

ECE 305
Principles of Electromechanical Energy Conversion
Course Syllabus
Summer Session 2025

Course Description:

Single-phase (1Ø) and three-phase (3Ø) circuits, power flow, analysis of magnetic circuits, performance of single-phase & three-phase transformers, principles of electromechanical energy conversion, and characteristics of AC and DC machinery.

Learning Outcomes:

At the conclusion of the course the student should be able to do/accomplish the following:

- Calculate/measure single-phase and three-phase real and reactive power flow.
- Analyze and design simple magnetic devices, relating mechanical dimensions to magnetic quantities.
- Analyze the performance of practical single-phase and three-phase transformers.
- Be familiar with the single-phase and three-phase per-unit systems.
- Discuss electric and magnetic field interactions in electromechanical devices and machines.
- Analyze the steady-state performance of AC and DC machines.

Course Structure:

The course consists of three recorded lectures per week. Additional lectures/materials will be posted on the course *Moodle* website. *Zoom* conferences are available upon request.

Course Prerequisites: ECE 211 or ECE 331:

The prerequisite for ECE 305 is grade of 'C-' or s better in ECE 211 or ECE 331. Exceptions require department approval.

Lectures:

The recorded lecture will be available through the Engineering on Line website, through a *Moodle* link to *Panopto*, and by direct download from a private *DropBox* account. Lectures may be streamed from all sources but note that the time limit on streaming from the *DropBox* account *may* be one hour.

Meeting Time:

Lectures will be available around Noon on Mondays, Wednesdays, and Fridays.

Instructor:

Dr. Leonard W. White, PE
Office Location: 100 Keystone Rm. 14
Tel: (919) 630-3400
e-mail: lwwhite@ncsu.edu

Office Hours:

No regular office hours are scheduled; however, individual meeting can be scheduled upon request. E-mail, texts, telephone calls, and *Zoom* conferences are accepted 24/7 unless there are previous conflicts.

TA:

To be determined... Announcement will be posted on *Moodle*

Course References:

1. Goetze lecture notes – provided in .pdf format
2. *Electromechanical Energy Conversion*, Vembu Gourishankar *et alii.* 2nd Edition, Intext Educational Publishers, 0-7002-2404-1, 1973 (Note: Copies of this – or other editions of a similar text with other secondary authors - are on reserve at the NCSU Hunt Library.)
3. *Electric Machinery*, A. E. Fitzgerald Charles Kingsley, Jr., Stephen D. Umans 6th Edition, McGraw-Hill, 978-0071230100, 2003

Moodle Course Website:

All course information, notes, homework, additional reference material, and lectures will be posted on the course Moodle site, <https://wolfware.ncsu.edu>. Students are encouraged to use the forums that will be available through Moodle to ask questions or to make comments; each assignment will have an individual general-use forum for questions, comments, and collaboration. Assignment questions should be posted to the Moodle site discussion forums rather than be sent to the instructor; this way the entire class benefits from both the question and the discussion comments that follow. In general, if a question or comment is not answered through discussions the instructor or TA will provide a response after a reasonable amount of time.

Grading:

Mid-term Exam No. 1	25%
Mid-term Exam No. 2	25%
Homework	20%
Final Exam	30%

This Course uses Standard NCSU Letter Grading, viz:

$97 \leq A+ \leq 100$	$73 \leq C < 77$
$93 \leq A < 97$	$70 \leq C- < 73$
$90 \leq A- < 93$	$67 \leq D+ < 70$
$87 \leq B+ < 90$	$63 \leq D < 67$
$83 \leq B < 87$	$60 \leq D- < 63$
$80 \leq B- < 83$	$0 \leq F < 60$
$77 \leq C+ < 80$	

Exams:

- There will be two mid-term exams and a final exam.
- Mid-term exams and the final exam will be pre-announced in Moodle and are **tentatively** scheduled on the dates indicated on the ECE-305 Lecture and Exam Schedule. Holidays and breaks should be planned around exams as, in general, no modifications will be made in the exam schedules to accommodate travel arrangements.
- Mid-term exams and the final exam are open-book, open-notes, and open-Internet. There are no restrictions on software or other materials and/or methods that you may use to work the problems. The only restriction is that you must work the problems alone without outside assistance of any type from another individual or individuals.

With regard to use of the Internet, note that there are sites, such as *chegg.com*, that allow the posting of active exam materials so that community members can provide answers. The use of such sites is considered ‘outside assistance’ and is strictly prohibited. Be advised that faculty and staff are well aware of these sites and that they are closely monitored during exams. Submitting exam material to these sites or use of any material from these sites will result in very severe academic consequences.

- Partial credit will be given on the mid-term and final exams. To receive partial credit for a problem all work must be clearly shown and the error(s) must be the result of mathematical operations rather than an understanding of the underlying theory. Units (Volts, Amps, Watts, VAR, *etc.*) must be stated with all solutions for full credit. Students are encouraged to pay very close attention to intermediate values and possible loss of accuracy due to rounding of intermediate values.
- To submit exam solutions, the completed solutions in *.pdf* format must be uploaded to the *Moodle* submittal port within the examination window time. The length of all exams is based on the normal in-class time that would be allowed for in-person lectures. The exam windows have been extended to 48 hours for mid-terms and 72 hours for the final to allow time for scanning and submittal.
- Any grading questions arising as a result of a particular exam must be resolved within *one week* after the work is returned. This time requirement will be rigidly enforced.

Homework:

- There will be 7-9 homework assignments. Homework due date will be stated at the time that the problems are issued. There will be a late-submittal window, typically 24 hours, where the homework can be submitted late with a fixed loss of points.
- Homework problem statements and solutions will be posted on the course *Moodle* site after the late submittal window closes. Late homework will not be accepted without prior approval of the instructor. Missed homework will be excused if a written excuse is provided from an official source within 3 days of your return to class. There will be no exceptions to the excused homework policy.
- Homework will be graded online; solutions will be posted on the *Moodle* site. Any grading questions arising as a result of a particular homework assignment must be resolved within *one week* after the work is returned. This time requirement will be rigidly enforced.
- It is strongly recommended that you do the assignments and use the solutions that may be available online or from other sources only to clarify difficulties that may arise. Make every effort to grasp the concepts from lectures, textbook, and homework solutions; otherwise, you will perform poorly in the exams. Remember that the majority of your grade points will come from the exams.
- Each student is required to do his/her own homework and submit *via* the Moodle site. Working on homework in a group can be helpful and is encouraged, but each member of the group must do his/her own work and must act responsibly with his/her own long-term education in mind.
- Again, any grading questions arising as a result of a particular test or homework must 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 the following website: <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 the following website: <http://policies.ncsu.edu/regulations/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 the following website: <http://policies.ncsu.edu/regulations/reg-02-50-03>

- Unexcused absences at exams will receive a grade of zero. Scheduled absences (approved in advance) and unscheduled absences (due to illness or other valid reason) must be certified in writing to the instructor. Make-up exams may or may not be given; if a make-up test is not given the grade will be averaged to account for a fewer number of contributing grades.

Academic Integrity:

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

Honor Pledge:

Your signature on any test or assignment indicates, "That I have executed this examination in full compliance with the rules and instructions provided and that I have not received any aid from any individual or group of individuals in the completion of this work."

Electronically-Hosted Course Components:

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.

Electronically-hosted Components:

Class notes, homework assignments, additional reading materials and discussion boards will be available on-line on the course *Moodle* site.

Accommodations for Disabilities:

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, student 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, or parts thereof, may be recorded in *Zoom* or other online meetings. By your continued participation in this recorded course, you are providing your permission to be recorded.