Department of Electrical and Electronics

Number of programmes where syllabus revision was carried out

SL. NO.	COURSE CODE	COURSE OFFERED
1	SEE1302	Power System Analysis

SEE1302	POWER SYSTEM ANALYSIS	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVES

- To impart knowledge in modelling of power system elements
- To implement Numerical methods in power flow problem
- To analyze the system in various faulted conditions.
- To have a knowledge in stability and security of power systems

UNIT 1 POWER SYSTEM MODELING **14 Hrs.**

Need for system analysis in planning and operation of power system - per phase analysis of symmetrical three-phase system. General aspects relating to power flow, short circuit and stability analysis - Modeling of generator, load, shunt capacitor, transmission line, shunt reactor for short circuit, power flow and stability studies -per unit representation - bus admittance by analytical method and direct inspection method.

UNIT 2 POWER FLOW ANALYSIS **10 Hrs.**

Problem definition - bus classification - derivation of power flow equation - solution by Gauss Seidel and Newton Raphson methods by polar form - P V bus adjustments for both methods - computation of slack bus power, line flow and transmission loss.

UNIT 3 SYMMETRICAL SHORT CIRCUIT ANALYSIS **12 Hrs.**

Need for short circuit study - Bus impedance matrix formation - Symmetrical short circuit analysis using Z-bus. - computations of short circuit capacity, post fault voltage and current.

UNIT 4 UNSYMMETRICAL SHORT CIRCUIT ANALYSIS **12 Hrs.**

Symmetrical component transformation - sequence impedances.- Sequence Networks - unsymmetrical short circuit analysis for single line fault, line to line fault and double line to ground fault using Z-bus - computations of short circuit capacity, post fault voltage and current.

UNIT 5 STABILITY & SECURITY ANALYSIS **12 Hrs.**

Distinction between steady state and transient state - Concepts of Stability & Security - Swing equation-solution to swing equation - step by step method - power angle equation - equal area criterion - critical clearing angle and time. Stability analysis of single machine connected to infinite bus by modified Euler's method - Multi-machine stability analysis using Runge Kutta method.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Model Impedance, Reactance networks and develop bus admittance matrix.
CO2 - Examine load flow in a power grid using bus admittance matrix.
CO3 - Examine fault currents and post fault voltages in symmetrical short circuit using bus impedance matrix.
CO4 - Estimate fault currents and post fault voltages in unsymmetrical short circuit using symmetrical components.
CO5 - Evaluate the stability conditions in power grid for minor and major disturbances.
CO6 - Develop the mathematical solution for achieving stability in power grid during transient state.

TEXT / REFERENCE BOOKS

1. John J. Grainger and Stevenson Jr. W.D., "Power System Analysis", Tata McGraw Hill, 2017.
3. Kothari .D.P and Nagarath .I.J,, "Power system Engineering", 2nd Edition, Tata McGraw Hill, 2011.
4. Stagg, G.W. and El-Abaid, A. H. "Computer Methods in Power System Analysis", McGraw-Hill International Book Company, 1994.
5. Nagarath, I.J., and Kothari, D.P., "Modern Power System Analysis", 4th Edition, Tata McGraw Hill Publishing Company, 2011.
6. Hadi Saadat, "Power system Analysis", Tata McGraw Hill Publishing Company,3rd Edition, 2011.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 80 **Exam Duration: 3 Hrs.**

PART A: 10 questions of 2 marks each - No choice **20 Marks**

PART B: 2 questions from each unit of internal choice, each carrying 12 marks **60 Marks**