

Professional Elective III
EE4103PE: Power System Operation and Control

B.Tech. IV Year I Sem.

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Pre-requisites: Power System-I, Power System-II

Course Objectives:

- To understand real power control and operation
- To know the importance of frequency control
- To analyze different methods to control reactive power
- To understand unit commitment problem and importance of economic load dispatch
- To understand real time control of power systems

Course Outcomes: At the end of the course the student will be able to:

- Examine the operation and control of power systems.
- Inspect various functions of Energy Management System (EMS) functions.
- Analyze the model of speed governing system and control of two area and single area systems
- Test the stability of the power system
- Apply the concept of energy control centre

UNIT- 1: Load Flow Studies

Introduction, Bus classification -Nodal admittance matrix - Load flow equations - Iterative methods - Gauss and Gauss Seidel Methods, Newton- Raphson Method - Fast Decoupled method-Merits and demerits of the above methods-System data for load flow study.

UNIT-II: Economic Operation of Power Systems Distribution of load between units within a plant- Transmission loss as a function of plant generation, Calculation of loss coefficients-Distribution of load between plants.

UNIT-III: Load Frequency Control

Introduction, load frequency problem-Megawatt frequency (or P-f) control channel, MVAR voltages (or Q-V) control channel-Dynamic interaction between P-f and Q-V loops. Mathematical model of speed governing system-Turbine models, division of power system into control areas, P-f control of single control area (the uncontrolled and controlled cases)- P-f control of two area systems (the uncontrolled cases and controlled cases)

UNIT-IV: Power System Stability

The stability problem-Steady state stability, transient stability and Dynamic stability-Swing equation. Equal area criterion of stability-Applications of Equal area criterion, Step by step solution of swing equation-Factors affecting transient stability, Methods to improve steady state and Transient stability, Introduction to voltage stability .

UNIT-V: Electrical Installations

Need of computer control of powersystems. Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and control. System hardware configuration - SCADA and EMS functions. Network topology

TEXT BOOKS

1. C. L. Wadhwa, Electrical Power Systems, 3rd Edn, New Age International Publishing Co., 2001.
2. D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, 4th Edn, TataMcGraw Hill Education Private Limited 2011.

REFERENCE BOOKS:

1. D. P. Kothari: Modern Power System Analysis-Tata Mc Graw Hill Pub. Co. 2003.
2. Hadi Sadat: Power System Analysis -Tata Mc Graw Hill Pub. Co. 2002.