

Course Type	Course Code	Name of the Course	L	T	P	Credits
DE	NEED504	Power Quality	3	0	0	3

#### Course Objective

- This course identifies and analyses various power quality issues such as voltage sag, voltage unbalance, transient overvoltage, and voltage and current harmonics arising in today's mixed form of power generation. This also imparts knowledge about various mitigation technologies. Students assess the power quality of electricity supply networks against major international standards. However, strong fundamental knowledge about power system analysis and active-reactive powers are the prerequisite for the course.

#### Learning Outcomes

Upon successful completion of this course, students will develop:

- an understanding of power quality issues in the power system.
- an acquaintance with devices which mitigate power quality problems.
- an understanding of various design and control techniques.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	<b>Introduction:</b> Brief review of various power quality (PQ) problems: Source of generation and their impacts on equipment and systems, need for monitoring, international power quality standards.	7L	Various power quality issues will be discussed along with their causes and effects.
2	<b>Passive Filters:</b> Control of harmonics using passive L-C filters, tuned and de-tuned filters, their design criterion and implementation.	8L	Knowledge about the design and working of passive power filters for the mitigation of power quality issues will be gained.
3	<b>Basics of Active Power Filters:</b> Power factor improvement, reactive power compensation, harmonics mitigation, and voltage sag compensation using active power filters.	5L	Knowledge about basics of active power filters.
4	<b>Types of Active Power Filters:</b> Study of various active power filters viz., static shunt compensators (STATCOM), dynamic voltage restorer (DVR), unified power quality conditioner (UPQC), etc.	10L	Knowledge of various active power filter and their application.
5	<b>Suitability:</b> Suitability of type of active filters for mitigation of various power quality problems.	4L	Knowledge about the suitability of various active power filters.
6	<b>Design and Control:</b> Design of active power filters, various topologies, and control schemes.	8L	Knowledge about the design and control aspects of various active power filters for mitigating power quality issues will be gained.
<b>Total Contact Hours</b>		<b>42L</b>	

#### Textbooks:

- Arindam Ghosh and Gerard Ledwich 'Power Quality Enhancement Using Custom Power Devices (Power Electronics and Power Systems)', Springer; 2002.
- Surya Santoso, H. Wayne Beaty, Roger C. Dugan, and Mark F. McGranaghan, 'Electrical Power Systems Quality', McGraw-Hill Professional, 2002.

#### Reference Books:

- Bhim Singh, Ambrish Chandra, Kamal Al-Haddad, Power Quality: Problems and Mitigation Techniques, Wiley.
- M.H. Bollen, Understanding Power Quality Problems: Voltage Sags and Interruptions, Wiley - IEEE Press