

4/4 B.Tech. SECOND SEMESTER

EE8T3C

ELECTRICAL POWER QUALITY (Elective –III) Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Objectives:

The objective of this course is to instil participating individuals with an in-depth knowledge in power quality. With reliability and availability largely guaranteed, power quality is becoming the primary concern in electric power distribution systems. This module introduces the new concept of power quality and quantifies the power quality disturbances that fall within the wider umbrella of electromagnetic phenomena. It aims to provide a strong foundation for a better understanding of the fundamentals behind each power quality problem, Power Quality Monitoring and assessment & mitigation

Learning outcomes

1. After the completion of this course, students are able to understand the basics corresponding the power quality, voltage quality, types of sags and interruptions.
2. Students are able to understand transient over voltages and indepth knowledge on harmonics
3. Students are able to know planning, monitoring and assessment of power quality.

Unit I Introduction

Power quality - Voltage Quality, power quality evaluation procedure terms and definitions General, classes of Power Quality Problems, Transients, long and short duration Voltage variations , voltage imbalance.

Unit II Voltage sags and Interruptions

Sources of sags and Interruptions. Estimating Voltage sag performance, fundamental principles of protection, monitoring sags.

Unit III Transient over voltages

Source of transients over voltages , principles over voltages protection, utility capacitor switching transients .

Unit IV Fundamentals of Harmonics

Harmonic distortion. Voltage versus transients, Harmonic indexes. Harmonic sources from commercial loads. Harmonic sources from industrial loads, Effects of Harmonic Distortion, intra harmonics.

Unit V Waveform distortion

Harmonic distortion evaluations, principels for controlling harmonics , harmonics studies, device for controlling harmonics distortion, harmonic filters, standards of harmonics

Unit VI Power quality benchmark

Benchmark process, power quality contract, power quality state estimation, including power quality in distribution planning, Interface to utility system, power quality issues, interconnection standards

Unit VII Power Quality Monitoring

Monitoring Consideration, power quality measurement equipment. Assessment of Power Quality measurement data, application of intelligent systems, power quality monitoring standards.

Unit VIII Power Quality assessment & mitigation

Power quality assessment, Power quality indices and standards for assessment disturbances, power assessment under waveform distortion conditions mitigation techniques at different environments

Learning resources

Text books:

1. Roger. C. Dugan, Mark. F. McGranaghram, Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality' McGraw Hill,2003
2. .T. Heydt, 'Electric Power Quality'. (West Lafayette, IN, Stars in a Circle Publications, 1991).

Reference books:

1. M.H.J Bollen, 'Understanding Power Quality Problems: Voltage Sags and Interruptions', (New York: IEEE Press, 2000).
2. "Power quality in power systems and electrical machines" Ewald F Fuchs, Mohammad A.S., Masoum, Academic Press , Elsevier 2009
3. " Modern power electronics', M.H.Rashid Tata Mc Graw Hill 2002