

COURSE TITLE	POWER QUALITY MANAGEMENT
COURSE CODE	01EE1710
COURSE CREDITS	3

Objective:

- 1 To equip students with the knowledge and skills necessary to understand, identify, analyze, and mitigate various power quality issues encountered in electrical systems

Course Outcomes: After completion of this course, student will be able to:

- 1 Recognise various power quality issues in the electrical system
- 2 Identify different sources of power quality disturbance
- 3 Analyse the impact of power quality issues on the systems
- 4 Design the solution for mitigation of power quality issues

Pre-requisite of course:Power Electronics and Electrical Power System

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Introduction to Power Quality introduction, the definition of power quality, reasons for rising concerns about power quality, consequences of bad power quality, voltage and current quality, power quality terminology: bonding, distortion, electromagnetic interference, flicker, harmonics, impulse, interruption, noise, notch, power factor, sag, swell, transient, etc., linear and non-linear loads, power relation in non-linear load, the responsibility of supplier and users, standards	10
2	Power Frequency Disturbance Common power frequency disturbances, voltage sags, cures of low-frequency disturbances, voltage tolerance	4
3	Electrical Transients Transient system mode, examples of models & response, types and causes of transients	4
4	Harmonics Definition, odd and even harmonics, inter-harmonics and sub-harmonics, sequence of harmonics, causes of harmonic, individual & total distortion, effect of harmonics, guidelines for harmonic voltage & current limitation	9

Contents : Unit	Topics	Contact Hours
5	Power Factor Introduction, active power, reactive power, apparat power, distortion power, displacement power factor, distortion factor, true power factor, causes of low power factor, isadvantages of poor power factor, power factor improvement, location of capacitor for power factor correction, penalty, voltage rise due to capacitance	8
6	Power Quality Improvement Devices Passive filters, synchronous condenser, static VAR compensator, shunt active power filter, series active power filter, dynamic voltage restorer, unified power quality conditioner	7
Total Hours		42

Textbook :

- 1 Power Quality, C. Sankaran, CRC Press, New York, 2001

References:

- 1 Electric Power Systems Quality, Electric Power Systems Quality, R. C. Dugan, M. F. McGranaghan and H. W. Beaty, McGraw Hill, New York, 2006
- 2 Power Quality: Problems and Mitigation Techniques, Power Quality: Problems and Mitigation Techniques, Bhim Singh, Ambrish Chandra and Kamal Al-Haddad, John Wiley & Sons Ltd., U.K., 2015
- 3 Power System Quality Assessment, Power System Quality Assessment, J. Arrilaga, N R Wattson and S. Chen, John Wiley & Sons, 2000
- 4 Instantaneous Power Theory and Applications to Power Conditioning, Instantaneous Power Theory and Applications to Power Conditioning, Hirofumi Akagi, Edson Hirokazu Watanabe and Mauricio Aredes, Willey Interscience, New Jersey, 2007

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs, etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the classroom.

Instructional Method:

- 3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, and Virtual Laboratory

Supplementary Resources:

- 1 <https://nptel.ac.in/courses/108/106/108106025/>
- 2 <https://nptel.ac.in/courses/108/107/108107157/>
- 3 <https://powerside.com/mitigating-voltage-sags-during-large-motor-starts/>
- 4 <https://powerside.com/what-is-power-factor/>