

**IV B.Tech – I Semester
(20EE7325) ELECTRIC POWER QUALITY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre-Requisite: Power Systems-I, Power Systems-II, Power System Analysis

Course Objectives

1. Able to learn different types of power quality phenomena.
2. Able to identify sources for voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
3. Able to describe power quality terms and study power quality standards.
4. Able to learn the principle of voltage regulation and power factor improvement methods.
5. Able to explain the relationship between distributed generation and power quality.

Syllabus

Unit – 1: Introduction

Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems – Transients – Long–duration voltage variations – Short– duration voltage variations – Voltage unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations.

Unit – 2: Voltage imperfections in power systems

Power quality terms – Voltage sags – Voltage swells and interruptions – Sources of voltage sag, swell and interruptions – Nonlinear loads – IEEE and IEC standards. Source of transient over voltages – Principles of over voltage protection – Devices for over voltage protection – Utility capacitor switching transients

Unit – 3: Voltage Regulation and power factor improvement

Principles of regulating the voltage – Device for voltage regulation – Utility voltage Regulator application – Capacitor for voltage regulation – End–user capacitor application – Regulating utility voltage with distributed resources – Flicker – Power factor penalty – Static VAR compensations for power factor improvement.

Unit – 4: Harmonic distortion and solutions

Voltage distortion vs. Current distortion – Harmonics vs. Transients – Harmonic indices – Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers, motors and meters – Point of common coupling – Passive and active filtering – Numerical problems.

Unit – 5: Distributed Generation and Power Quality

Resurgence of distributed generation – DG technologies – Interface to the utility system – Power quality issues and operating conflicts. Power quality monitoring and considerations – Historical perspective of Power quality measuring instruments – Power quality measurement equipment – Assessment of Power quality measuring data.

Course Outcomes

S. No	Course Outcomes	BTL
1.	Capable of identifying different types of power quality problems.	L1
2.	Will know the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.	L1
3.	Also analyze power quality terms and power quality standards.	L4
4.	Can go through the principle of voltage regulation and power factor improvement methods.	L2
5.	Demonstrate the relationship between distributed generation and power quality.	L2

Correlation of COs with POs& PSOs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO 1	2	2	-	-	-	-	-	1	1	-	1	-	3	2
CO 2	2	2	-	-	-	-	-	1	1	-	1	-	3	2
CO 3	2	2	-	-	-	-	-	1	1	-	1	-	3	2
CO 4	2	2	-	-	-	-	-	1	1	-	1	-	3	2
CO 5	2	2	-	-	-	-	-	1	1	-	1	-	3	2

1 – Weak, 2 – Moderate and 3 - Strong

Text Books:

1. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw–Hill, 2012, 3rd edition.
2. Electric power quality problems –M.H.J.Bollen IEEE series-Wiley India publications, 2011.

Reference Books:

1. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015
2. Signals and Systems – P. Ramesh Babu and R. Ananda Natarajan, Scitech Publications, Third Edition, 2004
3. Fundamentals of Signals and Systems– Michel J. Robert, McGraw Hill, 2008.
4. Signals and Systems – T K Rawat, Oxford University Press, 2011.