

Power Quality in Power Distribution Systems - Web course

COURSE OUTLINE

The course addresses various issues related to power quality in power distribution systems. Before going deeper details of the course the students should understand the basic definition and terms used in power system in order to define and characterize its features.

Power systems are ideally designed to operate three-phase balanced load at fundamental frequency. When there is deviation from these ideal conditions, the efficiency of power system comes down. This is due to increased losses, heating of electric machines, transformers and appliances. These aspects will be explained along with practical examples.

The consequences of power quality problems will be discussed and an effort will be made to understand their mitigation using custom power devices such as distribution static compensator (DSTATCOM), dynamic voltage restorer (DVR). For that the basic step involves to know the reference parameters say voltage and current in order to make system well behaved. A good number of lectures are devoted for this.

Once reference quantities are known using discussed algorithms, these have to be synthesized using suitable topologies of the voltage source inverters. These converter topologies and their applications will be discussed. The switching control strategies then will be presented in order to control the inverter to synthesize desired voltage and current quantities. Here modeling and analysis aspects of three phase compensated system will be presented.

COURSE DETAIL

Sl. No	Topic	No. of Hours
1.	Definitions of various powers, power factor and other figures of merit under balanced, unbalanced and non-sinusoidal conditions.	8
2.	Theories of load compensation.	12
3.	Introduction to custom power devices and their applications in power system.	4
4.	Detailed modeling, analysis and design aspects of custom power devices (DSTATCOM, DVR).	4
5.	Compensators to mitigate power quality related problems.	12
	Total	40



NP-TEL

NPTEL

<http://nptel.iitm.ac.in>

Electrical Engineering

Pre-requisites:

1. Power system, power electronics.

Hyperlinks:

1. Power Standards Lab - Tutorials & Standards

Website:

www.powerstandards.com/tutor.htm

Coordinators:

Dr. Mahesh Kumar

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References:

1. Power quality enhancement using custom power devices, A. Ghosh and G. Ledwich, Kluwer Academic Publication, 2002.
2. Power quality, C. Shankran, CRC Press, 2001.
3. Handbook of power quality, editor: Angelo Baghini, John Wiley & Sons, 2008.
4. Electrical power systems quality Roger C. Dugan et al., Tata McGraw-Hill, 2002.
5. Instantaneous power theory and application to power conditioning, H. Akagi et al., IEEE Press, 2007.