POWER QUALITY MANAGEMENT

Course Code: 15EE2214

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Pre requisites: Basic knowledge in Electrical Networks, Machines, Power Electronics.

Course Outcomes: At the end of the course, the student will be able to

CO1: Define different power quality issues and describe causes and performance of sags and Interruptions.

CO2: Describe various equipment's behavior with voltage sags.

CO3: Discuss various interfacing devices to mitigate the sags and Interruptions.

CO4: Distinguish Basic Harmonic Phenomena, methods for dealing with harmonic distortion.

CO5: Distinguish the relationship between DG and Power Quality, Guidance on identifying and correcting of wiring and grounding problems.

UNIT-I (10-Lectures)

INTRODUCTION, SAGS AND INTERRUPTIONS:

Overview of Power Quality - Concern about Power Quality -General Classes of Power Quality Problems – Transients –Long and Short-Duration Voltage Variations - Voltage Unbalance Waveform Distortion - Voltage fluctuation - Power Frequency Variations - Power Quality Terms -Voltage Sags and Interruptions - Sources of Sags and Interruptions, Estimating Voltage Sag performance, Evaluating the Economics of Different Ride through Alternatives, Reclosing, Fuse saving, Single Phase tripping.

UNIT-II (10-Lectures)

VOLTAGE SAGS – EQUIPMENT BEHAVIOR:

Voltage tolerance, computers, consumer electronics, adjustable speed AC drives and its operation. Mitigation methods of AC Drives,

adjustable speed DC drives and its operation, mitigation methods of DC drives other sensitive loads.

UNIT-III (10-Lectures)

MITIGATION OF INTERRUPTIONS, VOLTAGE SAGS AND EMC STANDARDS:

Overview and ways of mitigation methods, different events and mitigation methods. System equipment interface – voltage source converter, series voltage controller- basic principle active power injection; shunt controller, combined shunt and series controller. Purpose of standardization, IEC Electromagnetic compatibility standards.

UNIT-IV (10-Lectures)

HARMONIC DISTORTION AND SOLUTIONS:

Voltage vs. Current Distortion - Harmonics vs. Transients - Harmonic Indices – Sources of harmonics - Locating Sources of Harmonics – System Response Characteristics - Effects of Harmonic Distortion – Interharmonics - Harmonic Solutions - Harmonic Distortion Evaluation - Devices for Controlling Harmonic Distortion - Harmonic Filter Design - Standards on Harmonics.

UNIT-V (10-Lectures)

DISTRIBUTED GENERATION AND POWER QUALITY:

Resurgence of Distributed Generation - DG Technologies - Interface to the Utility System - Power Quality Issues - Operating Conflicts - DG on Low Voltage Distribution Networks - Interconnection standards - Wiring and Grounding - Typical Wiring and Grounding Problems - Solution to Wiring and grounding Problems

TEXT BOOKS:

1. Roger Dugan, Surya Santoso, Mark F. Mc Granaghan, H. Beaty, "*Electrical Power Systems Quality*", McGraw-Hill Professional Publishing, Second Edition, November 2002(Unit I, III & V).

2. Math H J. Bollen, "*Understanding Power Quality Problems: Voltage Sags and Interruptions*", First Indian edition, IEEE Press, 2001 (Unit II & III).

REFERENCES:

1. C.Sankaran, "*Power Quality*", First Indian reprint, CRC press, 2009 (Part of Unit-I).
2. J. Arrillaga, N. R. Watson, S. Chen, "*Power System Quality Assessment*", John Wiley & Sons, 2000.