

# ECE 8300 – Electromagnetics I

## Syllabus Spring 2020 (revision 0)

<b>Instructor:</b>	Dr. Anthony Q. Martin
<b>Course Info:</b>	<b>ECE 8300</b> Electromagnetics I
<b>Class Time:</b>	9:30 a.m. to 10:45 a.m., Monday & Wednesday
<b>Location</b>	WFIC 323
<b>Office/Phone:</b>	333 EIB/656-1052
<b>Office Hours:</b>	TBD. Questions via e-mail anytime.
<b>Pre-Requisites:</b>	<b>ECE 3810</b> (or equivalent) and <b>ECE 8290</b>
<b>Required Text:</b>	<i>Time-Harmonic Electromagnetics Fields</i> , R. F. Harrington, IEEE Press Reissue.

**Objectives:** To provide the student with an understanding of electromagnetic theory, including wave propagation, reflection and transmission at media interfaces, total transmission and reflection, electromagnetic theorems and their use, derivation of integral equations, Green's functions, wave equations in rectangular and cylindrical systems, rectangular waveguides, cylindrical guides, line-source and plane-wave scattering from cylindrical structures. Addition theorems.

**Topics covered:**

1. Review, wave equations, wave interactions,
2. Electromagnetic potentials, near and far zone fields,
3. Electromagnetic theorems and applications
4. Wave equations solutions rectangular systems
5. Wave equation solutions in cylindrical systems
6. Addition Theorems, Scattering by PEC and Dielectric Cylinders

### Grading Policy:

- Slight revisions to this syllabus, to correct mistakes, will be made during the first two weeks of the semester.
- Lectures are available as PDF files on your Canvas. Please bring them either in printed format or on your laptop. A PDF reader will be required.
- Good grammar and reasonable neatness is a requirement on all assignments
- Some assignments may involve programming and MATLAB. Students must have a working copy of MATLAB installed on their computers.
- All work must be shown on assignments and final to receive partial credit! Credit will not be given for *magic* numbers, formulas, equations, solutions, etc. I must be able to follow your solution from beginning to end to be able to assign partial credit. Please read later comments about the nature of assignments and what is required to reach the bar.
- There will be several out-of-class assignments given and a final exam. The final may be part in-class and/or part take home, or fully one or the other. Out-of-class assignments are a major part of your grade and are NOT “homework” assignments. As such, more much will be required in these assignments to meet the high bar expected of graduate students. Fully thought-out written discussion/commentary is expected for all assigned problems involved in these assignments. Merely listing equations on assignment problems will be considered woefully insufficient in this course and can lead to a failing grade in this course!
- Grading **may** be curved based on overall class performance. However, students should assume a 10-point scale (90+ = A, 80+=B, etc) at minimum.
- Students will not work together on the assignments, whether out-of-class assignment or the final exam. If an in-class final is given, 2 sheets of 8.5x11-inch paper will be allowed to serve as a formula sheet. The sheet(s) must be turned in with the test or exam to receive credit. Your name must be on each sheet.
- **Your Grade** All the assignments problems will be worth a certain number of points and a running total will be developed during the semester. Your grade will be based on the percentage of points earned over that available.

# ECE 8300 – Electromagnetics I

## Syllabus Spring 2020 (revision 0)

**Attendance:** ~~Attendance of class is required for all 4460-001/6460-001 students.~~ Photo roll will be taken during every lecture (this does not apply to section 843 students and there is NO attendance requirement). All students are expected to be in class and seated by 8 a.m. Attendance will affect your final grade by causing a percentage to be subtracted from it based on the number of unexcused absences recorded. The following table shows how class attendance will impact your grade:

Unexcused Absences	Change in final grade percentage
1 to 6	No change
7 or more	-20% (EG*0.8)

Absences for **serious illness** (emergency and/or acute) will only be excused with a doctor's note (i.e., excused absences) supported by office visit payment. Absences for **minor illness** (i.e., those **not requiring** a doctor's visit and payment for care or for a simple common cold or a common malady like a stomach ache) are not excused, but that is why there is an allowance for 6 unexcused absences as noted above (routine doctor's appointments are unexcused). Missing class for university activities will be considered an unexcused absence unless special permission is granted by the instructor in advance (generally this permission is not granted). Certainly, a student who has several unexcused absences will not be given favorable consideration for missing class due to university activities.

~~A student is required to keep track of his/her number of missed lectures.~~ Do not contact the instructor about your missed absences until after the last week of class, at which time the final tabulations will be completed.

If the instructor does not arrive within 15 minutes after the class period has started (by 9:45 a.m.) class is cancelled, all students may leave, and no student will receive an unexcused absence.

**Excused Absences:** Any student wanting to be excused for a medical absence must submit valid documentation within one week of the absence in question. Failure to do so will result in the absence counted as not excused. **NO EXCEPTIONS.**

**Disability Access:** It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have disabilities. Students are encouraged to contact Student Disability Services to discuss their individual needs for accommodation, obtain a letter if appropriate, and then to discuss those needs with the instructor. To obtain accommodations, the student must notify the instructor no later than the end of first week of class.

**Habitual Tardiness:** Due to the way the Riggs Hall classroom is constructed students who come late (late is defined to be any time after the class session has started) to class can disrupt the entire lecture. Thus, any student who is recognized to be habitually late (defined to be 2 or more times during any two-week period) to class will be penalized. Each student identified as habitually late will NOT be given any warning but will have 5% be deducted from the score of the final exam or project score for each infraction. Do not make a practice of arriving to class late.

### Assignments & Final Exam Schedule:

ASSIGNMENTS & FINAL EXAM SCHEDULE	
Test	Date
Assignments	Various dates
Final Exam Slot: MWF 9:05-9:55a	Friday, 4/31/20, 8-10:30am Take Home due: 4/31/20 at 2pm.

If there is some reason the final exam slot in the table above does not work, alert me of the reason immediately. Failure to do so is your tacit acceptance of this testing arrangement.

# ECE 8300 – Electromagnetics I

## Syllabus Spring 2020 (revision 0)

**Assignments:** For this course, each student will be required to turn in, by email, a report in an electronic file for each assignment. These reports should be in the form of a PDF file derived from MS Word or Powerpoint. These self-contained reports should include problem statements (required), discussions/commentary, mathematical derivations, computer programs (only in an appendix and the end of your report), computer generated results (i.e., plots and graphs with labels and figure captions), citations and appendices, all organized in a logical fashion. Students are **NOT** required to type lots of equations. Writing math & words by hand on ruled paper (required), scanning, and then “cutting & pasting” into Word/Powerpoint is sufficient (this is also a valuable skill to develop). Your grade will be determined partly (45%) by the percentage of correctly completed assignment, with the remaining (45%) based on the quality of commentary (a written-in-your-words demonstration of your understanding of the material) and form (neatness, grammar, 10%). Please note that if I have to struggle to follow your work then your grade will be negatively impacted. Your commentary should be included to help one follow your work, thus if your work is simply a long stream of equations with no explanatory words, then your maximum grade is 45%, assuming your presentation is neatly written. Also note that if you leave out too many steps, this could impact your grade negatively as well. Please give serious consideration to this matter (please ask me if you have questions about this). What I am NOT looking for is a simple “data dump” (or a list of equations to sort through). The completion of assignments and how they are delivered, are the major part of your grade. As future engineers/researchers/scientists, written communication is very, very important, and this aspect will be stressed in this course. At the end of this course, you should be able to organize your written reports into a standalone notebook and this will be representative of what you did in this course and your understanding of the material covered in this course. Please note, however, that I am not expecting each of you to write a tomb or a dissertation. ☺

All the assignments problems will be worth a certain number of points and a running total will be developed during the semester. Your grade will be based on the percentage of points earned over that available. The due date for each assignment will be announced during lecture, on Canvas, or via e-mail.

**Late work:** Assignments will have due dates which students are expected to meet. Any assignment which is not submitted within one week of its due date will not be accepted and a grade of zero points will be given for that assignment.

**Academic Integrity:** “As members of the Clemson University community, we have inherited Thomas Green Clemson’s vision of this institution as a ‘high seminary of learning.’ Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately and expeditiously to charges of violations of academic integrity.”

<http://gradspace.editme.com/AcademicGrievancePolicyandProcedures#integritypolicy>

### Electronic Submission

**Filenames:** Please name your submitted electronic file according to the following scheme:

lastname\_ECE8300\_assignment\_X.pdf

Here, lastname = your surname and X = the number of the assignment.

# ECE 8300 – Electromagnetics I

## Syllabus Spring 2020 (revision 0)

Example (using my surname, but you should use yours): [Martin\\_ECE8300\\_assignment\\_1.pdf](#).

If you do not follow this scheme I will not review your work.

Some tips about scanning assignments:

- If you scan a document at 600 dpi and 24-bit color, the file size will be huge. Most likely, this file will be too large to send through email. It is better to scan at, say, 150 dpi and in grayscale or in color if a low color depth. The scanned file will be much smaller.
- After you scan your work, please inspect it to ensure that it is legible.
- If including Matlab results, a direct cut & paste into your document is better than scanning. You may combine scanned solutions (obtained cut & paste) with computer generated results. Both are considered objects in a Word or Powerpoint file.
- You can use Word or Powerpoint to create a PDF file.
- The copier machine in EIB 337 will scan your written work and you can direct it to send the scanned file to you at your email address. Then you can manipulate the results (cut & paste) and send your final file, with the correct naming scheme (see above), to me. Please do not direct the output of the copier/scanner to me because I will not accept any work with an improper naming scheme.

Some tips on ensuring a good grade in this course are:

- Used ruled paper and write on the lines to keep your math organized. Consider the use of “white space” between lines of math to make your presentation easier for someone else to follow. This is commonly done in textbooks and research monographs to keep complex material accessible to the reader.
- Do NOT write in a micro-font (extremely tiny handwriting designed to minimize the use of paper) as this cannot be read & followed efficiently. Undergraduate students are notorious for this. As graduate students, you want to do this opposite of this because you may need to produce pages and pages of math and you need to finish with the correct result at the end. If others cannot follow your work, then it is very likely that you will not be able to either after some time as gone by.
- Perform a “cut & paste” of each problem statement into your document so as to make your work self-contained within a single file.
- Number the major equations of your work and refer back to them to help guide a reader through your math.
- Label your figures and tables and refer back to them. Do not leave it to the reader to figure out what your figures and tables mean. What are the units of quantities shown on the various axes? What do the various line colors correspond to? Make sure anything you put on a figure or in a table is completely explained. To assume that anyone reading what you have created is easily followed is a major flaw and will degrade the quality of your entire effort.
- Look at other major works for examples on how to present very technical information. Almost any textbook on engineering, physics, and math is a good source.
- Words are your friend in this course. Lack of them will hurt your grade tremendously.
- Do not wait until the last minute to start on an assignment in this course. Your grade is based on these assignments. These assignments should NOT be viewed as homework. I

# ECE 8300 – Electromagnetics I

## Syllabus Spring 2020 (revision 0)

will not grade any report that looks like typical homework. You will get a zero if you turn in anything that looks like some sloppy response to a homework assignment.

- Put MATLAB/computer code at the back of your document and refer to it in your text as an appendix. Be sure your appendices have titles and descriptions.

The policies in this syllabus are general policies common to all courses in ECE. Course specific information will likely be included in a separate, course specific syllabus. **Students are responsible for reading and understanding the information in both this common syllabus and in the course specific syllabus.**

The syllabus is subject to change based on extenuating circumstances or at the instructor's discretion. **In the event that there is a conflict or discrepancy between the common syllabus and course specific syllabus, the course specific syllabus overrides the common syllabus.**

## **Attendance**

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Unless otherwise stated on the course specific syllabus, **students are expected to attend class, and to arrive on time.**

In the event of an **emergency**, students should contact the course instructor, preferably before class or the exam. Students should speak with instructors regarding any scheduled absence as soon as possible and develop a plan for any make-up work, if allowed by the instructor. It is the student's responsibility to secure documentation of emergencies, if required by the instructor. A student with an excessive number of absences may be withdrawn at the discretion of the course instructor.

**If the instructor is late**, students are expected to wait 15 minutes for the instructor to arrive.

Any further attendance policies in place will be listed on the course specific syllabus and will serve to supplement these policies.

### **Notification of Absence**

The Notification of Absence module in Canvas allows students to quickly notify instructors (via an email) of an absence from class and provides for the following categories: court attendance, death of family member, illness, illness of family member, injury, military duty, religious observance, scheduled surgery, university function, unscheduled hospitalization, other anticipated absence, or other unanticipated absence. The notification form requires a brief explanation, dates and times. Based on the dates and times indicated, instructors are automatically selected, but students may decide which instructors will receive the notification. This does not serve as an "excuse" from class, and students are encouraged to discuss the absence with their instructors, as the instructor is the only person who can excuse an absence. If a student is unable to report the absence electronically, he/she may call the Office of Advocacy and Success at 864-656-0935 for assistance and guidance.

The Office of Advocacy and Success also assists students in identifying various appropriate methods of documenting absences and assists families in using the electronic Notification of Absence system when students are unable to do so themselves.

### **Academic Continuity Plan**

In the event the physical classroom facility becomes unavailable, as determined by the University's administration, class will be conducted in a virtual (online) format. The University issues official disruption notifications through email /www /text notification/social media. When notified, use one of

the following links to navigate to Clemson Canvas where you will find important information about attending class:

- Primary access link: <https://www.clemson.edu/canvas>
- Secondary access link, if needed: <https://clemson.instructure.com/>
- You can also use the Canvas Student App.

**February 19, 2020, has been declared an E-Learning Day by the university.** A real-time test of the Academic Continuity Plan will be conducted.

### **Inclement Weather Policy**

Any exam that was scheduled at the time of a class cancellation due to inclement weather will be given at the next class meeting unless contacted by the instructor. Any assignments due at the time of a class cancellation due to inclement weather will be due at the next class meeting unless contacted by the instructor. Any extension or postponement of assignments or exams must be granted by the instructor via email or Canvas within 24 hours of the weather related cancellation.

## **Academic Integrity**

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As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a 'high seminary of learning.' Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately to charges of violations of academic integrity.

Further information on Academic Integrity can be found in the [Undergraduate Announcements](#) and in the [Graduate School Policy Handbook](#).

## **Access Accommodations**

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Clemson University values the diversity of our student body as a strength and a critical component of our dynamic community. Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to this class should let the professor know, and make an appointment to meet with a staff member in Student Accessibility Services as soon as possible. You can make an appointment by calling 864-656-6848, by emailing [studentaccess@lists.clemson.edu](mailto:studentaccess@lists.clemson.edu), or by visiting Suite 239 in the Academic Success Center building. Appointments are strongly encouraged – drop-ins will be seen if possible, but there could be a significant wait due to scheduled appointments. Students who receive Academic Access Letters are strongly encouraged to request, obtain and present these to their professors as early in the semester as possible so that accommodations can be made in a timely manner. It is the student's responsibility to follow this process each semester. You can access further information here: <https://www.clemson.edu/academics/studentaccess/index.html>.



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## Anti-Harassment and Non-Discrimination

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Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at <http://www.clemson.edu/campus-life/campus-services/access/title-ix/>. Ms. Alesia Smith is the Clemson University Title IX Coordinator, and the Executive Director of Equity Compliance. Her office is located at 110 Holtzendorff Hall, 864.656.3181 (voice) or 864.656.0899 (TDD).

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## Online Courses

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In an online course, you will interact with the content, instructor, and/or classmates on at least a weekly basis through course assignments, asynchronous discussions and/or synchronous sessions as indicated on the course specific syllabus. Further resources for online courses may be found here: <http://www.clemson.edu/online/students/>.

Computing technology questions may be sent to [ITHELP@clemson.edu](mailto:ITHELP@clemson.edu).

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## Emergency Procedures

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Emergency procedures have been posted in all buildings and on all elevators. Students should review these procedures for their own safety. Clemson University is committed to providing a safe campus environment for students, faculty, staff, and visitors. As members of the community, we encourage you to take the following actions to be better prepared in case of an emergency:

- Ensure you are signed up for emergency alerts: <https://www.getrave.com/login/clemson>
- Download the Rave Guardian app to your phone: <https://www.clemson.edu/cusafety/cupd/rave-guardian/>
- Learn what you can do to prepare yourself in the event of an active threat: <http://www.clemson.edu/cusafety/EmergencyManagement/>

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## Copyright Statement

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Materials in some of the courses are copyrighted. They are intended for use only by students registered and enrolled in a particular course and only for instructional activities associated with and for the duration of the course. They may not be retained in another medium or disseminated further. They are provided in compliance with the provisions of the Teach Act. Students should be reminded to refer to the Use of Copyrighted Materials and "Fair Use Guidelines" policy in on the Clemson University website for additional information: <https://clemson.libguides.com/copyright>.