

## POWER SYSTEM OPERATION AND CONTROL

### III Year B.Tech. II-Sem

Course Code	Category	Hours/ Week			Credits	Maximum Marks		
23EE602	Core	L	T	P	3	CIE	SEE	TOTAL
		3	0	0		40	60	100
Contact Classes: 48	Tutorial Classes: 0	Practical Classes: Nil			Total Classes: 48			

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

#### Course Objectives:

- Understand the principles and significance of real power control, emphasizing the importance of frequency control in power systems.
- Analyze various methods for effective reactive power control in power systems.
- Grasp the concepts of unit commitment, economic load dispatch, and real-time control, highlighting their importance in power system operation.

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

- Understand operation and control of power systems.
- Analyze various functions of EMS functions and stability of machines.
- Understand power system deregulation and restructuring
- Analyze whether the machine is in stable or unstable position.
- Test the stability of the power system.

#### UNIT I

**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

**PF 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 Computer Control of Power Systems:** Need of computer control of power systems. 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 – Importance of Load Forecasting and simple techniques of forecasting

#### TEXT BOOKS:

- C. L. Wadhwa, Electrical Power Systems, 3rd Edn, New Age International Publishing Co., 2001.
- D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, 4th Edn, Tata McGraw 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.