Power System Stability and Control - Web course

COURSE OUTLINE

Introduction to power system stability problems

Definition of stability, classification of stability, Rotor angle stability, frequency stability, voltage stability, mid-term and long-term stability, classical representation of synchronous machine in a single machine infinite bus system (SMIB), equal area criterion to asses stability of a SMIB system, limitations of classical model of synchronous machines.

Modeling of power system components for stability analysis

Synchronous machine modeling: sub-transient model, two axis model, one axis (flux decay) model, classical model. Excitation systems modeling: DC excitation, AC excitation and static excitation. Prime mover and energy supply systems modeling. Transmission line modeling, load modeling. Methods of representing synchronous machines in stability analysis.

Small signal stability

Fundamental concepts, state space representation, Modal analysis: eigen properties, participation factors, stability assessment. Effects of excitation system on stability, power system stabilizer and its design, Angle and voltage stability of multi-machine power systems and phenomenon of sub synchronous resonance.

Transient stability

Fundamentals of transient stability, numerical solutions: simultaneous implicit and partitioned explicit methods, simulation of dynamic response, analysis of unbalanced faults, direct method of transient stability, transient energy function method, Methods of improving transient stability.

Voltage stability

Classification of voltage stability, modeling requirements, voltage stability analysis: static and dynamic, sensitivity analysis, modal analysis, voltage collapse, prevention of

NP-TEL

NPTEL

http://nptel.iitm.ac.in

Electrical Engineering

Pre-requisites:

1. Power system analysis.
2. Electric Machines.

Coordinators:

Dr. B. Kalyan Kumar
Department of Electrical EngineeringIIT Madras

voltage collapse

COURSE DETAIL

Sl. No	Topic	No. of Hours
1	Introduction to power system stability problems.	04
2	Synchronous machine modeling.	10
3	Turbine governor, exciter and load modeling.	08
4	Small signal stability analysis- state space representation, modal analysis.	08
5	Power system stabilizer and its design.	04
6	Transient stability analysis - numerical solutions: simultaneous implicit and partitioned explicit methods, simulation of dynamic response.	06
7	Analysis of unbalanced faults, direct method of transient stability, transient energy function method.	06
8	Phenomenon of sub synchronous resonance, improving transient stability.	04
9	Classification of voltage stability, modeling requirements, voltage stability analysis, voltage collapse and its prevention	06
	Total	**56**

References:

1. “Power system stability and control”, P. Kundur, Tata-McGraw Hill.

2. “Power system dynamics”, K. R. Padiyar, BSP publications.

3. “Power system stability”, M. A. Pai and Peter W. Sauer, Pearson Education.

4. “Topics on small signal stability analysis”, M. A. Pai, K. Sen gupta and K. R. Padiyar, Tata-McGraw hills.

5. “Power system stability”, Paul M. Anderson and A. A. Fouad, Wiley-interscience.