

ECE 3318
Applied Electricity and Magnetism
Spring 2022

Class Number 14380

Syllabus

Course Time

Tu, Th 5:30 pm – 7:00 pm, MH 128

Instructor

Prof. David R. Jackson; Office: W318-D3
Phone: 713-743-4426; Fax: 713-743-4444
E-mail: djackson@uh.edu

Information for the TA (grader) will be posted on the Blackboard site.

Note: *All policies indicated on this syllabus are subject to change.*

Zoom Information

The tentative policy regarding the mode of operation for the class is as follows: The class lectures will be held in the classroom, and will also be broadcast on Zoom during the first two weeks of class. The Zoom link can be found on the “Zoom” page of the class Blackboard site. Office hours will be held on Zoom only, using the same Zoom link. This tentative policy is subject to change.

Class Blackboard Site

This class will use Blackboard for the distribution of class material and assignments. You are responsible for checking the Blackboard site often for important announcements (found under the “Announcements” link). You are responsible for any information that is posted there. All of the homework and handouts will be posted on the Blackboard site. The class lecture notes for this semester will also be posted on the Blackboard site on a continuing basis.

Office Hours

Office hours will be listed on the Blackboard site. You are welcome to email or phone the instructor as well, especially if you have something private to discuss, but you are encouraged to ask questions about the homework during the Zoom office hours so that everyone in the class can benefit.

Catalog Description

Applied Electricity and Magnetism. Cr. 3. (3-0). Prerequisites: ECE 2202. Fundamentals of electricity and magnetism, vector calculus, Maxwell's equations, Kirchhoff's laws, static electric and magnetic fields, resistance, capacitance, inductance, magnetic circuits, and transformers.

Academic Honesty Policy

Students in this course are expected to follow the Academic Honesty Policy of the University of Houston. It is your responsibility to know and follow this policy. You must sign the "Academic Honesty and Syllabus Form" given by the instructor and upload it on Blackboard by Jan. 31, 2022. If you fail to do this, you may be dropped from the course. The policy may be found in the online *Student Handbook*. The online *Student Handbook* may be found at the following website:

<http://www.uh.edu/dos/resources/student-handbook>

Email

In addition to checking the Important Announcements section of the Blackboard site, it is your responsibility to configure your UH email alias properly in myUH (PeopleSoft) to receive email from the university. The ECE department will use your UH email alias for all official correspondence. Occasionally the instructor will also send important emails to the class using the UH email aliases, and it is your responsibility to make sure that you are able to receive these emails.

The UIT website giving information about updating your UH email alias is:

<http://www.uh.edu/infotech/services/accounts/email/update-student-address/index.php>

Religious Holy Days

Students whose religious beliefs prohibit class attendance on designated dates or attendance at scheduled exams may request an excused absence. To do this, you must request the excused absence, in writing, by Jan. 31, 2022. Please submit a written request to your instructor by this deadline to allow the instructor to make appropriate arrangements. For more information, please see the online *Student Handbook*.

Students with Disabilities

Students with recognized disabilities will be provided reasonable accommodations, appropriate to the course, upon documentation of the disability with a Student Accommodation Form from the **Justin Dart, Jr. Student Accessibility Center**. To receive these accommodations, you must request them by submitting a request to the instructor in writing by Jan. 31, 2022. Students who fail to submit a written request will not be considered for accommodations. For more information, please see the online *Student Handbook*.

Recommended Texts

W. H. Hayt and J. A. Buck, *Engineering Electromagnetics*, 9th Edition, McGraw-Hill, 2019.

L. C. Shen and J. A. Kong, *Applied Electromagnetism*, 3rd Edition, PWS, 1995.

Reading assignments will be posted on the class website from each of these two books. One copy of each text will be placed on reserve in the Library. Note that the Shen & King book is out of print, but you can still find it by searching online.

Electronic Version of Hayt & Buck Book

Due to special arrangements with the UH Bookstore, an electronic version of the Hayt & Buck book is available for those who have opted into the BryteWave program.

Recommended Supplements

In addition to the above EM textbooks, the following texts may be helpful to you in giving you additional supplementary material.

J. A. Edminister, *Schaum's Outline on Theory and Problems of Electromagnetics*, 2nd Ed., McGraw-Hill, 1993.

S. A. Nasar, *Schaum's Outline on 2000 Solved Problems in Electromagnetics*, McGraw-Hill, 1992.

H. M. Schey, *Div, Grad, Curl, and All That: an Informal Text on Vector Calculus*, 2nd Ed., W. W. Norton and Company, 1992.

M. R. Spiegel, *Schaum's Outline on Vector Analysis*, McGraw-Hill, 1959.

D. Fleisch, *A Student's Guide to Maxwell's Equations*, Cambridge University Press, 2008.

Note: One copy of each of the above books will be placed on reserve in the Library.

Online Texts

In addition to the above traditional textbooks, an online textbook is available free of charge from the Open Textbook Library at the University of Minnesota. The textbook is: S. W. Ellingson, *Electromagnetics*, VT Publishing, Blacksburg, VA, 2018. The website is: <https://open.umn.edu/opentextbooks/subjects/engineering>.

Also, Students at UH have access to the McGraw-Hill online engineering library system called *Access Engineering* at www.accessengineeringlibrary.com. Two online books may be found there:

- *Electromagnetic fields and Waves: Fundamentals of Engineering* by S. M. Riad and Iman M. Salama.
- *Schaum's Outline of Electromagnetics* by M. Nahvi and J. A. Edminister.

When connecting from off campus, you can use the following link to reach the McGraw-Hill Access Engineering site, via the UH Library:

<http://ezproxy.lib.uh.edu/login?url=https://www.accessengineeringlibrary.com>

(Once you are at the site, you can search for these books.)

Prerequisites

You must have earned a C- or better in ECE 2202 in order to be enrolled in ECE 3318: Waivers of this prerequisites are possible only through a petition. Please submit petitions to the ECE front office.

Grading Policy

Grades will be determined on the basis of overall performance on the two regular exams, the final exam, homework, and the project, with the following tentative weights (subject to change):

Homework	15%
Project	10%
Exam 1	20%
Exam 2	20%
Final Exam:	35%

Any items that require re-grading must be brought to the TA or the instructor within one week from the time the item is returned in class. After that, grades will not be changed.

Homework Policy

Homework is due at the beginning of class on the due date. NO LATE HOMEWORK IS ACCEPTED. Please upload your homework assignments (as a pdf file) on Blackboard. Students are expected to work individually on the homework. Having general discussions with others about the concepts involved in the homework problems is allowed, and even encouraged. However, directly obtaining answers or derivations from anyone else, or copying from someone else's assignment, is not allowed. Also, students should not use homework solutions from previous semesters, or attempt to obtain homework solutions from previous semesters. Violations of any of these rules will be considered a violation of the UH Academic Honesty Policy.

Exam Policy

No make-up exams will be given. If an extreme emergency prevents you from taking an exam on exam day, you must notify the instructor immediately (within 24 hours at the most) and provide documentation to verify the emergency. If the emergency is legitimate and documented, then you may be allowed to replace the missing exam grade with an extrapolated grade based on the grade you receive on the other exam

and the final exam, as the instructor deems appropriate. You must take the final exam in order to pass the course.

Attendance

Attendance at every class is expected. Attendance may be taken randomly during the semester. If you need to miss class for a legitimate reason, please obtain permission from the instructor at least one day ahead of time. Students who miss three classes (without getting an excused absence from the instructor before class) may be dropped from the course at any time, or receive a failing grade at the end of the semester.

Withdrawal Policy:

The withdrawal dates are listed in the Academic Calendar. For spring 2022 the last day to drop a course without receiving a grade is Feb. 2. After this date and before April 20, you may drop with a W if you have not exceeded your total 6W limit. Do not assume that you will be dropped by the instructor if you stop attending class. You are responsible for completing the withdrawal procedure. After April 20 you are not allowed to drop the class.

Please be aware that students are only allowed to attempt required engineering courses (which includes required ECE courses) two times. Staying in a course past the first drop deadline (Feb. 2) constitutes an attempt.

Grades of Incomplete (I) will be given only when a small portion of the course has not been completed for a good reason that can be documented, such as a medical emergency. If all of the material has been completed, an "I" grade cannot be given. Detailed information about these issues is available in the *Student Handbook*.

Expected Course Outcomes:

Students who successfully complete this course are expected to meet the following course outcomes.

- 1) Students should be able to solve mathematical physics problems using vector calculus. (Program Outcome #a).
- 2) Students should have a strong understanding of the fundamental physical concepts associated with static electric and magnetic fields (Program Outcome #a).
- 3) Students should understand the fundamental physical foundations for resistance, capacitance, and inductance, and how to calculate these quantities (Program Outcome #a).
- 4) Students should have an understanding of the practical relevance of electrostatic and magnetostatic concepts, such as how lightning rods work, how electric and magnetic fields come from power lines, how DC motors work, etc. (Program Outcome #a).
- 5) Students should be able to communicate effectively through the technical writing of a report (Program Outcome #g).

Important Dates:

First day of classes: Jan. 18 (Tuesday)

Last day to drop without receiving a grade: Feb. 2 (Wednesday)

Spring break: March 14-19 (Monday – Saturday)

Last day to drop a course (with a W): April 20 (Wednesday)

Last day of classes: May 2 (Monday)

Final exam: Tuesday, May 10, 5 – 8 pm

Useful Websites:

Department of ECE: <http://www.ee.uh.edu>

College of Engineering: <http://www.egr.uh.edu>

University of Houston: <http://www.uh.edu>

Student Handbook: <http://catalog.uh.edu>

Undergraduate Student Catalog: <http://catalog.uh.edu>

Academic Calendar: <http://catalog.uh.edu>

Final Exam Schedule: <http://www.uh.edu/academics/courses-enrollment/final-exam-schedules>

Course Listing: <http://publications.uh.edu>

Course Topics (not in chronological order)1) Vector calculus

- a) Coordinate systems
- b) Volume, surface and line integrals
- c) Divergence and the divergence theorem
- d) Curl and Stokes's theorem
- e) Gradient

2) Electrostatics

- a) Charge and current
- b) Electric field and voltage drop
- c) Grounding
- d) Coulomb's law
- e) Superposition with Coulomb's law
- f) Electric flux
- g) Gauss' law
- h) Electrostatic properties of conductors and charge relaxation
- i) Potential calculations
- j) Kirchhoff's voltage law
- k) Integral and differential forms of electrostatic laws
- l) Poisson's and Laplace's equations
- m) Dielectrics
- n) Dielectric breakdown
- o) Boundary conditions
- p) Boundary value problems
- q) Image theory
- r) Capacitance and capacitors
- s) Electric stored energy

3) DC currents

- a) Kirchhoff's current law
- b) Ohm's law
- c) Joule's law
- d) Conductance and resistance calculations
- e) Capacitance/Resistance analogy

4) Magnetostatics

- a) The magnetic field and magnetic flux density
- b) Integral and differential forms of Ampere's law and the magnetic Gauss law
- c) Biot-Savart law
- d) Magnetic materials
- e) Boundary conditions
- f) Magnetic stored energy
- g) Inductance
- h) Mutual inductance
- i) Magnetic force and torque
- j) Magnetic circuits
- k) Transformers
- l) Motors and generators

University of Houston Policies and Information

Face Covering Policy

To reduce the spread of COVID-19, the University strongly encourages everyone (vaccinated or not) to wear face coverings indoors on campus including classrooms for both faculty and students.

Presence in Class

Your presence in class each session means that you:

- Are NOT exhibiting any Coronavirus Symptoms that makes you think that you may have COVID-19
- Have NOT tested positive or been diagnosed for COVID-19
- Have NOT knowingly been exposed to someone with COVID-19 or suspected/presumed COVID-19

If you are experiencing any COVID-19 symptoms that are not clearly related to a pre-existing medical condition, do not come to class. Please see Student Protocols for what to do if you experience symptoms and Potential Exposure to Coronavirus for what to do if you have potentially been exposed to COVID-19. Consult the (select: Undergraduate Excused Absence Policy or Graduate Excused Absence Policy) for information regarding excused absences due to medical reasons.

COVID-19 Information

Students are encouraged to visit the University's COVID-19 website for important information including on-campus testing, vaccines, diagnosis and symptom protocols, campus cleaning and safety practices, report forms, and positive cases on campus. Please check the website throughout the semester for updates.

Vaccinations

Data suggests that vaccination remains the best intervention for reliable protection against COVID-19. Students are asked to familiarize themselves with pertinent vaccine information, consult with their health care provider. The University strongly encourages all students, faculty and staff to be vaccinated.

Reasonable Academic Adjustments/Auxiliary Aids

The University of Houston complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for disabled students. In accordance with Section 504 and ADA guidelines, UH strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. If you believe that you have a disability requiring an academic adjustments/auxiliary aid, please contact the Justin Dart Jr. Student Accessibility Center (formerly the Justin Dart, Jr. Center for Students with DisABILITIES).

Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston Undergraduate Excused Absence Policy and Graduate Excused Absence Policy for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to military service, religious holy days, pregnancy and related conditions, and disability.

Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the Justin Dart, Jr. Student Accessibility Center. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student,

whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with anyone without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

Syllabus Changes

Due to the changing nature of the COVID-19 pandemic, please note that the instructor may need to make modifications to the course syllabus and may do so at any time. Notice of such changes will be announced as quickly as possible through (specify how students will be notified of changes).

Helpful Information

Coogs Care: <https://www.uh.edu/dsaes/coogscare/>

Student Health Center: <https://www.uh.edu/healthcenter/>