

Course Syllabi: UEE524 Power Quality Monitoring and Conditioning (L:T:P::3:1:0)

1. **Course number and name:** UEE524; Power Quality Monitoring and Conditioning

2. **Credits and contact hours:** Credits: 3.5; Hours: 4

3. **Text book, title, author, and year**

- *Beaty, H. and Santoso, S., Electrical Power System Quality, McGraw–Hill (2002).*
- *Kennedy, B., Power Quality Primer, McGraw–Hill (2000).*
- *Bollen, M.H.J., Power Quality Problems: Voltage Sag and Interruptions, IEEE Press (2007).*
- *Mohan, N., Power Electronics, New Age International (P) Limited, Publishers (2007).*

a. Other supplemental materials

- Nil

4. **Specific course information**

a. Brief description of the content of the course (catalog description)

Overview and definition of power quality (PQ): Sources of pollution and regulations, Power quality problems, Rapid voltage fluctuations voltage unbalance, Voltage dips and voltage swells, Short duration outages.

Definitions Voltage sag analysis and mitigation: Sag caused by motor starting, Sag caused by utility fault clearing, Sag mitigation, Sag magnitude and duration calculations, RMS voltage, Peak examples of sag magnitude, Calculation in 1-phase systems, Equipment performance in presence of sag, Computers, AC and DC drives.

Harmonics: Effects-within the power system, Interference with communication harmonic measurements, Harmonic elimination.

Harmonic distortion: Power system harmonics, Harmonic analysis, Harmonic sources-the static converters, Transformer magnetization and non-linearities, Rotating machines, Arc furnaces, Fluorescent lighting. Introduction to power converters, Fourier analysis, Total harmonic distortion, Rms and average value calculations, Arcing and saturable devices, Effects of harmonic distortion, System response characteristics.

Principles for controlling harmonics: Locating sources of harmonics, Passive and active filters, Harmonic filter design.

Monitoring power quality: Monitoring essentials, Power quality measuring equipment, Current industry trends.

Power Conditioning: Electric power conditioning, Active and passive filters, IEEE, IEC, ANSI standards, Power acceptability curves, various standards.

5. **Specific goals for the course**

After the completion of the course, the students will be able to:

- Reliably identify the sources of various power quality problems.
- Estimate the impact of various power quality problems on appliances.
- Educate the harmful effects of poor power quality and harmonics.
- Decide the compensators and filters to keep the power quality indices within the standards.

6. **Brief list of topics to be covered**

- Power quality
- Voltage sag analysis and mitigation
- Harmonics
- Power Conditioning