Power System Dynamics and Voltage Stability

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Lectures (20 minute video clip for each 50 minutes lecture)

Power System Dynamics:

- L2: Small signal model, and PSS Design for OMIB.
- L3: Multi-machine power system model.
- L4: State space analysis and design of PSS for multi-machine systems.

Voltage Stability:

- L1: Introduction to voltage stability.
- L2: Power flow calculation near the nose point.
- L3: Voltage stability indices.
- L4: Influence of dynamic loads on voltage stability.
The course material for the two modules are taken from two of my graduate courses at the University of Manitoba:

1. Power System Analysis (ECE 7070)
2. Power System Control (ECE 7890)
Self Assessment Questions: 4-5 questions and answers per lesson

Self Assessment Questions help students test their understanding before moving on to the next section.

Example 1
What is the advantage of dq transformation?

Example 2
What does the nose point of P-V curve tell you?
Homework Problems on Power System Dynamics (two problems for each lecture)

Power System Dynamics:
- L1: Calculation of Initial Conditions.
- L1: Per unit calculation.
- L2: Sensitivity study.
- L2: Design of a PSS.
- L3: Develop device matrices for a synchronous machine.
- L3: Exercise on developing a state space model when the device matrices are given.
- L4: A case study on understanding power oscillations.
- L4: Sequential design of PSS.
Homework Problems on Voltage Stability (two problems for each lecture)

Voltage Stability:

- L1: Generate PV curves for a radial power system
- L1: Create a case to demonstrate voltage instability under an n-1 contingency
- L2: Generate PV curves for a meshed network
- L2: Computation of voltage sensitivities.
- L4: A case study on identifying a suitable location for reactive power compensation.
- L4: Multiple choice questions on voltage stability
Resources

- Matlab .m files necessary for the homework problems
- Example cases in different formats
  - PSSE
  - DSA Power Tools
  - PSCAD
  - RSCAD
- Worked solutions to selected homework problems
- Computer program to help students write their own models (under development)