

4/4 B.Tech. SEVENTH SEMESTER

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| EE7T1 | POWER SYSTEM OPERATION AND CONTROL | Credits: 3 |
| Lecture: 3 periods/week | | Internal assessment: 30 marks |
| Tutorial: 1 period /week | | Semester end examination: 70 marks |

Course Objective:

This subject deals with economic operation of power systems, hydrothermal scheduling, modeling of turbines, generators and automatic controllers. It emphasizes on single area and two area load frequency control and reactive power control.

Course Outcomes:

After completing the course the student shall be able to

1. Explain the functional content of economic load dispatch and load frequency control
2. Create simple architectures for simple area load frequency control and two area load frequency control
3. Understand importance of reactive power compensation
4. Exhibit knowledge of emerging trends in systems used for power system operation and control.

Unit I**Economic Operation of Power Systems**

Optimal operation of generators in thermal power stations, heat rate curve, cost curve, incremental fuel and production costs, input-output characteristics of steam unit, optimum generation allocation with line losses neglected. Optimum generation allocation including the effect of transmission line losses, loss coefficients, general transmission line loss formula.

Unit II**Hydrothermal Scheduling**

Optimal scheduling of hydrothermal system, hydroelectric power plant models, types of scheduling problems, short term hydrothermal scheduling problem.

Unit III**Load Frequency Control**

Modeling of speed governing system, steam turbine, hydro turbine and generator. Necessity of keeping frequency constant, definitions of control area, single area control, block diagram representation of an isolated power system, steady state analysis, dynamic response, proportional plus integral control of single area and its block diagram representation, steady state response. Load frequency control of 2- area system, tie-line bias control, comparison between load frequency control and economic dispatch control.

Unit IV**Power factor and Voltage Control**

Causes of low p.f, methods of improving p.f, static capacitor and synchronous condensers, phase advancers, most economical p.f. for constant KW load and constant KVA type loads, voltage control, shunt capacitors, series capacitors and their location in the power system, numerical problems.

Unit V**Reactive Power Control**

Overview of reactive power control, reactive power compensation in transmission systems, advantages and disadvantages of different types of compensating equipment for transmission systems, load compensation, specifications of load compensator, uncompensated and compensated transmission lines, shunt and series compensation.

Learning Resources

Text Books:

1. Power system stability and control by Prabha Kundur TMH Publishers
2. Modern Power System Analysis by I.J.Nagrath & D.P.Kothari TMH Publishers, 2nd edition.
3. Generation of electrical energy by B. R. Gupta , S. Chand and Company.

Reference Books:

1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., Thomson Publishers, 3rd Edition.
2. Electric Energy systems Theory by O.I.Elgerd, TMH Publishers, Second edition.
3. Power System Analysis by Grainger and Stevenson, TMH Publishers.
4. Power System Analysis by Hadi Saadat, TMH Publishers.