ECE 488: Power System Engineering, Syllabus¹
Spring 2014

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Office Phone: 453-7036

Office Hours: Daily 01:00-02:00 or by appointment
Lecture: TR, 02:00-03:15 p.m., ENGR A-0320

Grading/Evaluation:
- Projects (4 or 5) 30%
- Mid-Term Exam 30%
- Final Exam 40%
  A (100-90), B (89-80), C (79-70), D (69-50), F (49-0).

Classroom Policies:
A. Late Homework/Missed Exams: Late homework is not accepted. If an exam is missed for a legitimate reason, a grade will be assigned based on the remaining homework/exams.

¹ Pages 2 and 3 are for ABET
1. **Course number and name**: ECE 488 Power System Engineering
2. **Credits and contact hours**: 4 credits, equivalent of 3 contact hours per week.
3. **Course Committee**: C.J. Hatziadoniu, Reza Ahmedi
5. **Specific course information**
   Power system stability.
   b. prerequisites or co-requisites: ECE 356, ECE 487
   c. indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program: None
   d. Professional Component {Credit Hours}
      Mathematics 0  Sciences 0  General Ed. 0
      Eng. Science 2  Eng. Design 2
6. **Instructional Objectives (with SO’s), ex. The student will be able to explain the significance of current research about a particular topic. (a, b, h)**
   Upon completion of the course, the students should be able to:
   1. Understand, interpret, and explain the output results of a standard load flow program. Apply the principles of economic dispatch to solve for the optimum generation allocation of a small power system. (c,k)
   2. Determine the balanced fault currents for a power transmission or distribution network. Determine the unbalanced fault currents for a power transmission or distribution network. (e, k)
   3. Understand the factors that affect power system stability. Apply the direct stability method to evaluate the stability of a two-area power network. Apply numerical methods to evaluate the first swing stability of a small power system. (c,e,k)
   4. Use Power World Simulator to simulate the transient stability of a two area power system. (k)
7. **Brief list of topics (class, lab and project) to be covered (with hours)**
   a. Classroom Topic (Hours)

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2 subject to change at the instructor’s discretion. Students are responsible for announcements made in class and on D2L.
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- Power System Faults and protection: Bus impedance matrix. Balanced three-phase fault, short circuit capacity. Symmetrical components, sequence impedances, sequence networks of generators, single and double line faults; protection devices, types of relays, coordination issues {12 classes}
- Optimal Dispatch of Generation: Nonlinear function optimization, constraint parameter optimization, Lagrange multipliers. Economic dispatch neglecting limits, economic dispatch neglecting losses, economic dispatch considering transmission losses, derivation of loss formula {5 classes}
- Power System Control: excitation systems, generator voltage regulation; frequency control, area control error, tie line power flows, multi-area load-frequency control {10 classes}
- Power System Stability: Rotor dynamics, the swing equation, the power-angle equation. Evaluating stability using the equal area criterion. Multi-machine studies. Numerical methods {10 classes}
- Transmission line transients: Switching events in power systems, over-voltages, switching events in transmission lines, lattice diagrams; application of surge arresters to protection, insulation coordination and protective devices.{8 classes}

C. Projects (Hours)
1. Computation of the fault currents in a multi-bus system 6
2. Economic dispatch 6
3. Two-bus power system transient stability
4. Transmission line transients

8. CAD and Computer Tools Used: Power World
9. Assessment of the Contribution to Student Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
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<td>Assessed</td>
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</table>

Student Outcomes (ABET criteria a-k) are quoted here:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

University Policies

A. **Incomplete Grades:** An *INC* is assigned when, for reasons beyond their control, students engaged in passing work are unable to complete all class assignments. An *INC* must be changed to a completed grade within a time period designated by the instructor but not to exceed one year from the close of the term in which the course was taken, or *graduation*, whichever occurs first. Should the student fail to complete the course within the time period designated, not to exceed one year, or graduation, whichever comes first, the incomplete will be converted to a grade of *F* and the grade will be computed in the student’s grade point average. Students should not reregister for courses in which an *INC* has been assigned with the intent of changing the *INC* grade. Re-registration will not prevent the *INC* from being changed to an *F*.

B. **Academic Integrity:** You are expected to submit your original work and adhere to the academic policies as stated in the SIU Student Conduct Code: [http://srr.siu.edu](http://srr.siu.edu) (listed under Additional Links). Any act of academic dishonesty, cheating, or plagiarism in any form, including anonymous internet sources used in student papers, will be reported. These acts are taken seriously and the consequences may range from failing as assignment to expulsion from the university.

C. **SIU Email:** Your SIU email account is an official form of University communication. Your instructor will use SIU email as a primary means of electronic communication with students. Please make sure that you maintain a valid password and acquire the habit of regularly checking your SIU email account for important instructor and University announcements. You may view the official SIU Student Email Policy at: [http://policies.siu.edu/policies/email.html](http://policies.siu.edu/policies/email.html).

D. **Emergency Procedures:** SIU is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with SIU Emergency response Plan and building Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings on campus, available on BERT’s website at [http://www.bert.siu.edu/](http://www.bert.siu.edu/), the SIU Department of Public Safety’s website [www.dps.siu.edu](http://www.dps.siu.edu) (disaster dropdown and video, “Shots Fired”), and in the Emergency Response Guideline pamphlet. Know how to respond to each type of emergency. Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. **It is important that you follow these**
instructions and stay with your instructor during an evacuation or sheltering emergency. The Building Emergency Response Team will provide assistance to your instructor in evacuating the building or sheltering within the facility.

E. **Supplementary Assistance:** SIU is committed to assisting students with disabilities. With the cooperation of SIU’s Disability Support Services (DSS), each student who qualifies for reasonable supplementary assistance has the right to receive it. Students requesting supplementary assistance must first register with DSS in Woody Hall, B-150, 618-453-5738 or 618-453-2293 (TTY), by email DSS@siu.edu, or http://disabilityservices.siu.edu/. Notice: If you have any type of special need(s) or disability for which you require accommodations to promote your learning in class, please contact me as soon as possible. The Office of Disability Support Services (DSS) offers various support services and can help you with special accommodations. You may wish to contact DSS to verify your eligibility and options for accommodations related to your special need(s) or disability.

Student Services

A. **Learning Support Services:** The Center for Learning Support Services (CLSS) assists students of all cultures, abilities, backgrounds and identities with enhancing their self-management and interdependent learning skills. Programs offered by CLSS include: group study sessions; math tutoring; academic coaching; early intervention program; and study skills seminars. For additional information please contact CLSS in Woody Hall, Room A-313, 618-453-2925, or www.tutoring.siu.edu.

B. **Writing Center:** The Writing Center offers free tutoring services and assistance with improving writing skills to all SIU undergraduate students and faculty. For center locations and hours, to schedule an appointment online, and to view information regarding the Online Writing Lab (OWL) contact the Writing Center at 618-453-1231 (Morris Library location); 618-453-2927 (Trueblood location), or www.write.siu.edu.

C. **Saluki Cares:** The purpose of Saluki Cares is to develop, facilitate and coordinate a university-wide program of care and support for students in any type of distress-physical, emotional, financial or personal. By working closely with faculty, staff, students and their families, SIU will continue to display a culture of care and demonstrate to our students and their families that they are an important part of the community. To make a referral to Saluki Cares click, call or send: http://salukicares.siu.edu/index.html; 618-453-5714, or siucares@siu.edu.