EEPC3004 POWER SYSTEM - II (3-0-0)

Course Learning Objectives: This course will enable students to:

- Impact knowledge on need for operational studies, and To model the power system under steady state operating condition.
- Understand and apply iterative techniques for power flow analysis.
- Understand power system economics fundamentals and generation allocation
- Understand automatic generation control in power system
- Model of carry out short circuit studies for power system during symmetrical and fault
- Study about the various methods for analyzing power system stability

Module I (7 Hours)

Load Flow Studies: Representation of Power Systems Components, ComplexPower, Concept of real and reactive powers, Per-Unit System, Single Line or One Line Diagram and Reactance Diagrams, Formation of Y-bus matrix, Z-Bus Matrix, Network model formulation, Load flow problem, Gauss Siedel and Newton Raphson method for power flow, fast decoupled load flow, Regulating Transformer.

Module II (6 Hours)

Economic Operation of Power System: Formulation of economic dispatch problem, I/O cost characterization, Incremental cost curve, Coordination equations without and with loss (No derivation of loss coefficients), Solution by Direct method and λ-iteration method, Statement of unit commitment problem, Priority-list method.

Module III (6 Hours)

Automatic Generation Control: P-F versus Q-V control, Load frequency control(single Area), Turbine speed governing system, Modeling of Speed Governing system, Turbine, Generator, Steady states analysis, dynamic response, control Area, Load frequency control and economic dispatch, Two area load frequency control.

Module IV (6 Hours)

Fault Analysis : Symmetrical Faults on 3-phase system, Transient on a transmission line, Synchronous machine (no load and load),Short circuit current and MVA, Symmetrical Component transformation (positive, negative and zero sequences), Representation of generators, lines and transformers in sequence networks, Unsymmetrical fault analysis- LG, LL, LLG, Open conductor fault

Module V (5 Hours)

Power system stability: Power angle equation, steady state stability, transient stability, equal area criterion, factor affecting transient stability

Course Outcomes (CO): On completion of this course, students are able to:

CO1. Compute load flow solution by using different techniques.
CO2. Determine the economical load distribution between the generating station without and with transmission losses.
CO3. Analyze automatic generation control schemes in single and two area power system.
CO4. Evaluate Fault currents for symmetrical and unsymmetrical types of fault.
CO5. Understand concept of power system stability

Text Book(s):

1. J. J. Grainger and W. D. Stevenson, Power System Analysis. New York, NY, USA: McGraw-Hill Education, 1994.
2. C. L. Wadhwa, Electrical Power Systems, 6th ed. New Delhi, India: New Age International Publishers, 2010.
3. D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, 4th ed. New Delhi, India: McGraw-Hill Education, 2011.

Reference Book(s):

1. O. I. Elgerd, Electric Energy Systems Theory. New York, NY, USA: McGraw-Hill Education, 1995.
2. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake, and G. Strbac, Electric Power Systems, 5th ed. Hoboken, NJ, USA: Wiley, 2012.
3. R. D. Bergen and V. Vittal, Power System Analysis. Upper Saddle River, NJ, USA: Pearson Education Inc., 1999.
4. M. L. Soni, P. V. Gupta, U. S. Bhatnagar, & A. Chakrabarti, “A Textbook on Power System Engineering”, Dhanpat Rai & Co.,1998.
5. NPTEL - https://nptel.ac.in/courses/108/105/108105067/