

**VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA**  
**Department of Electrical Engineering**  
**Lesson Plan**

**Subject: COMPUTER AIDED POWER SYSTEM PROTECTION**

**Credit : 3-1-0**

**Faculty Member: Dr. Papia Ray**

**Semester: 2<sup>nd</sup> Sem M.Tech (Power System Engineering)**

**Course Objective:** The course is intended for post-graduate students in electric power engineering, for researchers in the field, or for anyone who wishes to understand this new development in the role of a potential user or manufacturer of computer relays.

Class No	Topics	No. Of Classes
<b>MODULE- 1</b>		
1	Introduction To Computer Relaying: Development of computer relaying, Historical background	10
2	Expected benefits of computer relaying, Computer relay architecture	
3	Analog to digital converter, Anti-aliasing filter	
4	Substation computer hierarchy	
5	Relaying Practices: Introduction to protection systems	
6	Functions of a protection system, Protection of transmission lines	
7	Transformer	
8	Reactor & generator protection	
9	Bus protection	
10	Performance of current & voltage transformers	
<b>MODULE-2</b>		
11	Mathematical Basis For Protective Relaying Algorithms: Introduction, Fourier series	10
12	Other orthogonal expansion, Fourier transform	
13	Use of Fourier transform, Discrete Fourier transform	
14	Introduction to probability & random processes, Random processes, Kalman filtering.	
15	Transmission Line Relaying: Introduction, Sources of error	
16	Relaying as parameter estimation, Beyond parameter estimation	
17	Symmetrical component distance relay	
18	Protection of series compensated lines.	
19	Contd.	
20	Problems solving on Fourier Transform	
<b>MODULE-3</b>		
21	Protection Of Transformers, Machines & Buses: Introduction	
22	Power transformer algorithms	
23	Generator protection	

24	Motor protection, Digital bus protection	10
25	Hardware Organization In Integrated Systems: The nature of hardware issues, Computers for relaying	
26	The substation environment, Industry environmental standards	
27	Countermeasures against EMI, Supplementary equipment	
28	Redundancy & backup, Servicing,	
29	Training & maintenance	
30	Contd.	
<b>MODULE-4</b>		
31	System Relaying & Control: Introduction	10
32		
33	Measurement of frequency & phase, Sampling clock synchronization	
34	Application of phasor measurements to state estimation	
35	Phasor measurement in dynamic state estimation, Monitoring	
36	Developments In New Relaying Principles: Introduction	
37	Traveling waves on single-phase lines, Traveling waves on three-phase lines, Traveling waves due to faults	
38	Directional wave relays, Traveling wave distance relay	
39	Differential relaying with phasors, Traveling wave differential relays	
40	Adaptive relaying, Examples of adaptive relaying	

## BOOKS

[1]. A.G. Phadke and J.S. Thorp, "*Computer Relaying for Power Systems*", John Wiley and Sons, 1994.

[2]. Stanley H. Horowitz and Arun G. Phadke, "*Power System Relaying*", Research Studies Press Ltd., England. J.L. Blackburn, "*Protective, Relaying*", Marcel Dekker, Inc., 1987.

**Signature of the Faculty**

**Signature of the H.O.D**