MICROWAVE ENGINEERING

University of Texas at El Paso

EE 4380/5390 – Microwave Engineering (Online)

Fall 2020

Course Information

Course designation:	EE 4380 / EE 5390
CRN:	19253 / 19256
Credit hours:	3
Lecture hours:	3

Catalog Description: Course concerning distributed-elements analysis and design of electric circuits at microwave frequencies. Topics include transmission lines, waveguides, two-port microwave circuits, matching, tuning, resonators, dividers, and directional couplers.

Instructor Information

Jesus J. Gutierrez, Ph.D.

Physical Office:	ENGR E-315
Virtual Office Hours:	T, R, and F - 10:00 am – 11:50 am via UTEP e-mail or by appointment via Zoom.
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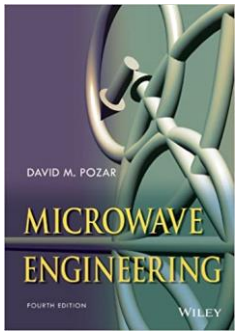
Course Materials

The following items are required for this course:

- TI85 scientific calculator or equivalent
- Computer or laptop with access to the internet
- Access to MATLAB 2013 or above.
- Textbook: Microwave Engineering (4th Ed.)
  David M. Pozar
  John Wiley & Sons, Inc., 2011
  ISBN: 978-0-470-63155-3
- Course website:
  https://empossible.net/academics/emp4301_5302/



The video lectures and notes will be posted to the course website and the homework, tests, and discussion forums will be posted to Blackboard. Students should be responsible of checking the website regularly for new material, watching the video lectures, taking notes, completing the required assignments, and submitting them to the professor on time.

You can install MATLAB on your laptop or computer following the UTEP link: https://www.utep.edu/technologysupport/ServiceCatalog/SOFTWARE_PAGES/soft_matlab.html. You will be required to create a Mathworks account to download both the software and the license using your UTEP username and password.

If a student has no computer with access to the internet, from UTEP's Technology Support Center has borrowing services for laptops and tablets: https://www.utep.edu/technologysupport/TSCenter/TSC_EQ_LaptopsTablets.html

Students can also make use of the computer labs across campus: https://www.utep.edu/technologysupport/ServiceCatalog/COMP_ComputerPrintingLabs.html

You can contact Technology support for a list of computer labs that have MATLAB software installed.

Students should maintain a well-organized notebook that archives their syllabus, lecture notes, homework problems, and tests. Students are also encouraged to purchase a USB Drive or use a cloud service like Dropbox or OneDrive to save their homeworks, lecture notes, tests, and other digital work.

Course Prerequisites

By Course (with grade of "C" or better):

- EE 3321 – Electromagnetic Field Theory

By Topic:

- Circuit Theory
- Maxwell's Equations
- Electromagnetic Waves
- Differential Equations
- MATLAB

Course Outline

Topics covered in this course include:

1. Review of Basic Electromagnetics
2. Transmission Lines
3. Numerical Analysis of Transmission Lines
4. Smith Charts
5. Waveguides
6. Network Analysis
7. Microwave Design
8. Microwave Communications

Course Outcomes

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

- Have a solid understanding of basic electromagnetic theory.
- Understand the basic principles of transmission lines and analyze them analytically and numerically.
- Understand and use Smith Charts.
- Understand the basic principles of waveguides
- Understand the basic principles of microwave devices.
- Understand how microwave devices contribute to communications.

Contribution to Professional Component

EE-4380/5390 is a senior/graduate level core course that builds on topics covered primarily in EE 3321 – Electromagnetic Field 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 microwave problems.
- Ability to identify, formulate, and solve engineering problems:
  Students solve problems, observe, and realize simulations of microwave problems.
- Ability to communicate effectively:
  Students create written reports and discuss electromagnetic topics in digital form.
- Ability to use computers to enhance problem solving:
  Students will use 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, participation in discussion boards, and four (4) exams.
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 (8) ……..……....40%
Exams (4) ……40%
Class Participation ……..20%

90% – 100% → **A**
80% – 89% → **B**
70% – 79% → **C**
60% – 69% → **D**
0% – 59% → **F**

For some students, there may be a "gray area" between two-letter grades in the final distribution, so two people getting the same weighted average grade could get different letter grades. If you are in one of these gray areas, whether you get a higher or lower grade depends primarily on two factors: (a) class engagement and participation and (b) whether your performance has been improving or declining over time.

Homework Policy

- Homework will consist of eight (8) assignments, and each worth 5%, for a total of 40% of the final grade.
- The homework will be posted to the course website and the due date for submission will be Sunday at 11:59 pm on the week that is due (check calendar).
- Homework will be submitted through Blackboard. The homework should be a single PDF document with the problems in order, clearly legible, must show all work, and the answers should be in a box.
- The document title for the homework should be as follows:

  LastName_FirstName_Homework_#

  Example: Doe_John_Homework_3.pdf
- Failure to comply with the instructions will result in points taken off the homework assignment.
- Students should be responsible for having internet access to complete the homework and submit it on time. Late submissions will not be accepted and will carry a grade of zero (0).
- You may only use a calculator or MATLAB for calculations like complex numbers, phasors, or arithmetic. You can look at the website course notes. Use of websites like Google, Chegg, or similar is not allowed.
- Your homework must be your own work. Cheating is taken very seriously. Students suspected of cheating or copying homework will be submitted to the Office of Student Conduct and Conflict Resolution and will remain part of your permanent record at UTEP.
- Students from the graduate section will have one or two extra problems to solve in addition to the regular problems.
- Students from the undergraduate section can solve the problems from the graduate section for extra credit in their homework.

Exam Policy

- There will be 4 exams, each one accounting for 10% of the final grade, for a total of 40% of the final grade.
- The exam will be posted to the course website and the due date for submission will be Sunday at 11:59 pm on the week that is due (check calendar).
- The exam will be submitted through Blackboard. It should be a single PDF document with the problems in order, clearly legible, must show all work, and the answers should be in a box.

- The document title for the exam should be as follows:
  LastName_FirstName_Test#
  Example: Doe_John_Test_2.pdf
- Failure to comply with the instructions will result in points taken off the homework assignment.
- Students should be responsible for having internet access to complete the test and submit it on time. Late submissions will not be accepted and will carry a grade of zero (0).
- You cannot use any other resources than paper, pen, and your calculator or MATLAB for basic calculations. You can look at the course notes, but the use of websites like Google, Chegg, or similar is prohibited.
- Your test must be your own work. Cheating is taken very seriously. Students suspected of cheating will be submitted to the Office of Student Conduct and Conflict Resolution and will remain part of your permanent record at UTEP, along with a zero (0) grade for the test.
- Students from the graduate section will have one or two extra problems in addition to the regular problems which will be more difficult.
- Students from the undergraduate section can solve the problems from the graduate section for extra credit in their exam.
- Some important dates to keep in mind:

Date	Motive
Monday, September 7	Labor Day (No Classes)
Wednesday, September 9	Fall Census Day
Friday, October 30	Class Drop/Withdrawal Deadline
November 26-27th	Thanksgiving Holiday (No Classes)
Friday, December 4	Dead Day

~ Missed Exams ~

A missed exam can be made-up IF AND 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.**

Class Participation Policy

- The class participation will consist of different forums in which students will participate by posting their questions, impressions, helping each other and sharing ideas with their fellow peers.
- Class participation is worth 20% of the final grade.
- Some forums will have a reading assignment or an online video of an interesting application of the topic that is being taught. There will also be forums to post questions and general discussions about the topics presented during the course.
- Class participation will be graded in relation to the number of posts submitted, replies to other fellow students, and the quality of the posts (i.e. a post just saying "Cool!" or "I agree." without any justification are discouraged).
- Be sure to post or reply at least twice a week for class participation credit.
- If you are too embarrassed to post a question, the forum to post questions will have an option to post anonymously. No matter how dumb you think your question is, there may be other students that have the same question. Confusion in small details in course material can cause bigger problems and hold you back. If you are still embarrassed to post your question anonymously, send an anonymous e-mail to the instructor. I promise I will respond!
- However, anonymous posts will not count towards class participation credit since it is not known who makes the post.
- Posting answers for homework or tests, or partial answers in any form, in any forum, is prohibited.
- When communicating online, ALWAYS follow the netiquette rules:
    - Treat your instructor with respect in any form of online communication.
    - Treat your fellow classmates with respect in any form of online communication.
    - Use clear and concise language. Avoid slang terms and abbreviations.
    - All communication should have correct spelling and grammar.
    - Avoid using caps lock.
    - Limit or possibly avoid the use of emoticons.
    - Be cautious when using sarcasm or humor, as it is often lost in discussion and can be taken seriously or offensive.
    - Do not share personal or confidential information, both you and others.

Attendance Policy

Students are required to watch the video lectures, take notes, and do all assignments and tests. As an online course, attendance will be measured by the submission of on-time assignments and tests. Students missing more than two assignments, or one exam should seriously reflect on their commitment to this course and will be contacted by the instructor regarding their situation. The instructor will then reserve the right to drop students from the course if the student misses another assignment or test.

Course Calendar

This is a tentative schedule of the course topics, assignments, and tests, and might be subject to change.

Week	Dates	Topic	Assignments	Notes
1	Aug. 24-30	1. Review of Basic Electromagnetics	-	
2	Aug. 31-Sept. 6	2. Transmission Lines	Homework 1	HW 1 Due Sept. 6 at 11:59 pm
3	Sept. 7-13	2. Transmission Lines	Homework 2	HW 2 Due Sept. 13 at 11:59 pm
4	Sept. 14-20	3. Numerical Analysis of Transmission Lines	-	
5	Sept. 21-27	3. Numerical Analysis of Transmission Lines	Exam 1 (Due Sept. 27 at 11:59 pm)	Exam 1 covers topics 1 and 2.
6	Sept. 28-Oct. 4	4. Smith Charts	Homework 3	HW 3 Due Oct. 4 at 11:59 pm
7	Oct. 5-11	4. Smith Charts	Homework 4	HW 4 Due Oct. 11 at 11:59 pm
8	Oct. 12-18	5. Waveguides	-	
9	Oct. 19-25	5. Waveguides	Exam 2 (Due Oct. 25 at 11:59 pm)	Exam 2 covers topics 3 and 4
10	Oct. 26-Nov.1	6. Network Analysis	Homework 5	HW 5 Due Nov. 1 at 11:59 pm
11	Nov. 2-8	6. Network Analysis	Homework 6	HW 6 Due Nov. 8 at 11:59 pm
12	Nov. 9-15	7. Microwave Design	-	
13	Nov. 16-22	7. Microwave Design	Homework 7	HW 7 Due Nov. 22 at 11:59 pm
14	Nov. 23-29	8. Microwave Communications	Exam 3 (Due Nov. 29 at 11:59 pm)	Exam 3 covers topics 5 and 6
15	Nov. 30-Dec. 6	8. Microwave Communications	Homework 8	HW 8 Due Dec. 6 at 11:59 pm
16	Dec. 7-11	Final Exam Week	Exam 4 (Due Dec. 11 at 11:59 pm)	Exam 4 covers topics 7 and 8

Time Management

Time management is a common problem for many online students. Here are some tips that may help you manage your time online:

Plan and Prioritize: For each course, you should plan to spend approximately 3 hours for every credit hour taken. So, for one course you should expect to spend:
3 hours of class time + 9 hours of study and prep time = 12 hours per week.

Use Various Study Strategies: Since online classes will likely only engage your visual and auditory senses, it is up to you to devise creative ways to use your other senses for learning.

Message Your Friends Later: When you set a schedule for your online class, make sure that this is college time, not computer time. Ban yourself from social networking sites such as Facebook or Instagram when you are supposed to be working. If you intend to spend a long time working online, you can reward yourself with little breaks every few hours, but otherwise stick to only using the computer for activities related to your classes.

Cramming Rarely Works: Cramming might help you do well on a test, but it won't help you retain knowledge or perform well in the long run. Consistency and habitual studying are much more effective than large infusions of knowledge the night before a big test.

Ask for Help: Most professors are more than happy to help students who feel confused or are struggling in the class. Most professors, however, will not go out of their way to ask you if you need help.

Set Your Own Deadlines: Make your own deadline for finishing online work a few days before the professor's due date. By sandbagging your deadlines this way, you help yourself account for unexpected incursions on your time.

Meeting Deadlines: You should never wait until the last minute to try to submit an assignment or take a test. If your paper is due by 11 pm—it’s best to be at least a couple of hours early just in case you experience technical issues.

Invest in a Laptop and/or Mobile Device: You don't need your own laptop or tablet to take courses online, but having one means that you can make good use of time that would typically be lost commuting to a computer lab or waiting for an available computer.

Save All Your Work: Make sure to save all your projects on your computer and back them up on a jump drive or cloud storage site. It is better to take the time to save and save again than to have to replace a lost or corrupted file.

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 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, e-mail: cass@utep.edu, website: http://sa.utep.edu/cass/

Copyright and Fair Use

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Discrimination Statement

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