POWER SYSTEM STABILITY

Course Code: 15EE2107 **L P C**
3 0 3

Pre requisites: Power system operation and control, Electrical Machines

Course Outcome: At the end of the course, the student will be able to
CO1: Understand and classify power system stability and analyze single machine connected to Infinite bus system.
CO2: Analyze response to small disturbances.
CO3: Apply Park's transformation to model synchronous machine.
CO4: Assess the excitation systems.
CO5: Analyze voltage stability

UNIT I (10-Lectures)
Definition of stability, Classification of stability, Rotor angle stability, frequency stability, voltage stability, mid-term and long-term stability, elementary model, swing equation, power angle equations, Natural frequency of oscillations, single machine infinite bus system, equal area criterion, classical model of multi machines system.

UNIT II (10-Lectures)
Response to small disturbances: The unregulated synchronous machine, modes of oscillations of an unregulated multi machine system, regulated synchronous machine, Distribution of power impacts.

UNIT III (10-Lectures)
Synchronous Machine: Parks transformation, Flux Linkage Equations, voltage equations, equivalent circuit of synchronous machine, the flux linkage state-space model- voltage equations, torque equation.

UNIT IV (10-Lectures)

Excitation Systems: Simplified view of excitation control, control configuration, Typical Excitation configurations- primitive systems, excitation control systems with alternator and with compound, Voltage regulators. Computer representation of excitation systems-Types

UNIT V (10-Lectures)

Effect of Excitation on Stability: Effect of excitation on - Power limits, Transient stability, Dynamic stability. Approximate excitation system representation, supplementary stabilizing signals, block diagram of a simplified model of a complete system.

Voltage Stability: Introduction, Comparison of angle and voltage stability, reactive power flow and voltage collapse, mathematical formulation, voltage stability analysis, prevention of voltage collapse.

TEXT BOOKS

1. P.M. Anderson and A.A.Foud, "Power system control and stability", second edition, Wiley Inter –science publications.
2. D.P.Kothari and I.J.Nagrath, "Modern Power System Analysis", third edition, TMH Publications, 2003.

REFERENCES

1. K. R. Padiyar, "Power System Dynamics Stability and control", Second Edition, B. S. Publications, 2008.
2. M.A. Pai, "Power System Stability – Analysis by the direct method of Lyapunov", North Holland Publishing Company, Newyork, 1981.
3. Edward Wilson Kimbark, "Power System stability: Synchronous Machines", Dover publications Inc., New York.