



**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: MEEE-206-N-B</b>	<b>Subject Title: Harmonic Measurement and Filtration Techniques (Major Elective-I)</b>
<b>Pre-requisite</b>	

**A. Course Objective:**

- To introduce students to measurement of harmonics in the power system
- To enable students to learn harmonic filtration techniques
- To impart knowledge of converter topologies and their control strategies in the field of active power filters

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				
04	00	02	06	05	03	70	30	20	30	150

**B. Outline of the Course:**

Sr. No	Title of the Unit	Minimum Hours
1	The instantaneous Power Theory	08
2	Harmonic Filtering Techniques	12
3	Active Filters	28
4	Harmonic Analysis	12

**Total Hours (Theory): 60**

**Total Hours (Lab): 30**

**Total Hours: 90**



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**Detailed Syllabus**

Sr. No	Topic	Lecture Hours	Weight age(%)
1	<p><b>The instantaneous Power Theory:</b></p> <p>Basics of p-q Theory, p-q theory in Three phase-Three wire systems, p-q theory in Three phase, Four-wire systems, Instantaneous abc Theory, comparison between pq and abc Theory.</p>	8	10
2	<p><b>Harmonic Filtering Techniques:</b></p> <p>Passive filter design, single tuned filter, Band pass filter, Tuned harmonic filter design, other methods to decrease harmonic distortion Limits</p>	12	15
3	<p><b>Active Filters:</b></p> <p>General description of Shunt Active filters, 3-phase, 3-wire shunt active filters, Active filters for current minimization, Active filters for harmonic damping, 3-phase, 4-wire shunt active filters, Hybrid and series active filters, comparison with pure active filters,</p> <p><b>Hybrid and series filters</b></p> <p>Combined series and shunt power conditioners, Unified Power Flow Controller (UPFC), Unified Power Quality Controller (UPQC)- basic concepts.</p>	28	60
4	<p><b>Harmonic Analysis:</b></p> <p>Harmonic source representation, Harmonic Propagation facts, flux of harmonic currents, Interrelation between AC system and Load Parameters Analysis methods</p>	12	15
<b>Total</b>		<b>60</b>	<b>100</b>

**C. Instructional Method and Pedagogy:**



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- 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 carry 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 carry a weightage 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

- Students will be able to measure and mitigate harmonics in the power system.
- Students will be able to understand various power filter topologies for harmonic mitigation.

**E. Text Books & Reference Books:**

- Harmonics and Power systems By Francisco C. De La Rosa Taylor & Francis group, CRC Press
- *Power System Harmonics, Second Edition* J. Arrillaga, N.R. Watson, John Wiley & Sons, Ltd ISBN: 0-470-85129-5
- Power Electronics Converter Harmonics By Deane A Paice, IEEE Press
- Instantaneous Power Theory and Application to Power Conditioning By Hirofumi Akagi et al., IEEE Press, Wiley-Interscience A John Wiley & Son Publication