

1 Course Information

Instructor

J. W. McDaniel

Office: 112 Radar Innovations Lab

e-mail: jmcDaniel@ou.edu

Office Hours:

W 2:30-4 pm (RIL 112),

Th 2:30-4 pm (Devon TBD),

and by appointment

Prerequisites

Vector Calculus

Electromagnetic Fields I

Course Website

<https://canvas.ou.edu>

Credit

3 undergraduate/graduate hours

Class Times

T & Th 4:30-5:45 p.m.

Textbook

Required:

Advanced Engineering Electromagnetics

Balanis 2nd ed.

Supplementary:

Engineering Electromagnetics Demarest

Class Format

This class will not be pure lecture. There will be class discussion and activities. Participation is expected.

1.1 Course Objectives

Upon completion of this course you will know, understand (intuitively and mathematically), and be able to apply Maxwell's equations. All material in electromagnetics stems and can be derived from Maxwell's equations. After this course you will also be able to derive, understand, and apply plane wave and waveguide equations. There will also be detailed discussion on transmission line theory and how to design them. You will understand and be able to design some resonant structures, in particular empty cavities and linear antennas.

2 Class Policies

1. Maintain collegial atmosphere in classroom
 - Participate in discussion
 - Be respectful of other students
 - Put cell phones on silent
 - Do not use cell phones or laptops in class
 - Ask questions
 - Let me know when you are lost
2. Contact with the instructor
 - E-mail is the best way to contact me for a quick question
 - For long questions please come to office hours
 - If you can't come to office hours e-mail me for an appointment
3. Extra Credit
 - No extra credit will be given in this course.

4. Attendance

- Class attendance is expected
- Make every attempt to be on-time to class
- If late to class please try to minimize the distraction that you create

5. Academic Integrity

- It is your responsibility to read and understand the Academic Integrity Policy (<http://www.ou.edu/provost/integrity/>).
- Plagiarism and copying will not be tolerated. If caught, all parties involved will receive a zero for the assignment. If caught multiple times, then the repeat offenders will receive a failing grade for the course. There will be a report due for this course, please educate yourself on the proper use of citations and what constitutes plagiarism.

6. Reasonable Accommodation

- Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.

7. Late Assignments

- No late assignments will be accepted for this course (exception noted in Homework section).
- If you will not be in town when an assignment is due, either give the assignment to another student to turn in for you, or turn in the assignment before you leave town.

8. Religious Holidays

- It is the policy of the University to excuse the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required classwork that may fall on religious holidays.

3 Assignments

3.1 Grading

| | |
|--------------------------|-----|
| <i>Homework:</i> | 10% |
| <i>Homework Quizzes:</i> | 10% |
| <i>Midterm Project:</i> | 10% |
| <i>Midterm Exam:</i> | 25% |
| <i>Final Project:</i> | 15% |
| <i>Final Exam:</i> | 30% |

The Undergraduate and Graduate grading will be completely separate. The grading scheme is shown below:

| | |
|--------------|---|
| 90-100 | A |
| 80-89 | B |
| 70-79 | C |
| 60-69 | D |
| 59 and below | F |

3.2 Homework

- Homework will be posted in canvas under the assignment tab.
- Homework should be turned in at the beginning of class on the due date listed at the top of the assignment.
- You may collaborate with other students on homework (I in fact encourage you to do so!); however, there is a line between collaboration and copying. If students are caught copying, then both students will receive a zero on the assignment. If caught twice, I will report you both to the disciplinary committee.
- Late Policy: After the due date, homework will be accepted until the end of the following class at 15% off. It will not be accepted after that unless the student has a University accepted excuse.
- Assignments are expected to be turned in before a student leaves town if a student must miss class the day the assignment is due. In this case, the assignment can also be scanned and emailed to me.
- There will be homework problems assigned from the book and handouts of problems written by me.
- Homework will be a completion grade. Essentially, if you write something reasonable down for each problem and box an answer you will receive full-credit.
- Homework solutions will be posted on canvas.

3.3 Homework Quizzes

There will be four homework quizzes throughout the semester that will take place at the end of the class. Essentially, if you understood the homework, you will be fine for the quiz.

3.4 Midterm Project

More details will be given later. However, the project will be an introduction to the ANSYS High Frequency Structure Simulator (HFSS) software. The goal is to follow the provided tutorials and walk through a couple of examples to learn the software. This will be needed to complete the final project.

3.5 Final Project

More details will be given later. However, the final project will cover the analysis and design of a microstrip and stripline transmission line as well as a quarter-wave transformer matching network. You will design, simulate, analyze theoretically, and compile a report of your understanding.

3.6 Midterm Exam

The midterm exam will be take-home (largely because I couldn't fit them in the course schedule). It will most likely be handed out at the end of class on Tuesday and will be due in-class the following Tuesday. Since it is a take-home exam, obviously, it will be open book and note. However, it is not open-neighbor. You must work the exam entirely by yourself.

3.7 Final Exam

There will be a final exam during the final exam period for this course - Friday December, 11th from 4:30-6:30 pm. This will be an open book open note exam as well.

4 Additional Policies

4.1 Disability Accommodation

The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students with disabilities must be registered with the Office of Disability Services prior to receiving accommodations in this course. The Office of Disability Services is located in the University Community Center, 730 College Ave., (405) 325-3852 (Voice), (405) 325-4173 (TDD), (405) 325-4491 (Fax), and Email: drc@ou.edu.

4.2 Academic Integrity

The Provost's web pages include information on expectations for academic integrity. Please review the material at http://integrity.ou.edu/students_guide.html. It is the aim of the faculty of the University of Oklahoma to foster a spirit of complete honesty and a high standard of integrity as well as academic excellence. Any attempt by students to present as their own any work that they have not honestly performed is regarded by the faculty and administration as a serious offense and renders the offenders liable to serious consequences, possibly suspension.

4.3 Adjustments for Pregnancy/Childbirth Related Issues

Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact me as soon as possible to discuss. Generally, modifications will be made where medically necessary and similar in scope to accommodations based on temporary disability. Please see www.ou.edu/content/eoo/pregnancyfaqs.html for commonly asked questions.

4.4 Title IX Resources

For any concerns regarding gender-based discrimination, sexual harassment, sexual misconduct, stalking, or intimate partner violence, the University offers a variety of resources, including advocates on-call 24.7, counseling services, mutual no contact orders, scheduling adjustments and disciplinary sanctions against the perpetrator. Please contact the Sexual Misconduct Office 405-325-2215 (8-5) or the Sexual Assault Response Team 405-615-0013 (24.7) to learn more or to report an incident.

5 Course Schedule

Please find course schedule on next page.

| Topic | Subtopic | Class Day | Assigned Reading | Homework Assignment | Homework Quiz | Exam | Project |
|--------------------------------|---|-----------|----------------------------|-------------------------|---------------|------|-----------------|
| Maxwell's Equations | Syllabus Day | 1 | 21-Aug | | | | |
| | Review of Vector Calc and M.E. | 2 | 23-Aug 1.1-1.4 | | | | |
| | Review of Vector Calc and M.E. | 3 | 28-Aug | | | | |
| | Electrical Properties of Matter | 4 | 30-Aug 2.1-2.4 | | | | |
| | In-Depth Look at M.E. | 5 | 4-Sep | HW #1 (Due: Sept. 6th) | | | |
| | Boundary Conditions | 6 | 6-Sep 1.5 | | | | |
| Plane Waves | Time-harmonic/Helmholtz Eqs. | 7 | 11-Sep 1.6, 1.7, 3.1-3.3 | | | | |
| | Wave Equation/Propagation | 8 | 13-Sep 3.4.1, 4.1, 4.2.1 | | | | |
| | Lossy and Oblique Angle Prop. | 9 | 18-Sep 4.2.2, 4.3 | HW #2 (Due: Sept. 18th) | Quiz #1 | | |
| | Polarization | 10 | 20-Sep 4.4 | | | | |
| | Reflection and Transmission | 11 | 25-Sep 5.1-5.4 | HW #3 (Due: Sept. 25th) | | | |
| | Lossless Normal/Oblique Reflection and Transmission | 12 | 27-Sep | | Quiz #2 | | |
| Waveguides & Cavity Resonators | Brewster/Critical Angle | | | | | | |
| | Multiple Interfaces | 13 | 2-Oct 5.5 | HW #4 (Due: Oct. 2nd) | | | Midterm Project |
| | Rectangular Waveguide | 14 | 4-Oct 8.1-8.2 | | | | |
| | WG Cutoff Freq. and Prop. | 15 | 9-Oct | HW #5 (Due Oct. 9th) | | | |
| | Rectangular Resonant Cavities | 16 | 11-Oct 8.3 | | Quiz #3 | | |
| | Circular Waveguides/Test Rev. | 17 | 16-Oct 9.1-9.2 | | | | MT Project Due |
| Midterm Exam | Due Oct. 16th | | | | | THM1 | |
| | TL Theory & Network Parameters | 18 | 18-Oct Supp. Mat. (Canvas) | | | | |
| | Characteristic Impedance | 19 | 23-Oct 8.9 | | | | |
| | Reflection Coefficient | 20 | 25-Oct | HW #6 (Due Oct. 25th) | | | |
| | Smith Chart/Stripline | 21 | 30-Oct | | | | |
| | Network Parameters | 22 | 1-Nov | | | | |
| Vector Potential | Network Parameters Cont. | 23 | 6-Nov | | Quiz #4 | | Final Project |
| | Derivation | 24 | 8-Nov | | | | |
| | Hertzian Dipole | 25 | 13-Nov 6 (all sections) | HW #7 (Due Dec. 6th) | | | |
| | Radiation Patterns | 26 | 15-Nov | | | | |
| | Radiation Resistance and Gain | 27 | 20-Nov | | 5 | | |
| | Realistic Dipoles | 28 | 27-Nov | | | | |
| Theorems | Reciprocity theorem | 29 | 29-Nov 7.5 | | 6 | | |
| | Image theory/ Monopole | 30 | 4-Dec 7.4 | | | | |
| | Final Review | | | | | | |
| | Due Dec. 13th | | | | | | |
| | Final Exam | | | | | THF1 | |