N25A500 - SIMULATION OF POWER SYSTEM DEVICES

2011 Catalog Data:  Prerequisite Courses: Electric circuit, Power system analysis

Textbook:  Dynamic Simulation of Electric Machinery Using MATLAB/SIMULINK
Author: Chee-Mun Ong

Reference:  none

Teaching assistant:  TBA

Course Objectives:
1. To understand and be able to model the devices in the AC networks
2. To gain proficiency working in analyzing the power system devices
3. To understand the operation and control of power system devices

Prerequisites by topic:
1. Three phase power flow
2. Basic per unit system
3. Electric machinery

Typical topics:
1. Introduction  1 week
   - Creating a SIMULINK simulation
2. Basics of magnetic and transmission line modeling  3 weeks
   - Lumpd parameter circuit models
   - Simulation of single phase line
   - Project assignment
3. Transformers  3 weeks
   - Model of a Two-winding Transformer
   - Simulation of a Two-Winding Transformer
   - Terminal conditions
   - Core saturation effect
   - Three phase connections
   - Project assignment
4. Basics of Electric Machines and Transformation  2 weeks
   - Three phase transformation
   - dq0 transformation applied on line elements
   - Space vectors and transformations
   - Project assignment
5. Three-Phase Induction Machine  3 weeks
   - Circuit model of a three-phase induction machine
   - dq0 stationary and synchronous reference frame
   - Simulation of an induction machine in the stationary reference frame
   - Project assignment
6. Control of Induction Machine  2 weeks
   - Speed control
   - Constant Volt/Hertz operation
   - Field-oriented control
   - Project assignment
7. Synchronous machines  2 weeks
   - Math model
   - Simulation of three-phase synchronous machines
   - Project assignment
6. Synchronous machines in power systems and drives  2 weeks
Typical Methods for Evaluating Student Performance:
1. Homework (70%)
2. Demo (20%)
3. Attendance (10%)

Computer Usage:
MATLAB will be routinely required for solution of homework problems.

Laboratory projects (including major items of equipment and instrumentation used):
none

Contribution of course to meeting the professional component:
Engineering topics: 3 credits
100% engineering science

Relationship of course to program outcomes:
Outcome 1: Ability to apply knowledge of math, science and engineering to solve problems.
Outcome 6: Proficiency in the use of computers and other modern tools to solve engineering problems.

Prepared by: Le-Ren Chang-Chien  Date: 7/11/2011