theory, synchronous reference frame theory, Fast Fourier Transform (FFT), current controllers for active power filters – hysteresis current control, space vector hysteresis current control, PI based current control.	8	30%	

Course Outcome:

After learning the course, the students should be able to

1. Explain concept of Power Quality & their issues for various electrical systems.
2. Describe effects of harmonics on electrical apparatus.
3. Know different power quality improvement methods and devices.

List of Text Books:

1. C. Sankaran, "Power quality" , CRC Press, 2002.
2. Roger C. Dugan , "Electrical Power Systems Quality" , 2nd Edition, Tata Mcgraw Hill Publication.

List of Reference Books:

1. Hirofumi Akagi, Edson Hirokazu Watanabe, Mauricio Aredes, "Instantaneous Power Theory and Applications to Power Conditioning", John Wiley & Sons, 2007.
2. Harmonics and Power systems By Francisco C. De La Rosa Taylor& Francis group, CRC Press.

List of Experiments:

1. Simulation and analysis of single phase bridge rectifier as a non-linear load.
2. Performance and analysis of single phase bridge rectifier as a non-linear load.
3. Simulation and analysis of three phase uncontrolled rectifier as a non-linear load.
4. Simulation and analysis of three phase controlled rectifier as a non-linear load.
5. Design, Simulation and analysis of passive filters.
6. Simulation and analysis shunt active power filter.
7. Simulation and analysis series active power filter.
8. Simulation and analysis hybrid active power filter.