ECE 453-001 / ECE 592-004 / ECE 592-601
Electric Motor Drives

Instructor: Srdjan M. Lukic
Office: Keystone Centennial Science Center, 1791 Varsity Drive, Suite 100, Rm 022
Tel: 919-513-2842
EML: smlukic@ncsu.edu

TA: Gholamreza Jalali
Office: Keystone Centennial Science Center, 1791 Varsity Drive, Suite 100,
EML: gjalali@ncsu.edu

Class Meeting Time: Mondays, Wednesdays 3:00-4:15pm, Room 2232, EB3

Office Hours:
Instructor:
Location: Instructor's office in Keystone
Time: Mondays 1-2PM (priority to on-campus students)
       Wednesdays 1-2PM (priority to distance-ed students)
Teaching Assistant:
Location: Keystone Centennial Science Center, 1791 Varsity Drive, Suite 100,
Library Conference Room
Time Fridays 1:00pm-3:00pm.

Course Texts (optional):

Course Description:
Principles of electromechanical energy conversion; analysis, modeling and control of electric
machinery; steady state performance characteristics of direct-current, induction, synchronous and
reluctance machines; scalar control of induction machines; introduction to direct- and quadrature-axis theory;
dynamic models of induction and synchronous motors; vector control of induction and
synchronous motors.

Course Topics Outline:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to electric motor drives</td>
<td>(1)</td>
</tr>
<tr>
<td>Review of principles of electro-mechanical power conversion</td>
<td>(2)</td>
</tr>
<tr>
<td>Direct-current machines: torque-speed characteristics, equivalent circuit model and control</td>
<td>(3)</td>
</tr>
<tr>
<td>Induction machines: torque-speed characteristics and equivalent circuit model</td>
<td>(3)</td>
</tr>
<tr>
<td>Scalar control of induction machines</td>
<td>(2)</td>
</tr>
<tr>
<td>Synchronous machines: torque-speed characteristics, equivalent circuit model</td>
<td>(3)</td>
</tr>
<tr>
<td>Introduction to direct- and quadrature-axis theory</td>
<td>(2)</td>
</tr>
<tr>
<td>Dynamic models of induction and synchronous machines</td>
<td>(3)</td>
</tr>
<tr>
<td>Vector-control of induction and synchronous machines</td>
<td>(5)</td>
</tr>
<tr>
<td>Variable reluctance motors, Brushless DC motors, single phase motors</td>
<td>(2)</td>
</tr>
</tbody>
</table>

Course Prerequisites: The prerequisite for ECE 305 is grade of 'C-' or better in ECE 305.
Exceptions require departmental approval.


**Grading:**

This Course uses Standard NCSU Letter Grading.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-Term Exam 1</td>
<td>15%</td>
</tr>
<tr>
<td>Mid-Term Exam 2</td>
<td>15%</td>
</tr>
<tr>
<td>Homework and Quizzes</td>
<td>25%</td>
</tr>
<tr>
<td>Design Project</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
</tr>
</tbody>
</table>

**“Moodle” Course Website:**

All course materials, notes, homework and lectures will be posted on the course Moodle site (https://wolfware.ncsu.edu/). Students are encouraged to use the forum available through Moodle to ask any questions about the course. Any general course question should be posted on the Moodle site rather than be sent to the instructor. This way the entire class benefits from the discussion.

**Exams:**

- Mid-term exams are scheduled for **Wednesday February 24 and Wednesday March 30**
- Exams will be pre-announced in class and given approximately on the dates indicated on the Lecture and Exam Schedule. The mandatory Final Examination is scheduled for 1:00 pm Monday, May 4, 2015. Confirm this date with the University Examination Schedule.
- The Mid-terms and the Final Examination will be closed book and closed notes.
- The grade recorded in Moodle for an assignment/exam will be final and will count towards the course grade. Any grading questions arising as a result of a particular test or homework should be resolved within **one week** after the work is returned, with the change noted in Moodle.

**Quizzes:**

- Quizzes will be given using the Moodle Quiz feature and in class. Announcements regarding the dates of these quizzes will be made through the Moodle Announcement feature.
- Any grading questions arising as a result of a particular test or homework should be resolved within **one week** after the work is returned.

**Assignments:**

- You will be given approximately 8 homework assignments. Homework is due before the start of the class period of the due date. Homework problem statements and solutions will be posted in the course Moodle Site. Late homework will be accepted for one week after the due date for 60% credit, but only until the solutions are posted. Due to exam scheduling sometimes the solutions will be posted early. Please consult with the instructor if you plan to submit a late HW.
- Homework will be graded, recorded and returned; solutions will be posted. It is strongly recommended that you do the homework and use the solutions only to clarify difficulties that may arise. Give every effort to grasp the concepts from lectures, textbook and homework solutions; otherwise, you will perform poorly in the exams.
- Each student is required to do his/her own homework and submit it in class. Working on homework in a group can be helpful and is encouraged (except for assignments where
individual work requirement is specified), but each member of the group must do his/her own work and act responsibly with his/her own long-term education in mind. Remember that all exams, and quizzes are closed-book, which each student must face individually.

- Each student should print his/her name on a cover sheet together with (a) the course number, ECE305 and (b) the homework assignment number. Do NOT fold your paper in half. Write on only one side of the paper and staple your homework together.
- A circuit must be drawn for each homework problem if at all applicable. Label any unknown voltages or currents used in your work. Specify where each equation comes from. Please box your final answer
- Any grading questions arising as a result of a particular test or homework should be resolved within one week after the work is returned.

**Requirements for Credit-Only (S/U) Grading:**

In order to receive a grade of S, students are required to take all exams and quizzes, complete all assignments, and earn a grade of C- or better. Conversion from letter grading to credit only (S/U) grading is subject to university deadlines. Refer to the Registration and Records calendar for deadlines related to grading. For more details refer to [http://policies.ncsu.edu/regulation/reg-02-20-15](http://policies.ncsu.edu/regulation/reg-02-20-15).

**Requirements for Auditors (AU):**

Information about and requirements for auditing a course can be found at [http://policies.ncsu.edu/regulation/reg-02-20-04](http://policies.ncsu.edu/regulation/reg-02-20-04).

**Policies on Incomplete Grades:**

If an extended deadline is not authorized by the instructor or department, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is located at [http://policies.ncsu.edu/regulation/reg-02-50-3](http://policies.ncsu.edu/regulation/reg-02-50-3).

**Attendance:**

- Attending the class regularly is required. Students should notify the instructor if she/he will miss the class. The instructor will keep track of attendance and this attendance record will be taken into account in grading, especially in border line cases. Students need to notify the instructor if he/she will miss the class and state the reason.
- Unexcused absences from tests or final exam will receive a grade of zero. Scheduled absences (approved in advance) and unscheduled absences (due to illness) must be certified in writing to the instructor. Make-up tests or exam may or may not be given. A student who misses a test and has a certified medical excuse may be allowed, at the discretion of the instructor, to count the Final Examination as 45% and one test as 35% of the semester grade.
Academic Integrity:

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at http://policies.ncsu.edu/policy/pol-11-35-01

Academic Honesty:

See http://policies.ncsu.edu/policy/pol-11-35-01 for a detailed explanation of academic honesty.

Honor Pledge:

Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment."

Electronically-Hosted Course Components:

Class notes, homework assignments, additional reading materials and discussion boards will be available online. Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

Accommodations for Disabilities:

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Services Office (http://www.ncsu.edu/dso), 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation at http://policies.ncsu.edu/regulation/reg-02-20-01.

Non-Discrimination Policy:

NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at http://policies.ncsu.edu/policy/pol-04-25-05 or http://www.ncsu.edu/equal_op/. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.
Recording Notice:

Please be advised this course is being recorded for current and potential future educational purposes. By your continued participation in this recorded course, you are providing your permission to be recorded.