EE 523– Power System II
University of North Dakota
Fall 2014

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Prerequisite: EE 423 – Electric Power Systems Analysis and Control

Prerequisite by topic: Three-phase circuits; Complex power; Generator and transformer
model; Power Flow; System response and stability; Voltage and
frequency control; Computer Methods in system analysis.

Authors: Hadi Saadat
ISBN: 978-0-9845438-0-9
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Access to Power System Simulator software –Homework
assignments will be completed using either Power World-Ver.18,
which can be downloaded at http://www.powerworld.com/
or PSS®E by SIEMENS, which the educational version is

Tutorial assistance and a number of other study aids are included.

All types of calculators are authorized.

Access to Blackboard

Course Description:

This course is designed to introduce the student to the concepts of stability and control in
power system. At the end of the course, the students should be able to:
1- Analyze the steady state and transient performance of the power system
components.
2- Analyze the stability of the system.
3- Identify what control action should be taken to improve the stability and
reliability of the network
Learning Objectives:

1- Modeling and transient analysis of synchronous machine, balanced and unbalanced short circuit analysis.
   a. Transient phenomena
   b. Synchronous machine transients
   c. Park transformation
   d. Balanced and unbalanced three-phase short circuits
2- Balanced Fault analysis
   a. Balanced three-phase faults
   b. Short circuit capacity
   c. Systematic fault analysis
3- Symmetrical Components and unbalanced fault
   a. Sequence impedances
   b. Line-line and line-ground faults
   c. Unbalanced fault analysis
4- Stability analysis
   a. Synchronous machine models for stability analysis
   b. Steady state and transient stability
5- Power system Control
   a. Load-frequency control
   b. Automatic generation Control (AGC)

Class Structure:

Class sessions will combine lecture, discussion, and problem solving. Some textbook problems will be used, so you will want to bring your textbook to class. You will also want to have a calculator with you. During most class sessions you will have an opportunity to solve problems on your own or in a small group to which you will be assigned. These problems are intended to enhance your understanding of the material, help you work through homework assignments, and provide examples of potential exam questions.

Expectations:

Students are expected to attend this course regularly, to make their best attempt to arrive at each class meeting on time, and to stay until the class is completed. Leaving class early, or leaving and returning to class, is disruptive and highly discouraged. Class attendance helps the student acquire knowledge and clarification. Material will be covered in class that may not be covered in the textbook. If you are not present, you are still responsible for all material covered and any changes that may have been made in assignments. Pertinent readings should be completed prior to class and you should come to class prepared for discussion. Reading in advance of class will enhance your ability to participate in class discussions and to benefit from in-class exercises. Out of courtesy to your fellow students, all cell phones, pagers, and electronic devices should be turned off.
or set to vibrate mode prior to class. Text messaging during class is not permitted. Violation of these policies will adversely impact your grade.

Power-point Slides for Class Lectures:

Power-point slides are available through Blackboard system for each chapter and also in my personal webpage at http://engineering.und.edu/electrical/faculty/arash-nejadpak/index.cfm
The slides include data for some examples that will be used to illustrate important concepts. You should find that your learning experience is enhanced by having a copy of the slides with you in class and it is your responsibility to download and print these documents.

Class Exercises/quiz:

There will be regular exercises and quizzes in the class. Those quizzes will be taken on a monthly basis and will help learning, especially with feedback. The given time to take the quiz will not exceeds 15 minute.

Group Projects:

You will be randomly assigned to a group and will work with that group throughout the term. Each group will turn in one “solution” and all group members who were present or participated will receive the same grade for that assignment. Only one submission will be accepted per group and each individual should write his/her name on the joint submission. The purpose of the group project is to help all students learn the material. If you are confident that you understand how to do a particular problem, help your fellow group members to understand it as well. Similarly, if you don’t understand how to do something on a group assignment, ask for help.

Homework Problems:

Homework problems will be completed and graded through Blackboard. Completion and understanding of the assigned problems are critical for you to successfully complete this course. Problems must be completed by the due date and no late or manual submissions will be accepted.

Examinations:

There will be two interim exams and a cumulative final exam. The interim exams will be given at the beginning of class and will last about 1 hour. If you arrive late for an exam, extra time will not be given. Exams will comprise problems similar in format to homework problems and class examples, conceptual questions, and questions/problems that require you to apply concepts to contexts similar (but not exactly the same) to the materials covered in class or in the homework problems. Students are allowed to use 1 page notes to remind the complicated formulas or algorithms during any exam. All
different types of calculators are allowed. Pen/pencils, and erasers are the only materials you may use during exams. Cell phones, PDAs, etc. will not be permitted as calculators or clock-substitutes during exams. If an examination is to be missed, the student must inform the instructor prior to the exam. The instructor will decide, based on the evidence provided, whether or not an absence is excused. Make-up exams will be permitted only in truly exceptional circumstances and generally only when prior arrangements have been made with the instructor. MAKE-UP EXAMS WILL NOT BE GIVEN WITHOUT PRIOR APPROVAL AND APPROPRIATE WRITTEN DOCUMENTATION. A COMMON MAKE-UP DATE MAY BE REQUIRED IF MULTIPLE STUDENTS HAVE EXCUSED ABSENCES.

Grading:

The following weights will be applied in the calculation of each student’s course grade:

Exam 1 50  
Exam 2 50  
Final Exam 100  
Quiz 20  
Homework 50  
*Project 30  

Total Possible Points 300

The University’s grading system includes pluses and minuses. Course averages will be translated into letter grades according to the following table:

- 90-100 A
- 75-89 B
- 60-74 C
- 50-59 D
- < 49 F

At the end of the semester, any necessary adjustments will be made to reflect the above allocation of points. Blackboard will not be altered to reflect these adjustments.

Extra Credit Problems, Projects, or Assignments:

There may not be extra credit problems, projects, or assignments. If you have concerns regarding your grade, please see me to determine what you need to do in order to improve your performance. Do not wait until the end of the semester to do this. Come to me early to enable us to develop a plan for your successful completion of this class.

Study Suggestions:

- There is a lot of material to cover in this course. I strongly recommend that you do not delay in studying for this course. Work hard from the start.
- Attend class, come prepared, and ask questions.
• I will not be able to cover everything in the class lecture, so reading the chapter and completing the exercises/problems will enhance your understanding of the material.
• There is no substitute for working through the homework assignments.
• Prepare well for each exam, be able to apply principles in varied settings, and avoid memorizing. Do not wait until the night before an exam to study.

Communication:

I will communicate with you periodically through Blackboard. E-mail sent in this fashion is delivered to your UND e-mail address. If you have specified another e-mail account to which your UND e-mail will be forwarded, please ensure that it is accurate and that you are receiving e-mails promptly. If a message I send bounces, I cannot easily determine if your UND account or alternate account has rejected the message. Therefore, it is essential that you maintain your e-mail account so that communication lines are operating properly. Students are responsible if they do not receive or review e-mail from the instructor in a timely manner. Also, when sending e-mail please be sure to identify the course you are communicating about and your name since the return e-mail address does not always readily identify you. I will be unable to respond to questions or issues raised in e-mail messages unless I know with whom I am communicating.
Important Dates:

Wednesday, August 27: First day of the Class
Monday, September 1st: Holiday-Labor Day
Wednesday, September 3rd: Last day to add/drop course without delay.
Friday, November 14: Last day to withdraw from the term or drop with record.
Friday, November 28: Holiday-Day after Thanksgiving

A withdrawal grade does not affect your GPA but does appear on your official transcript.

Chapters and Topics:

Week 1  Review-Power System Analysis
Week 2  Chapter 8: Modeling and transient analysis of synchronous machine
Week 3  Chapter 8: Synchronous machine transients
Week 4  Chapter 8: Balanced and unbalanced three-phase short circuits
Week 5  Chapter 9: Balanced three-phase faults and Short circuit capacity
Week 6  Exam 1
Week 7  Chapter 9: Systematic fault analysis
Week 8  Chapter 9: Symmetrical Components and unbalanced fault
Week 9  Chapter 10: Symmetrical Components and unbalanced fault
Week 10  Chapter 10: Sequence impedances
Week 11  Chapter 10: Line-line and line-ground faults
Week 12  Exam 2
Week 13  Chapter 10: Unbalanced fault analysis
Week 14  Chapter 11: Stability analysis
Week 15  Chapter 12: 1- Power system Control

Note: The above topical outline represents the broad course structure. Based on our progress during the semester, further materials may be added or some may be deleted at the instructor’s discretion. This schedule is subject to change.

Academic Honesty:

For moral reasons, and to protect the validity of grades, all academic work must be done by the student to whom it is assigned without any unauthorized assistance. Examinations will be designed and administered in a manner to discourage and detect cheating. Students who violate academic honesty will be subject to harsh penalties.

Plagiarism and cheating are considered serious violations of academic honesty and will not be tolerated. Penalties for cheating on exams or any assignments may include course failure and suspension or expulsion from the University. At minimum, if plagiarism or cheating is detected the affected graded element will receive a score of zero.

Students with Disabilities

If you have a documented disability that requires accommodations, you will need to register with Disability Services for Students (DSS) for coordination of your academic accommodations. The DSS office is located at McCannel Hall, Room 190

2891 2nd Ave. N. Stop 9040. DSS telephone number is 701-777-3425. Once you have your accommodations in place, I will be glad to meet with you privately during my office hours to discuss your special needs. Student Disability Services’ mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at University of North Dakota.

Note: In matters not explicitly covered in this syllabus, the established policies of the Department of Electrical Engineering and University of North Dakota will be followed.