



# Kadi Sarva Vishwavidyalaya

## Faculty of Engineering & Technology

### Master of Engineering Semester I

#### (Electrical Power System)

(With effect from Academic Year 2017-18 (CBCS))

<b>Subject Code: MEEE105-N</b>	<b>Subject Title: Power Quality</b>
<b>Pre-requisite</b>	

#### A. Course Objective:

- To present a problem oriented introductory knowledge of Electrical Engineering Fundamentals.
- To focus on the study of electrical parameters & different engineering application based principles.
- To address the underlying concepts & methods behind Electrical Engineering.
- To focus on the calculation of energy consumption of the residential building.

Teaching scheme				Total Credit	Evaluation Scheme					Total Marks
L	T	P	Total		Theory		IE Marks	CIA Marks	Pract. Marks	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks				
03	00	00	03	03	03	70	30	20	00	120

#### B. Outline of the Course:

Sr. No	Title of the Unit	Minimum Hours
1	An Introduction to Power Quality	4
2	Power Frequency Disturbances	10
3	Harmonics	8
4	Power Factor	12
5	Distributed Generation and Power Quality	6
6	Measuring and Solving Power Quality Problems	5

**Total Hours (Theory): 45**

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#### Detailed Syllabus

Sr. No	Topic	Lecture Hours	Weight age(%)
1	<b>Introduction</b> Definition of power quality- overview of power quality phenomena- Classification of power quality issues, Power Quality standards	4	10
2	<b>Power Frequency Disturbances</b> Introduction, Common power frequency disturbances, Cures for Low-Frequency disturbances, Voltage tolerance criteria <b>Electrical Transients:</b> Transient System Model, Examples of Transient Models and Their Response, Power System Transient Model, Types and Causes of Transients, Examples of Transient Waveforms	10	20
3	<b>Harmonics</b> Definition of Harmonics, Odd and Even Order Harmonics, Harmonic Phase Rotation and Phase Angle Relationship, Causes of Voltage and Current Harmonics, Individual and Total Harmonic Distortion, Harmonic Signatures, Effect of Harmonics on Power System Devices, Guidelines for Harmonic Voltage and Current Limitation, Harmonic Current Mitigation.	8	20
4	<b>Power Factor</b> Introduction, Active and Reactive Power, Displacement and True Power Factor, Power Factor Improvement, Power Factor Correction, Power Factor Penalty, Other Advantages of Power Factor Correction, Voltage Rise Due to Capacitance, Application of Synchronous Condensers, Static VAR Compensators <b>Electromagnetic Interference</b> Frequency Classification, Electrical Fields, Magnetic Fields, Electromagnetic Interference Terminology, Power Frequency Fields, High-Frequency Interference, Electromagnetic Interference Susceptibility, EMI Mitigation, <b>Unbalance:</b> Unbalance in three phase power system, Sources of Unbalance, Effect of Unbalance, <b>Other issues:</b> DC Offset, Electric Noise, Voltage Fluctuation, Flicker and Power Frequency Variation	12	25



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5	<b>Distributed Generation and Power Quality</b>  Resurgence of DG, DG Technologies, Interface to the Utility System Power Quality Issues Operating Conflicts, DG on Distribution Networks, Siting Distributed Generation, Interconnection  <b>Wiring and Grounding</b>  Resources, Definitions, Reasons for Grounding Typical Wiring and Grounding Problems, Solutions to Wiring and Grounding Problems	6	15
6	<b>Measuring and Solving Power Quality Problems</b>  Power Quality Measurement Devices, Power Quality Measurements.	5	10
<b>Total</b>		<b>45</b>	<b>100</b>

#### C. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures, which may carries five marks in overall evaluation.
- One internal exam of 30 marks is conducted as a part of mid semester evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carries a weight age of five marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar /Tutorial may be conducted and having share of five marks in the overall internal evaluation.

#### D. Learning Outcome

On successful completion of the course

- The student can be acquired the basic knowledge of power quality, electrical fundamentals, thus being prepared to pursue any area of engineering spectrum in depth as desired.
- The students will be able to effectively employ electrical systems and lead the exploration of new applications and techniques for their use.

#### E. Text Books & Reference Books:

- Roger C. Dugan, Mark F. McGranaghan and H.WayneBeaty, “Electrical Power System Quality,” MC Graw Hill.
- C. Sankaran, “Power Quality”, CRC Press, 2002.
- SurajitChattopadhyay • MadhuchhandaMitra, SamarjitSengupta, “Electric Power Quality”, Power System series, Springer Publication.