ECE 385 Syllabus
Fall 2014

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Office Hours: MWF 11:00-01:00 or by appointment.
Lecture: MWF, 10:00-10:50 am., ENGR A-0310
Labs: TR 14:00-15:50 ENGRE 0215

Grading/Evaluation:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>(30%)</td>
</tr>
<tr>
<td>Labs</td>
<td>(20%)</td>
</tr>
<tr>
<td>Mid Test</td>
<td>(20%)</td>
</tr>
<tr>
<td>Final Exam (comprehensive)</td>
<td>(30%)</td>
</tr>
</tbody>
</table>

Grading Scale: A: 100-90; B: 89-80; C: 79-70; D: 69-55; F: 54-0.

Classroom Policies:

A. Attendance Policy: Attendance is required. Attendance will be taken at random times (at least 7). A penalty of 5 grade point deduction for many absences.

B. D2L: Class material, announcements and assignments as well as assignment grades are posted on D2L. Students are responsible for all announcements made in class and/or posted to D2L.

C. Late Homework/Missed Exams: Late homework is not accepted without an excuse. If an exam is missed for a legitimate reason, a grade will be assigned based on the remaining homework/exams.

D. Academic Honesty: Plagiarized work will be punishable up-to a failing grade in the course and referral to the university. Copying on homework, projects or exams or cheating will also be punishable with a failing grade in the course and referral to the university.

E. Academic Standards: Project reports and homework submissions are official university documents that must be prepared with care so that they are legible, well organized and include adequate information so they can be evaluated. Projects must be typed including

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1 Pages 2 and 3 are for ABET
the equations and most of the figures. Substandard work will receive a failing grade up to zero.

1. **Course number and name**: ECE 385 Electromechanical Energy Conversion.

2. **Credits and contact hours**: 4 credits, three hours a week.

3. **Course Committee**: C.J. Hatziadoniu, Reza Ahmed.


   **References or other supplemental materials**: “Electrical Machines with MatLab” by Turan Goenen, 2nd Edition CRC Press (in reserve at the Morris Library).

5. **Specific course information**
   a. (Catalogue Description): Circuits in the sinusoidal steady state, phasors and impedance. Power in sinusoidal steady state. Three-phase circuits. Magnetic circuits and power transformers. AC machines: synchronous machines; synchronous motors; induction motors. Prerequisite: ECE 235 with a grade of C or better.
   
   b. indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program: None

   c. Professional Component {Credit Hours}
      Mathematics 0 Sciences 0 General Ed. 1
      Eng. Science 3 Eng. Design 1

6. **Instructional Objectives (with SO’s), ex. The student will be able to explain the significance of current research about a particular topic.**

   Upon completion of the course, the student should be able to:

   • Solve problems related to the sinusoidal steady state of electric circuits. (a,e)

   • Understand the laws of magnetic circuits and their application for the solution of problems related to flux distribution and inductance calculations. Understand the principles of a power transformer and the practical issues derived from flux leakage, saturation and hysteresis; derive the transformer equivalent circuit from test data (open circuit, short-circuit tests); solve the transformer circuit to obtain the transformer performance. (e)

   • Understand the principles governing the magnetic field distribution, voltage and torque generation in ac machines (synchronous and induction); understand the equivalent representation of ac machines at steady state and the terminal relations between voltage, current, and torque; solve the equivalent circuit and obtain the performance of both the synchronous and the induction machine. (a,c,h,i)

   • Obtain experimentally the machine parameters for both the synchronous and the induction machine; use these data to obtain the machine equivalent circuit. Understand the basic components of a power plant and the basic control functions (power and excitation control). (b)
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- Understand the principles of dc machines, the commutation process, and the armature winding construction techniques; understand the different types of dc motor connections and the corresponding torque-speed characteristics. (a,i)

- Use MATLAB and SIMULINK to obtain graphs, perform parametric calculations of the performance and characteristics of transformers and machines; obtain the non-linear response of the transformer during energization. (k)

- Understand more about written technical reports and presentations. (i)

7. Brief list of topics (class, lab and project) to be covered (with hours)²
a. Lectures

- Review of sinusoidal steady state, phasors, AC power {4 classes}

- Magnetic field and magnetic circuits, electromagnetic force {5 classes}

- Power transformer: basic material properties, apparatus construction, parameters and equivalent circuit, the p.u. system, transformer operation, multi-winding transformers, autotransformer, three-phase circuits, three-phase power, three-phase transformer {11 classes}

- Principles of ac machines, rotating magnetic field, torque generation, the machine d-q axis frame of reference, principles of the synchronous machine, construction, characteristics, equivalent circuit, the d-q axis model of the machine, saliency, operation of the synchronous generator, parallel generators, synchronous motors {9 classes}

- Principles of the induction machine, rotor types, construction. Induction motor characteristics, equivalent circuit, speed-torque characteristics, single phase motors, induction motor control and protection, starting of the induction motor automation, speed control {8 classes}

- Principles of the dc machine, machine construction, commutation, dc motors, dc generators, equivalent circuits, control of the dc motor {7 classes}

b. Lab

1. AC Power
2. DC Machines
3. Transformer
4. Synchronous Machine
5. Induction Machine

² subject to change at the instructor’s discretion. Students are responsible for announcements made in class and on D2L.
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8. CAD and Computer Tools Used: MATLAB
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>
</tr>
</thead>
<tbody>
<tr>
<td>Assessed</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
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</tr>
</tbody>
</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 (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.

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/, the SIU Department of Public Safety’s website 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.