Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology
Master of Engineering Semester I
(Electrical Power System)
With effect from Academic Year 2017-18 (CBCS)

Subject Code: MEEE106-N-A	Subject Title: Advanced Power System Protection (Major Elective)
Pre-requisite	

A. Course Objective:

- This course aims to upgrade the knowledge and skills of practicing engineers and technologies involved in the protection of power system.
- To address the underlying concepts behind Advanced Power System protection

Teaching scheme				Total Credit	Evaluation Scheme						
					Theory		IE Marks	CIA Marks	Pract. Marks	Total Marks	
L	**T**	**P**	**Total**		**Hrs**	**Marks**					
Hrs	**Hrs**	**Hrs**	**Hrs**								
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	**Basic Elements of Digital Protection**	**12**
2	**Relay coordination of Interconnected Power**	**10**
3	**Reclosing and Synchronizing**	**26**
4	**Concept of Different Relay Algorithms**	**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	**Basic Elements of Digital Protection:** Application of Numerical relays for Interconnected power system networks, Basic Components of a Digital Relay, Signal Conditioning Subsystems, Transducers ,Surge Protection Circuits, Analogue Filtering, Analogue Multiplexers, Conversion Subsystem, The Sampling Theorem, Signal Aliasing Error, Sample and Hold Circuit, Digital Multiplexing ,Digital-to-Analogue Conversion, Analogue-to-DigitalConversion ,Digital Relay Subsystem, Benefits of digital relays.	12	25
2	**Relay coordination of Interconnected Power System:** Protection of an interconnected system, Link net structure, Flowchart of primary/Backup relay pairs, Flowchart of Time Multiplier Setting. Examples based on existing power system network.	10	20
3	**Reclosing and Synchronizing:** Introduction, Reclosing Precautions, Reclosing System Consideration, One-Shot vs. Multiple-Shot Reclosing Relays, Selective Reclosing, Deionizing Times for Three-Pole Reclosing, Live-Line/Dead-Bus, Live-Bus/Dead-Line Control, Instantaneous-Trip Lockout, Intermediate Lockout, Factors Governing Application of Reclosing Considerations for Applications of Reclosing , Feeders with No-Fault-Power Back-Feed and Minimum Motor Load, Single Ties to Industrial Plants with Local Generation, Lines with Sources at Both Ends, Reclosing Relays and Their Operation, Review of Breaker Operation, Single-Shot Reclosing Relays, Multishot Reclosing Relays, Synchronism Check, Phasing Voltage Synchronism Check Characteristic, Angular Synchronism.	26	30
4	**Concept of Different Relay Algorithms** Introduction of different techniques, Least square based methods, Introduction, Integral LSQ fit, Power series LSQ fit, Differential equation based techniques, Basic principles, and Digital harmonic filtering by selected limits, Fourier analysis based techniques, Introduction, The full cycle window algorithm, The half cycle window algorithm.	12	25
	Total	60	100

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 identify and appreciate concepts of different types of relaying algorithm and numerical relaying.

- Student should be able to implement different protection techniques through simulation in power system.

E. Text Books & Reference Books:

- Digital Protection- L P. Singh
- Protective Relaying Theory and Applications, Walter A. Elmore, Marcel Dekker Inc; New York
- "Protecting Relaying," Marcel Dekker Inc; New York, 1998- J. L. Blackburn
- "Power System Relaying," John Wiley & Sons, NewYork, 1996- S. H. Horowitz and A. G. Phadke
- Power System Protection, IEEE Press, Wiley Interscience, A John Wiley & Sons Inc; New York, 1999- P. M. Anderson