

Fall 2017 Course Syllabus for
Applied Electromagnetics

*University of Texas at El Paso
College of Engineering
Department of Electrical and Computer Engineering*

COURSE INFORMATION

Course Prefix and Number:	EE 4347
Course Title:	Applied Electromagnetics
Course Website:	http://emlab.utep.edu/ee4347/appliedem.htm
Meeting day and time:	T/R, 12:00pm – 1:20pm
Room:	UGLC 336
Final exam:	Tuesday, December 12, 1:00pm – 3:45pm
CRN:	17065
Credit hours:	3
Lecture hours:	3

Catalog Description – The study of static and time-varying electromagnetic principles and laws in their application to modern technology, natural phenomena, as well as to scientific and industrial devices and systems from DC to microwave frequencies.

INSTRUCTOR INFORMATION

Dr. Raymond C. Rumpf

Office: ENGR A-337
Office Hours: T/R, 9:00am – 10:00am
Telephone: (915) 747-6958
E-Mail: rcrumpf@utep.edu

COURSE MATERIALS

The following items are required for this course:

- Access to the internet
- TI85 scientific calculator, or equivalent
- Access to MATLAB. Manual available at: <http://www.mathworks.com/help/techdoc/>
- 30 cm ruler, compass, and colored pens/pencils
- Engineering graph paper and blank Smith charts for homework assignments
- Textbook: *Elements of Electromagnetics* (6th Ed.)
Matthew N. O. Sadiku
Oxford University Press 2015
ISBN: 978-0-19-932138-4

Students should maintain a well-organized notebook that archives their syllabus, lecture notes, homework, quizzes, and all other materials related to this course.

PREREQUISITES

By Course (with grade of “C” or better):

- MATH 2313 – Calculus III
- MATH 2326 – Differential equations
- EE 2351 – Electric Circuits II
- EE 2353 – Continuous Time Signals and Systems
- PHYS 2421 – Fields and Waves
- EE 3321 – Electromagnetic Field Theory

By Topic:

- Fundamental laws of electricity
- Differential equations
- Vector calculus
- Fields and waves
- Maxwell’s equations
- Electrostatics and magnetostatics
- Programming
- MATLAB

COREQUISITES

None.

COURSE OUTLINE

Topics covered in this course include:

1. Review of basic electromagnetics (EE 3321)
2. Electromagnetic waves
3. Scattering at an interface
4. Transmission lines
5. Waveguides
6. Electromagnetic devices
7. Metamaterials and photonic crystals
8. Electromagnetic simulations

LEARNING OUTCOMES

By the end of the semester, the student will demonstrate the ability to:

- Describe and analyze electromagnetic wave propagation.
- Describe and analyze scattering from an interface
- Describe and analyze transmission lines and associated problems.
- Understand the basics of waveguides and their applications.
- Understand the basics of periodic structures in electromagnetics and their applications.
- Understand the basics of antennas and their various forms.

Contribution to Professional Component

EE-4347 is a senior level core course that builds on topics covered primarily in EE 3321 “Electromagnetic Field Theory.” This course is heavier on applications than it is theory.

Relationship to (ABET) Program Outcomes

- Ability to apply knowledge of mathematics, science, and engineering:
Students use concepts from physics and calculus in the analysis of electromagnetic problems.
- Ability to identify, formulate, and solve engineering problems:
Students solve problems and observe simulations of electromagnetic problems.
- Ability to communicate effectively:
Students solve problems and discuss electromagnetic issues in class.
- Ability to use computers to enhance problem solving:
Students observe MATLAB to solve problems and visualize solutions.

RULES AND POLICIES

Grading

Student achievement in the course objectives will be assessed using a combination of homework, quizzes, the final exam, and class participation. Participation includes attendance, asking and answering questions during the lecture, and providing honest and useful feedback to the course instructor. Student grades are protected by the Privacy Act of 1974.

Your course grade will be determined by your weighted performance in the following categories:

Homework	30%	90% – 100% → A
Quizzes	40%	80% – 89% → B
Participation	10%	70% – 79% → C
Final Exam	20%	60% – 69% → D
		0% – 59% → F

Given the above percentages, your final grade is calculated according to:

$$(\text{Grade}) = 0.3(\text{Homework}) + 0.4(\text{Quizzes}) + 0.1(\text{Participation}) + 0.2(\text{Final Exam})$$

You can calculate what you need on the final exam to earn your desired grade using the following equation:

$$(\text{Final Exam}) = 5.0(\text{Desired Grade}) - 1.5(\text{Homework}) - 2.0(\text{Quizzes}) - 0.5(\text{Participation})$$

Homework Policy

Homework will be assigned on a weekly basis and graded on a 100 point scale. Show all work! Homework is due at the beginning of lecture on the assigned due date. In order to provide solutions in a timely manner, no homework assignments will be accepted after three days following the due date and 10 points will be deducted for every day late. Homework must be completed with a high level of professionalism and be

formatted properly. Points will be deducted for sloppy work, incorrect formatting, or if not all of the work is shown. **Always do your own work. Do not ever copy from other students. This policy is strictly enforced.**

Format – Unless otherwise indicated, all homework assignments will be submitted as a single document stapled in the upper left corner with no additional binding. Remote students shall submit their assignments via e-mail as a single MS Word or PDF document. The first page must be a cover sheet with the student's name, student's 800 number, date of the assignment, course information, and assignment number. No problems or work should appear on the cover sheet. Homework shall be neat, well organized, and the writing clear. Answers to the homework questions must be provided in the order they were asked. Final answer(s) must be clearly boxed and given proper units. Finish all calculations. For example, 3π , $\sqrt{14}$, $\sin(0.2)$ are not final answers. These should be given as 9.4248, 3.7417, and 0.1987 respectively. If you are using engineering paper, do not use the backside because this is hard to read. You do not need to repeat the question or problem in your answer, but you may if you wish. Students may include computer codes if they wish, but all of the codes shall be placed at the end of the assignment in an appendix unless specifically requested to do otherwise.

Exam Policy

~Biweekly Quizzes – Instead of midterm exams, quizzes will be given on approximately a biweekly basis (once every two weeks) and graded on a 100 point scale. Duration of the quizzes will be strictly enforced, but will not last the whole period. Work on the quizzes must be neat and well organized. The final answer must be boxed and given proper units. Finish all calculations. For example, answer with '±4' instead of $\pm\sqrt{5^2-9}$. The quizzes will be closed book, but calculators are allowed for performing basic arithmetic.

Final Exam – The final exam will last the entire duration of the time allotted by the University, but no longer. Work must be neat and well organized. The final answer must be boxed and given proper units. Finish all calculations. For example, answer with '±4' instead of $\pm\sqrt{5^2-9}$. The final exam will be closed book, but calculators are allowed for performing basic arithmetic.

Missed Exams – A missed exam can be made-up ONLY IF: (1) the reason for missing the exam is beyond the student's control, e.g. such as a medical excuse, jury duty, death in the family or automobile accident, or (2) prior consent is obtained from the instructor for missing the exam based on a non-frivolous reason, e.g. such as a job interview, conference, or out-of-town job related travel. In either case, the student must submit a written and signed statement describing the reasons for missing the exam, with appropriate documentation, and petition for a makeup exam. Medical excuses require a note from the doctor. **A missed exam will carry zero grade if these conditions are not met.**

Attendance Policy

Students are required to attend class and to show up to lectures on time. The course instructor reserves the right to turn away late comers and to withdraw students from the course that are repeatedly absent. Students missing more than two lectures should seriously reflect on their commitment to this course, as missing classes is highly correlated with poor performance. Students absent from lecture are still held responsible for all information discussed, homework assigned, and exams administered during that missed lecture. In some cases, absence can be forgiven if the reason is not frivolous and coordinated with the course instructor well before the lecture is missed.

Participation Policy

The following items are expected from students as part of their participation grade:

- Ask questions! Despite how “silly” or “dumb” you may think your question is, it is very likely that other students have the same question. Confusion on even small details in course material can cause bigger problems and hold you back. If you are truly embarrassed by your question, send an anonymous e-mail to the course instruction. I promise I will respond!
- Respond honestly to poles and provide real-time feedback to instructor about the course. This will contribute greatly to the quality of the course and to your success in it.
- Visit the course instructor during office hours, or by appointment, if needed.
- Treat e-mail correspondence as a professional exchange of information.
- Turn off cell phones, pagers, or anything else that may distract the class.
- Purchase the text book with the correct edition.
- Read assigned sections of the book.
- Bring all of your course materials (text book, notebook, pens/pencils, paper, calculator, and ruler) to every class.
- Show proper etiquette during class. Do not talk, make excessive noise, or otherwise distract the class. You will be asked to leave and it will affect your grade.
- Maintain a good quality notebook. Keep everything well organized including notes, tests, homework, etc.

ACADEMIC DISHONESTY

As an entity of The University of Texas at El Paso, the Department of Electrical and Computer Engineering is committed to the development of its students and to the promotion of personal integrity and self responsibility. The assumption that a student’s work is a fair representation of the student’s ability to perform is the basis for departmental and institutional quality. All students within the Department are expected to observe appropriate standards of conduct. Acts of scholastic dishonesty such as cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in the whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student, or the attempt to commit such acts will not be tolerated. Any case involving academic dishonesty will be referred to the Office of the Dean of Students. The Dean will assign a Student Judicial Affairs

Coordinator who will investigate the charge and alert the student as to its disposition. Consequences of academic dishonesty may be as severe as dismissal from the University. See the Office of the Dean of Students' homepage (Office of Student Life) at <http://studentaffairs.utep.edu/dos> for more information.

You can also refer to the IEEE website for information on our code of ethics: <http://www.ieee.org/about/corporate/governance/p7-8.html>

AMERICAN DISABILITIES ACT

The UTEP Disabled Student Services Office was established for the purpose of providing appropriate and reasonable accommodations as mandated in Section 504 of the Rehabilitation Act of 1973 (<http://www.dol.gov/oasam/regs/statutes/sec504.htm>) and the Americans with Disabilities Act (<http://www.ada.gov/>). If you have needs regarding learning disabilities, please help by reporting your special needs to the course instructor the first week of classes.

For addition help, contact the Center for Accommodations and Support Services (CASS):

(915) 747-5148
cass@utep.edu
<http://sa.utep.edu/cass/>

DISCRIMINATION

I do not discriminate, nor will I allow discrimination, on the basis of age, gender, color, ethnicity, national origin, religion, disability, sexual orientation, or favorite sports team. Members of the UTEP community are protected from discrimination and harassment by the State and Federal Laws.

COURSE SCHEDULE AND OUTLINE

Important Dates

Aug 29	First day of class!!! ☺
Sep 4	Labor Day – University closed
Nov 3	Course drop deadline
Nov 23-24	Thanksgiving Holiday – University closed
Dec 8	Dead Day
Dec 12	Final Exam, 1:00pm – 3:45pm

Schedule of Topics

Topic 1 – Review of basis electromagnetics
Topic 2 – Electromagnetic waves: plane waves, polarization, scattering at an interface
Topic 3 – Transmission lines
Topic 4 – Waveguides
Topic 5 – Electromagnetic devices
Topic 6 – Smith charts