Power System Reliability Analysis

Lecture 1, 2 Sept 3, Sept 8
  Introduction, Basic Probability Concepts.
  Probability Calculation Rules.
  Random Variable and its Distribution.
  The hazard function in Reliability Analysis.

Reading: ISU Course materials on Web, chapters U5, U6, and U7

Lectures 3, 4 Sept 10, 15
  Outage Models of System Components.

Reading: ISU Course materials on Web, ch U11

Lectures 5, 6 Sept 17, 22
  Elements of Monte Carlo Simulation.
  General Concept.
  Random Number Generators.
  Inverse Transform Method of Generating Random Variates.
  Latin Hypercube Sampling

Reading: Read See materials in Monte Carlos Analysis section of Notes Link

Lecture 7, 8 Sept 24, 29
  Techniques used in Generation-Demand Systems
  Loss of Load Probability

Lectures 9, 10 Oct 1, 6
  Techniques used in Substation Configurations

Lecture 11, 12 Oct 8, 13
  Techniques used in Composite Generation and Transmission Systems.

Lecture 13, 14 Oct 15, 20
  Techniques used in Distribution Systems

Mid Term Exam October 22

Power System Production Cost Computations

Lectures 15, 16 Oct 27, 29
Based on Chapter 8 Wood Wolleneberg 2nd Edition
Introduction
  8.2 Uses and Types of Production Cost Programs
  8.2.1 Production Costing Using Load-Duration Curves
  8.2.2 Outages Considered
Probabilistic Production Cost Programs

8.3.1  Probabilistic Production Cost Computations
8.3.2  Simulating Economic Scheduling with the Unserved Load Method
8.3.3  The Expected Cost Method
8.3.4  A Discussion of Some Practical Problems

Lecture 19 Nov 10
Sample Computation and Exercise
8.4.1  No Forced Outages
8.4.2  Forced Outages Included

Lecture 20 Nov 12
Production Cost using Monte Carlo Methods

Short-Term Demand Forecasting

Based on Chapter 12 of “Power Generation Operation and Control” Wood, Wollenberg, and Sheble.

Lectures 21, 22 Nov 17, 19
12.1  Perspective
12.2  Analytic Methods
12.3  Demand Models

Lectures 23, 24 Nov 17, 19
12.5  Forecasting Errors
12.6  System Identification

Lectures 25, 26 Nov 24, 26
12.7  Econometric Models
12.7.1  Linear Environmental Model
12.7.2  Weather-Sensitive Models

Lectures 27, 28 Dec 1, 3
12.8  Time Series
12.8.1  Time Series Models Seasonal Component
12.8.2  Auto-Regressive (AR)
12.8.3  Moving Average (MA)
12.8.4  Auto-Regressive Moving Average (ARMA): Box-Jenkins
12.8.5  Auto-Regressive Integrated Moving-Average (ARIMA): Box-Jenkins

Lectures 29, 30 Dec 8, 10
12.9  Time Series Model Development
12.9.1  Base Demand Models
12.9.2  Trend Models
12.9.3  Linear Regression Method
12.9.4  Seasonal Models
FINAL EXAM  December 15, 2014 4-6PM

Text: Singh & Billinton, System Reliability Modelling and Evaluation, provided as PDF files on class web page


Grades based on Quiz 1, Final Exam, Homework and Major Projects weighted as follows:

Quiz 1: 15%
Final Exam: 30%
Homework: 15%
Major Projects 40% (10% each project)

Office Hours:
Professor Wollenberg’s Office Hours: Room 5-113, 11:00-12:00 Mon & Tues, 1:00-2:00 Wed, You may stop in any time and I will do my best to accommodate you. Phone 612 626 7192, email: wollenbe@umn.edu

Homework:
Homework problems will be assigned on an irregular basis, look in the web page each week

Major Projects:
Four Major Projects will be assigned during the semester. You will need to be able to wrote Matlab programs to solve these projects. These projects are given two to three weeks for completion. See course schedule above for starting and hand in dates.

Course Web page:
The course web page is located at  www.ece.umn.edu/class/ee5725
Material will be available as PDF files which can be downloaded from the web page. In addition to the syllabus, the web page will give homework assignments, and any special exam instructions. We shall also attempt to present a set of links of interest to students taking the course such as electric power industry reports, government reports and news articles.

Statement on Academic Honesty
Academic integrity is essential to a positive teaching and learning environment. All students enrolled in University courses are expected to complete coursework responsibilities with fairness and honesty. Failure to do so by seeking unfair advantage
over others or misrepresenting someone else’s work as your own, can result in disciplinary action. The University Student Conduct Code defines scholastic dishonesty as follows:

Scholastic Dishonesty: Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering forging , or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis.

Within this course, a student responsible for scholastic dishonesty can be assigned a penalty up to and including an "F" or "N" for the course. If you have any questions regarding the expectations for a specific assignment or exam, ask.

Disruptive Classroom Conduct. Disruptive classroom conduct means engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities. (from the University Conduct Code).

In Professor Wollenberg’s classes the following will be treated as disruptive conduct:

- Use of cell phones
- Use of personal laptop computers. Laptop computers should not be opened in class. If you regularly use a Tablet PC for notes please speak to Professor Wollenberg.
- Standing up, leaving the classroom and then reentering the classroom
- Talking to other students during lectures
- Eating and drinking during the class
- Reading materials such as newspapers, magazines, etc. during class

Students who disrupt the class will be asked to leave.