

EE8006 POWER QUALITY

DETAILED SYLLABUS

OBJECTIVES:

To impart knowledge about the following topics:

- Causes & Mitigation techniques of various PQ events.
- Various Active & Passive power filters.

UNIT I INTRODUCTION TO POWER QUALITY

Terms and definitions & Sources – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustained interruption - Sags and swells - Voltage sag - Voltage swell - Voltage imbalance – Voltage fluctuations - Power frequency variations - International standards of power quality – Computer Business Equipment Manufacturers Associations (CBEMA) curve

UNIT II VOLTAGE SAG AND SWELL

Estimating voltage sag performance - Thevenin's equivalent source - Analysis and calculation of various faulted condition - Estimation of the sag severity - Mitigation of voltage sag, Static transfer switches and fast transfer switches. - Capacitor switching – Lightning - Ferro resonance - Mitigation of voltage swell.

UNIT III HARMONICS

Harmonic sources from commercial and industrial loads - Locating harmonic sources – Power system response characteristics - Harmonics Vs transients. Effect of harmonics – Harmonic distortion - Voltage and current distortions - Harmonic indices - Inter harmonics – Resonance Harmonic distortion evaluation, IEEE and IEC standards.

UNIT IV PASSIVE POWER COMPENSATORS

Principle of Operation of Passive Shunt and Series Compensators, Analysis and Design of Passive Shunt Compensators Simulation and Performance of Passive Power Filters- Limitations of Passive Filters Parallel Resonance of Passive Filters with the Supply System and Its Mitigation. Fundamentals of load compensation – voltage regulation & power factor correction.

UNIT V POWER QUALITY MONITORING & CUSTOM POWER DEVICES

Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems - Quality measurement equipment - Harmonic / spectrum analyzer – Flicker meters Disturbance analyzer - Applications of expert systems for power quality monitoring. Principle & Working of DSTATCOM – DSTATCOM in Voltage control mode, current control mode, DVR Structure – Rectifier supported DVR – DC Capacitor supported DVR -Unified power quality conditioner.

TEXT BOOKS:

1. Roger. C. Dugan, Mark. F. Mc Granagh, Surya Santoso, H. WayneBeaty, "Electrical Power Systems Quality", McGraw Hill,2003
2. J. Arrillaga, N.R. Watson, S. Chen, "Power System Quality Assessment", (New York: Wiley),2000.
3. Bhim Singh, Ambrish Chandra, Kamal Al-Haddad," Power Quality Problems & Mitigation Techniques" Wiley, 2015.

REFERENCES

1. G.T. Heydt, "Electric Power Quality", 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994.
2. M.H.J Bollen, "Understanding Power Quality Problems: Voltage Sags and Interruptions", (New York: IEEE Press), 2000.