

THE UNIVERSITY OF TEXAS AT EL PASO
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

EE 3321 Electromagnetic Field Theory

This class will be delivered in hybrid format. Most sessions will be on line at the designated lecture time. Classroom sessions will occur four times during the semester. To ensure social distancing in the classroom, students will be assigned to one of two teams: Blue and Orange. Team “Blue” will meet 09/15/20, 10/06/20, 10/27/20, and 11/17/20. Team “Red” will meet on 09/17/20, 10/08/20, 10/29/20, and 11/19/20. Please plan accordingly. Meeting dates are subject to change.

All lectures will be recorded (Read Virtual Lecture Etiquette Statement). All exams will be online and timed (Read Institutional Policies Statement).

Semester: Fall 2020

Section: 22388

Class Time: Tuesday and Thursday 12:00 - 1:30 pm

Classroom: CRBL 205

Instructor: Dr. Benjamin C. Flores

Office: Eng. 336A

Office Hours: MW 3:00 to 4:00 PM or by appointment

E-mail: bflores@utep.edu

Required Book. *Fundamentals of Applied Electromagnetics*, Seventh Edition, by Fawwaz T. Ulaby and Umberto Ravaioli, Pearson Education Inc., New Jersey, 2015.

Other Materials. All slide presentations will be posted in **Blackboard**. You are responsible for downloading them and bringing them to class.

Course Topics. Electrostatics, magnetostatics, Maxwell’s equations, wave propagation.

Prerequisites. By courses, students must have earned a grade of “C” or better in EE 2351 Electric Circuits. By topic, students must have the following prerequisite knowledge:

- Waves and phasors
- Complex numbers
- Vector operations
- Cartesian, cylindrical, and spherical coordinate systems
- Second order ordinary differential equations

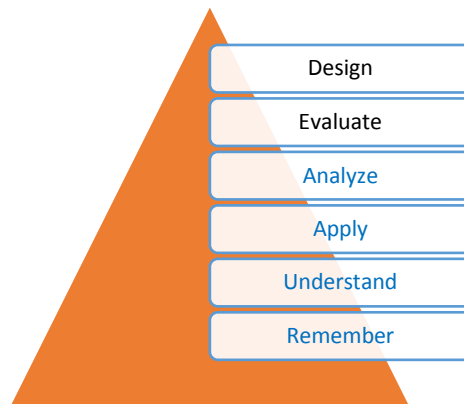
Class Attendance. Attendance is an essential component of this course. You’re expected to attend all lecture sessions. If you are unable to attend lecture, you are required to watch recorded lectures

THE UNIVERSITY OF TEXAS AT EL PASO
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Participation. Everyone is expected to participate. Disruptive behavior as determined by the instructor may be reported to OSCCR and penalized with a grade reduction.

Study Habits. For every hour of lecture, you are expected to dedicate at least two hours of study per day. This is a standard expectation. Thus, you should study approximately 6 hours per week or until you fully understand the material discussed in class. Time on task is essential for your success!

Course Outcomes. From an educational perspective, you are expected to *remember* (recall facts and basic concepts), *understand* (explain ideas and concepts), *apply* (use information in new situations), and *analyze* (draw connections among ideas). This is part of a taxonomy that describes your depth of knowledge as shown in the figure below.



You are required to master the four lower levels of this taxonomy. Consequently, by the end of the semester, you will be able to:

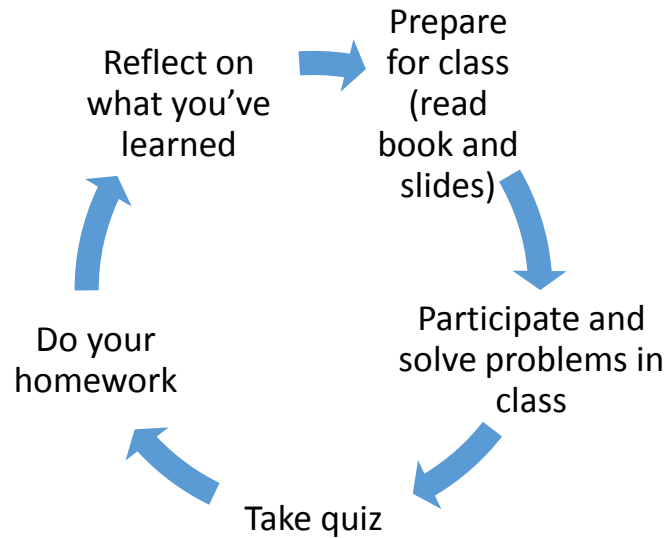
1. Understand spatial coordinate systems and apply calculus operators (Chapter 3)
2. Apply fundamental laws to solve basic electrostatic (resistance and capacitance) problems (Chapters 3 and 4)
3. Apply fundamental laws to solve basic magnetostatic (inductance) problems (Chapters 3 and 5)
4. Understand time dependence of electric and magnetic fields and the coupling that develops between them as a result of time variations (Chapter 6)
5. Propagation of Transverse Electro Magnetic (TEM) waves in space and in coaxial cables (Chapter 2 and 7)

These are the five learning objectives of the course.

Study Strategy. Dedicating time and effort to this course can be achieved systematically. The process is simple but it requires your commitment. As a college student you should strive to:

THE UNIVERSITY OF TEXAS AT EL PASO
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

1. Study the corresponding slide presentation **before** each class period.
2. Read the corresponding chapter sections in the book **before** each class period.
3. Show up to class on time and participate in discussions.
4. Solve, collaboratively, all exercises assigned in class.
5. Take all quizzes.
6. Do your homework.
7. Reflect on what you learned and need to improve upon.



A good engineer student commits to practice this cycle. As the saying goes: **practice makes perfect**. The expectation is that you will do your best. Your final grade should be a reflection of this effort.

Course Materials. The following items are required for the course:

- Engineering graph paper for homework assignments.
- 1 ½ inch, 3 ring binder to keep homework problems, exams, and MATLAB assignment.
- Graphics or scientific calculator.
- MATLAB manual available at <http://www.mathworks.com/access/helpdesk/help/techdoc/matlab.shtml>.

Study Groups. I encourage you to form virtual study groups of two or three people. You may get together to discuss homework problems and computer assignments. However your solutions must be a reflection of truly individual effort.

“Tutoring” Websites. The use of tutoring websites such as chegg.com is strictly prohibited. All work submitted for grading must be strictly your own.

THE UNIVERSITY OF TEXAS AT EL PASO
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Computer Usage. You are required to use MATLAB to conduct simulations of electromagnetic phenomena. There will be at least one MATLAB assignment per chapter. You will receive a handout for each assignment. Submit a report with the items described in the handout. This will include your MATLAB script which must be unique and well documented. Reports will be due a week after the assignment. There will be a 20 point deduction for late reports. Extremely late reports will not be accepted.

At-Home Experiments. Experimental projects that can be completed at home will be assigned on a regular basis. You will receive a handout for each assignment. Submit a report with the items described in the handout. This will include pictures. Reports will be due a week after the assignment. There will be a 20 point deduction for late reports. Extremely late reports will not be accepted.

Project topics include:

1. CD Rainbow
2. Leyden Jar
3. Paper Capacitor
4. Electromagnet
5. Electromagnetic Train
6. Transformer
7. Microwave Oven

You will require basic tools (scissors, pliers, wire cutter, screw driver, hammer), materials and supplies (ruler, wire, aluminum foil, glass jar, masking tape, stainless steel nails, Neodymium magnets, batteries, compact disk, etc.) and some supplies to complete these projects. A complete itemized list will be posted separately.

Daily Quizzes. It is in your best interest to always come prepared to class. There will be a short quiz in every class period to check that you are keeping up with your studies. There are no makeup opportunities for short quizzes. Quizzes will count 10% of the final grade.

Midterm exams. There will be five online exams, one for each learning objective. You are responsible for finding a reliable internet connection (hardwired if possible). Do not communicate with any class peer during the exam period. You may not take a break once you start taking the exam. Additional rules may be announced during exam periods. There will be no grading curves or negotiation on points earned. If you feel that a grading error was made, I will review the case individually. Remember you earn your grade based on the work you do. Midterms will count 60% of the final grade.

Final Examination. None.

Final Grade. The final grade will be determined as follows:

THE UNIVERSITY OF TEXAS AT EL PASO
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Midterm Exams (4)	60%
Quizzes	10%
MATLAB Assignments	15%
At home experiments	15%
Total	100%

The corresponding letter grade scale is:

A	100-90	Outstanding
B	89-80	Above average
C	79-70	Average
D	69-60	Poor
F	60 or less	Failing

Grade Formula

At any time, you can estimate your grade using the following formula:

$$\text{Final Grades} = 0.60 \times G + 0.10 \times A + 0.15 \times N + 0.15 \times A + S$$

where

$$G = \text{exam average}$$

$$A = \text{quiz average}$$

$$N = \text{MATLAB reports average}$$

$$A = \text{experiment reports average}$$

$$S = \text{extra credit}$$

Extra Credit. You may receive up to 5% of your final grade if you provide proof of IEEE, SWE, SHPE, or NSBE membership. Proof must be submitted by the end of the first month of the semester.

Note: This syllabus is subject to changes as determined by the instructor. Any changes will be posted on a timely manner.

Prepared by Prof. Benjamin C. Flores

THE UNIVERSITY OF TEXAS AT EL PASO
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

INSTITUTIONAL POLICIES STATEMENT

Academic Integrity and Professional Ethics. Every college student must abide by professional and academic integrity rules. I expect nothing but the best from you. However, I will not hesitate to report all cases of misconduct to the Office of Student Conduct and Conflict Resolution. Check the OSCCR website for UTEP's policy on academic dishonesty. Also, carefully review the IEEE code of ethics below. Remember, *cheating is for losers*.

IEEE Code of Ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to *the highest ethical and professional conduct* and agree:

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1. to hold paramount the safety, health, and welfare of the public, to strive to comply with ethical design and sustainable development practices, and to disclose promptly factors that might endanger the public or the environment;
 2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
 3. to be honest and realistic in stating claims or estimates based on available data;
 4. to reject bribery in all its forms;
 5. to improve the understanding by individuals and society of the capabilities and societal implications of conventional and emerging technologies, including intelligent systems;
 6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
 7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
 8. to treat fairly all persons and to not engage in acts of discrimination based on race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression;
 9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
 10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

Learning Disabilities. The UTEP Center for Accommodation and Support Services (CASS) was established for the purpose of providing appropriate and reasonable accommodations as mandated in Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA). If you have needs regarding learning disabilities, please help me to help you by reporting those needs the first week of classes.

THE UNIVERSITY OF TEXAS AT EL PASO
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Discrimination. Members of the UTEP community are protected from discrimination and harassment by State and Federal Laws. Discrimination on campus on the basis of age, gender, race, ethnicity, genetic information, national origin, religion, veteran's status, disability, sexual orientation or gender identity is strictly prohibited.

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I have read the course syllabus and understand the policies and procedures that apply to this course. Sign this page and upload it to Blackboard as HW Assignment 1.

Name _____

Signature _____

Student ID # _____

Date: _____