San José State University  
Electrical Engineering Department  
EE130 Section 1, Electric Machines and Drives, Spring, 2021

Course and Contact Information

Instructor(s): Ahmad Shahsiah  
Office Location: Engineering Building Room 347A  
Telephone: (408) 924-3950  
Email: ahmad.shahsiah@sjsu.edu  
Office Hours: Friday 18:15~19:15  
Class Days/Time: Friday 15:30~18:15  
Classroom: Online  
Prerequisites: EE 110 and EE 112 (with grade of "C-" or better).  
GE/SJSU Studies Category: Undergraduate

Course Description  
Introduction to electric machinery including: magnetic circuits, transformers, electromechanical energy conversion, synchronous machines, induction machines, DC machines, speed control, single-phase motors, special machines, transients and dynamics, power converters and machine control.

GE Learning Outcomes (GELO)  
This course introduces the theory of operation and the control of electro-mechanical machines including DC machines, DC brushless machines, and AC synchronous machines and their electric drive systems.

Upon successful completion of this GE course, students will be able to:

1. Determine voltage, current, power, reactive power of electric motors and generators  
2. Use circuit models to predict behavior of different types of electric machines under load.  
3. Calculate the electric motor speed and understand motor regulation and control.  
4. Determine the total generator output power and its response to sudden load change.  
5. Determine motor efficiency and maximum torque.

Course Learning Outcomes (CLO)  
Upon successful completion of this course, students will be able to:

1- Understand magnetic circuits and magnetic circuits design,  
2- Learn circuit models of single phase and three-phase transformers,
3- Learn fundamentals of energy conversion, Mechanical force in magnetic circuits, field energy, Rotating machine fundamentals ,
4- Model and analyze rotating magnetic field, synchronous generators, equivalent circuit, real and reactive power controls,
5- Learn fundamentals of motor speed controls for various types of electric motors,
6- Learn about synchronous generators and their stability, 
7- Understand three-phase induction motors and equivalent circuit, power and torque calculations, motor starting and speed control,
8- Learn about the DC machines and special types of machines such as switched reluctance motors and brushless DC motors.

Required Texts/Readings

Textbook

Other Readings

Course Requirements and Assignments

Homework is crucial for understanding the course material. Homework will be assigned regularly and will be collected and graded. Students are encouraged to discuss homework problems with other students in the class but you have to submit your own independent solutions. Copied homework earns zero grade for all parties involved and could have more serious consequences.

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.

“Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.”

Final Examination or Evaluation

There will be one midterm and one final exam. The midterm dates will be announced at least 1 week before the exam. The final exam will be given at the official university final exam time for this course. All exams are closed book. One 8.5” by 11” (front & back) summary sheet in your own hand-writing is allowed.

Grading Information

Homework: 25%
Midterm Exam: 35%

Electric Machines, EE130, Spring, 2021
This course must be passed with a C- or better as the EE major requirement.

Students can check for updates regarding Special University Grading Policy for Spring 2021 at:
https://www.sjsu.edu/registrar/academic-records/grade-changes.php

University Policies

Per University Policy S16-9 (http://www.sjsu.edu/senate/docs/S16-9.pdf), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on Syllabus Information web page (http://www.sjsu.edu/gup/syllabusinfo), which is hosted by the Office of Undergraduate Education. Make sure to visit this page to review and be aware of these university policies and resources.

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester’s Catalog Policies section at http://info.sjsu.edu/static/catalog/policies.html. Add/drop deadlines can be found on the current academic year calendars document on the Academic Calendars webpage at http://www.sjsu.edu/provost/services/academic/calendars/. The Late Drop Policy is available at http://www.sjsu.edu/aars/policies/latdrops/policy/. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the Advising Hub at http://www.sjsu.edu/advising/.

Consent for Recording of Class and Public Sharing of Instructor Material

University Policy S12-7, http://www.sjsu.edu/senate/docs/S12-7.pdf, requires students to obtain instructor’s permission to record the course and the following items to be included in the syllabus:

- “Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor’s permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material.”
- “Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.”

Academic integrity
Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The University Academic Integrity Policy S07-2 at http://www.sjsu.edu/senate/docs/S07-2.pdf requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The Student Conduct and Ethical Development website is available at http://www.sjsu.edu/studentconduct/.

**Campus Policy in Compliance with the American Disabilities Act**

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the Accessible Education Center (AEC) at http://www.sjsu.edu/aec to establish a record of their disability.

**Accommodation to Students’ Religious Holidays**

San José State University shall provide accommodation on any graded class work or activities for students wishing to observe religious holidays when such observances require students to be absent from class. It is the responsibility of the student to inform the instructor, in writing, about such holidays before the add deadline at the start of each semester. If such holidays occur before the add deadline, the student must notify the instructor, in writing, at least three days before the date that he/she will be absent. It is the responsibility of the instructor to make every reasonable effort to honor the student request without penalty, and of the student to make up the work missed. See University Policy S14-7 at http://www.sjsu.edu/senate/docs/S14-7.pdf.
### EE130 / Electric Machines, Spring 2021, Tentative Course Schedule

This schedule is subject to change with sufficient advance notice such as class announcements.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics, Readings, Assignments, Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/29/21</td>
<td>Magnetic circuits, excitation, hysteresis, ferromagnetism, permanent magnets</td>
</tr>
<tr>
<td>2</td>
<td>2/05/21</td>
<td>Transformers, transformer circuit model, voltage regulation and efficiency, auto-transformers.</td>
</tr>
<tr>
<td>3</td>
<td>2/12/21</td>
<td>Three-phase transformers, voltage-frequency relation, magnetic core saturation, harmonics</td>
</tr>
<tr>
<td>4</td>
<td>2/19/21</td>
<td>Energy conversion, Mechanical force in magnetic circuits, field energy, Rotating machine fundamentals</td>
</tr>
<tr>
<td>5</td>
<td>2/26/21</td>
<td>Rotating Machine fundamentals.</td>
</tr>
<tr>
<td>6</td>
<td>3/05/21</td>
<td>Rotating magnetic field, synchronous generators, equivalent circuit, real and reactive power control.</td>
</tr>
<tr>
<td>7</td>
<td>3/12/21</td>
<td>Midterm Exam.</td>
</tr>
<tr>
<td>8</td>
<td>3/19/21</td>
<td>Synchronous generators, Generator stability, swing equation, equal area criterion, Speed control, power factor control, salient-pole generators.</td>
</tr>
<tr>
<td>9</td>
<td>3/26/21</td>
<td>Three-phase induction motors and equivalent circuit, power and torque calculations, motor starting and speed control.</td>
</tr>
<tr>
<td>10</td>
<td>4/02/21</td>
<td>Spring recess – No class</td>
</tr>
<tr>
<td>12</td>
<td>4/16/21</td>
<td>DC Machine fundamentals, circuit model, speed control,</td>
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<tr>
<td>13</td>
<td>4/23/21</td>
<td>DC motor and generators, permanent magnet DC motors, DC machine transients.</td>
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<tr>
<td>14</td>
<td>4/30/21</td>
<td>Synchronous motors, switched reluctance motors, brushless DC motors, Special machines, universal motors, servo motors, stepper motors</td>
</tr>
<tr>
<td>15</td>
<td>5/07/21</td>
<td>Power semiconductor devices, controlled rectifiers, voltage controllers, Semiconductor motor controls, inverters, switching commutation</td>
</tr>
<tr>
<td>16</td>
<td>5/14/21</td>
<td>Review, Q &amp;A</td>
</tr>
<tr>
<td>Final Exam</td>
<td>5/25/21</td>
<td>See the university schedule for final exams</td>
</tr>
</tbody>
</table>

Spring recess – No class