Motors and Generators

The University of Toledo
Electrical Engineering Technology program, College of Engineering
EET-4980-001, CRN: 23805

Name:	William Mugge	**Class Location**:	PH 3070
Email:	William.Mugge@utoledo.edu	**Class Day/Time**: :	M, W 5:30 pm – 6:50 pm
Office Hours:	Monday and Wednesday 2:15 – 5:15 and appointment	**Lab Location**:	NE 1475
Office Location:	NE 1639	**Lab Day/Time**:	M 7:05 pm to 8:45
Instructor Phone:	419-530-3277	**Credit Hours**:	4.0
Offered:	Spring 2019		

CATALOG/COURSE DESCRIPTION

This course is an introduction to AC and DC machines, including generators, motors, single phase, 3 phase, variable frequency drives, stepper, and DC brushless motors. Safety topics are integrated along with applicable Codes and Standards.

COURSE STATEMENT

This course prepares the student for understanding of motors and generators commonly used in industry. Upon completion of this course, the students will be able to:

1. Perform magnetic circuit calculations.
2. Perform calculations for induced Electromotive Force.
3. Describe Direct Current motor operation, including theory, Starting, Speed Control, and Torque.
4. Describe the operation of conventional DC, servo, and stepper motors.
5. Describe the operation of AC motor fundamentals including theory, Starting, Speed Control, and Torque
6. Describe the operation of single phase three phase, synchronous, induction, and variable frequency drives
7. Describe electric braking and regenerative breaking
8. Describe solid state switching circuits
9. Perform calculations for all the above.

STUDENT LEARNING OUTCOMES

Outcome a. an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;

Outcome b. an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;

Outcome f. an ability to identify, analyze, and solve broadly-defined engineering technology problems;

PHILOSOPHY OF TEACHING (TEACHING METHODOLOGY)

This is an active learning course that will require students to be fully engaged. Face-to-face instructions in lectures will provide maximum help to students. Homework, quizzes, and comprehensive tests will be given. Laboratory sessions are used to reinforce control systems concepts. The purpose of this course is to help students understand the fundamental control theories and use those theories to solve the relevant problems. Students are welcome to ask questions and discuss problems. The course will be instructed based on the philosophy of cycling education:

- through the theory to understand the formula
- through the usage of formulae to the understand examples
- through the examples to solve similar exercise problems
- through face-to-face instruction to improve learning efficiency
- through lab guides reinforcement of principles provided in lecture
- through exams to emphasize importance and clarify confusion
- though taking this course to have the capability to self-study for future work or research

Recommendations for success:

- Come to lectures and take notes
- Read the relevant contents in the textbook
- Solve examples in the textbook and do homework
- Review the relevant contents and homework before each test or exam

Never hesitate to ask for help from the instructor

PREREQUISITES AND COREQUISITES

EET 3250 for UG with min of D- or ENGT 3050 for UG with min of D-

REQUIRED INSTRUCTIONAL MATERIALS (TEXTS AND ANCILLARY MATERIALS)

Mohamed A. El-Sharkawi, Fundamentals of Electric Drives, ISBN: 978-1-305-97096-0

TECHNOLOGY EXPECTATIONS

Web assist - Blackboard http://blackboard.utdl.edu/

UNIVERSITY POLICIES

Academic Accommodations

The University of Toledo is committed to providing equal opportunity and access to the educational experience through the provision of reasonable accommodations. For students who have an accommodations memo from Student Disability Services, it is essential that you correspond with me as soon as possible to discuss your disability-related accommodation needs for this course. For students not registered with Student Disability Services who would like information regarding eligibility for academic accommodations due to barriers associated with a potential disability, please contact the Student Disability Services Office.)

ACADEMIC POLICIES

Students in this course should be familiar with policies that govern the institution's academic process. Please find a total list of undergraduate Academic Polices:
http://www.utoledo.edu/policies/academic/undergraduate/

Missed Class Policy: Students are expected to attend each class session. Should there be an unexpected absence on your part, you must notify me **by e-mail**. Please read the Missed Class Policy: http://www.utoledo.edu/policies/academic/undergraduate/

Academic Dishonesty Policy: MISCONDUCT: Students may work together on homework problems but must submit their own work. Students are not allowed to work together on exams. Any occurrence of academic misconduct will follow the policy for Academic Dishonesty. Students that receive a reduced course grade as a result of academic misconduct will not be allowed to withdraw from the course and may not petition for a GPA recalculation after retaking the course. Please refer to the Academic Dishonesty and Academic Grievance policies for more details. If you are caught in the act of plagiarism or cheating, you will be reported to the Dean and you will be placing your entire academic career at risk. There are no reasonable excuses or exceptions for cheating and plagiarism. Examples include but are not limited to as followings. Please read the http://www.utoledo.edu/policies/academic/undergraduate/

1. Plagiarizing or representing the words, ideas or in formation of another person as one's own and not offering proper documentation;
2. Giving or receiving, prior to an examination, any unauthorized information concerning the content of that examination;
3. Referring to or displaying any unauthorized materials inside or outside of the examination room during an examination;
4. Communicating during an examination in any manner with any unauthorized person concerning the examination or any part of it;
5. Giving or receiving substantive aid during an examination;
6. Commencing an examination before the stipulated time or continuing to work on an examination after the announced conclusion of the examination period;
7. Taking, converting, concealing, defacing, damaging or destroying any property related to the preparation or completion of assignments, research or examination;
8. Submitting the same written work to fulfill the requirements for more than one course.

Exams Policy: There will be no makeup tests given. It is the student's responsibility to contact the instructor prior to the scheduled exam if an absence cannot be avoided in order to make alternate arrangements.

Attendance Policy: Attendance will not be taken, but students are fully responsible for being present at all examinations, and for all materials, announcements, or changes in the schedule in class. In case of excused absence, **any missed work must be done** and written documentation of the circumstance (such as a doctor's signed note) must be provided to be kept on file.
Syllabus Revisions: The instructor reserves the right to amend this syllabus at any time during the semester.

Disturbance to Other Students: any behavior that negatively impacts the learning of other students, such as conversation that can be heard from three rows away, or cell phone ringing. Cell phones and other similar devices must be in silent mode during lectures.

Electronic Devices: No personal laptop / tablet / phone is allowed during examination. If you are found using any such device, you will automatically get zero on that quiz/test, and possibly considered for academic dishonesty regulations.

COURSE EXPECTATIONS

Homework: Homework will be assigned for the corresponding lecture. Homework is normally due at beginning of the class on the day a week from the assigning day. Homework will usually not be graded. Weekly quizzes will be given based on the assigned homework.

Laboratory reports: Lab reports are typically due the Thursday following the week of performance. The labs may be turned to the lab TA or to the instructor. Pre-labs are due on the date assigned, typically due in the first 10 minutes the day of the lab period.

Quizzes, tests, and exams: The final answer alone is not enough to get credit. Solution steps must be shown to get credit.

Electronica Policy: No electronic items: cellular telephones, Blackberrys, personal digital assistants, digital music players or similar items that may disrupt the learning environment may be used at any time for any purpose during the classroom or laboratory time. If a cell phone must be kept on due to a potential emergency situation, it must be on a silent setting. If an emergency call must be taken during a class, the student must leave the classroom prior to answering the call and not return until the call is completed. See also Article IV.B Conduct Rules and Regulations of the Student Code of Conduct at the University of Toledo, which states, in part:

> "Disruption of operations of the University Community. Disruption is an action or combination of actions by an individual or a group, which unreasonably interferes with, hinders, obstructs, or prevents the right of others to freely participate in its programs, services, or academic settings. This may include but is not limited to a disruption by the use of pagers, cell phones and/or any other communication devices."

If there is a conflict or misunderstanding, please see me privately to work out a resolution.

OVERVEW OF COURSE GRADE ASSIGNMENT

Assigned work turned in passed the due date with no prior agreement with the instructor may be accepted, accepted with point reduction, or not at all.

Both the midterm and final grading use the same formula, scale, and weights.

Midterm Grading

Midterm grades will be presented per university requirements and based on the current updated cumulative scores obtained by the students usually the first 5 or 6 weeks.

Final Grading

Quizzes: 20%	A: 93.00-100	C: 73.00-76.99
Lab reports: 20%	A-: 90.00-92.99	C-: 70.00-72.99
Mid-term test: 20% (T1)	B+: 87.00-89.99	D+: 67.00-69.99
Second test 20% (T2)	B: 83.00-86.99	D: 63.00-66.99
Final Exam: 20%	B-: 80.00-82.99	D-: 60.00-62.99
Total: 100%	C+: 77.00-79.99	F: < 59.99

COURSE GUIDELINES

When not done in person, preferred communication between the instructor and students will take place via email to a student's Rocket email address. While the instructor will not communicate via email on a regular basis throughout the semester, it is advisable that students check their email regularly so as to keep abreast of any special instructions, clarifications on assignments or cancellations that may occur during the term.

Syllabus Revisions: The instructor reserves the right to amend this syllabus at any time during the semester.

ACADEMIC SUPPORT SERVICES

The University of Toledo's academic support services such as the Center for Success Coaching, Starfish, Learning Enhancement Center, the Counseling Center, Disability Services Office, etc. can assist in their academic success. Be sure to include information on how to contact these offices. – For specific verbiage and links to Academic Support Services please refer to the **Syllabus Guidelines Document**.)

In addition to visiting the instructor which is highly encouraged, several offers additional support, are available which could aid you in succeeding in this course:

- Engineering Technology Department Teaching Assistants - NE 1604 & NE 1606

SAFETY AND HEALTH SERVICES FOR UT STUDENTS

***Escort Service**: If any student desires an escort to their vehicle after class, they should call the escort service at 419-530-4292.*

To see a comprehensive list of these services, please use the following link: (http://www.utoledo.edu/offices/provost/utc/docs/CampusHealthSafetyContacts.pdf)

*Should the need arise, the **Student Food Pantry** is available:*

http://www.utoledo.edu/studentaffairs/food-pantry/).

COURSE SCHEDULE

No Class Dates: Per university calendar

Final Exam Date: Per university schedule

Course Schedule (Subject to Change depending on the course progress)

Week No.	*Course Content*	
1	Introduction and magnetic theory	
2	Magnetic circuits	
3	Direct Current generators	
4	Direct Current motors; starters and speed control	
5	Solid- state switching circuits	Test 1
6	Stepper motors	
7	Servos	
8	Alternating Current generators	
9	Alternating Current motors - synchronous	
10	Alternating Current motors – single phase	
11	Alternating Current motors – three phase	
12	Alternating Current motors - induction	
13	Alternating Current motors – variable frequency drive	
14	Braking and regenerative braking	
15	Codes and Standards, Review	Test 2
16		Final exam