

EE 5309-002: Electric Motor Drive

Spring 2015

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Office Hours: By previous appointment- ELB 303.

Section Information: EE 5309-002

Time and Place of Class Meetings: NH 203, Tuesday and Thursday, 12:30 PM – 1:50 PM.

Description of Course Content: The course presents selected topics in electric motor drives. In particular, this course covers different circuit topologies and control strategies for electromechanical energy conversion systems. The course content helps graduate students to improve and/or develop their research skills in power and energy systems.

Student Learning Outcomes: This course is dealing with the building blocks and enabling technologies in Electric Motor Drives. Students will be able to analyze different classes of electrical machinery and inverter topologies, and switching patterns. They will be able to simulate and characterize different energy conversion systems using various simulation tools.

Course Schedule: The tentative course schedule is given here:

Week	Lecture Content
1	Fundamentals of energy conversion system
2	Magnetic systems, inductances, multi-core systems, introducing relative motion and force formulation
1	Reference frame theory, abstract concepts, algebra, and circuit elements
2	Static and Dynamic modeling of induction machines
2	Inverters: topologies and switching strategies
2	Scalar and vector control of induction motors
2	Permanent magnet machines; permanent magnetic machines with trapezoidal back-EMF; five-phase permanent magnet machines; optimal operation of brushless dc machines
1	Principles of double-fed induction generators
1	Principles of switched reluctance machines

Disclaimer: As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. –Ali Davoudi

Requirements: Students are expected to be familiar with power electronics, power systems, and electrical machinery at an undergraduate level, and control theory at a graduate level. Students are required to be competent in working with Matlab/Simulink simulation environment. Otherwise, consent of the instructor is required.

Required Textbooks and other Course Materials:

This course draws on recent IEEE Transactions on Energy Conversion. Classic reference papers will be distributed in the classroom. The instructor will use the following book as a reference:

- “Analysis of Electric Machinery and Drive Systems,” by P. C. Krause, O. Wasynczuk, S. D. Sudhoff, and S. Pekarek, 2013, Wiley-IEEE Press.

Descriptions of major assignments and examinations:

There will be three projects throughout this course. There will be no midterm or final exam.

Attendance: Attendance and active participation in class is mandatory.

Grading: There will be four projects with increasing complexity, and they constitute 20%, 25%, 25%, and 30% of the final grades. Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels. The following rubric is used:

Numerical grade	Letter grade
90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
50 - 59	F

Expectations for Out-of-Class Study: A general rule of thumb is this: for every credit hour earned, a student should spend 3 hours per week beyond the time required to attend each class meeting, students enrolled in this course should expect to spend at least an additional 3 hours per week of their own time in course-related activities, including reading materials and simulation projects. Simulation of basic as well as more real life circuits in PSPICE or Matlab/Simulink might be developed and required

Make-up Exams: There will be no make-up exam.

Grade Grievances: Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current graduate catalog: <http://www.uta.edu/gradcatalog/2012/general/regulations/#grades>

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aao/fao/>).

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor

with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Academic Integrity: Students enrolled in this course are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at www.uta.edu/resources.

Lab Safety Training: Depending on the class level and appetite, several educational modules on power electronics can be tested. In that case, **students registered for this course must complete all required lab safety training prior to entering the lab and undertaking any activities.** Once completed, Lab Safety Training is valid for the remainder of the same academic year (i.e., through the following August) and must be completed anew in subsequent years. There are no exceptions to this University policy. Failure to complete the required training will preclude participation in any lab activities, including those for which a grade is assigned.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as "lecture," "seminar," or "laboratory" shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is located in NH 208. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.