

School of Engineering + Technology
EE322 - Electromagnetic Waves
Spring 2020
Belk 355 – MWF 1:25 am-2:15 pm

Instructor Information

Instructor: Dr. Yeqin Huang
Campus Office/Office hours: MW 11:00 am-12:00 am
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Catalog Description

A study of Maxwell's equations, transmission line theory, plane waves, guided electromagnetic waves in wave guides.

Prerequisites: EE 321 with a grade of C or better.

Credits: 3

Course Aims and Objectives

The goal of this course is to provide an understanding of electromagnetic waves, dielectric and magnetic materials, waveguides, transmission lines, as well as an introduction to antennas. Upon completion of the course, the students are expected to be able to

1. Demonstrate understanding of basic concepts of wave propagation.
2. Understand and apply mathematical concepts of vector analysis to the time-dependent solution of electromagnetic engineering.
3. Apply higher level mathematics in the solution of engineering problems making use of Maxwell's equations in applications involving reflection, transmission, and oblique incidence of plane waves, transmission lines, waveguides, and boundary value problems in electromagnetics.

Course Materials

Required Text: Arlon T. Adams and Jay Kyoon Lee, *Electromagnetics*, 2nd Edition, Cognella Academic Publishing, USA, 2018.
ISBN: 1516571584.

References: Matthew N. O. Sadiku, *Elements of Electromagnetics*, 4th Edition, Oxford University Press, USA, 2006.
ISBN: 0195300483.

Grading

The following percentages will be used to determine the final grades.

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|--------------|-----|
| • Homework | 20% |
| • Two Tests | 30% |
| • Quiz | 20% |
| • Final exam | 30% |

Grades will be awarded based on the following scale:

Numerical Course Average	Grade Assigned	Numerical Course Average	Grade Assigned
97-100	A+	72 - 77	C
92 - 96	A	70 - 71	C-
90 - 91	A-	68 - 69	D+
88 - 89	B+	62 - 67	D
82 - 87	B	60 - 61	D-
80 - 81	B-	0 - 59	F
78 - 79	C+		

Tentative Schedule

Week	Topic
01	Vector calculus
	Maxwell's equations
02	Maxwell's equations (cont'd)
	Plane waves in lossless dielectrics
03	Wave propagation in lossy dielectrics
	Plane waves in conductive materials
04	Power and the Poynting vector
	Reflection of a plane wave at normal incidence
05	Reflection of a plane wave at oblique incidence
	Transmission line equations
06	Input impedance , Standing wave ratio
	Lossless and low-loss propagation, The Smith Chart
07	Power transmission and loss characterization
	TEST 1
08	Rectangular waveguides
	Rectangular waveguides (cont'd)
09	TE modes, TM modes
	Wave propagation in the waveguide
10	Power transmission and attenuation
	Power transmission and attenuation, cont'd
11	Waveguide resonators
	Introduction to antennas
12	Hertzian dipole, Half-wave dipole antenna
	Quarter-wave monopole antenna
13	Small loop antenna
	Antenna characteristics
14	Antenna arrays
	TEST 2
15	Review
	Review
16	Final

Faculty Expectations of Students/Course Policies

Attendance:

Students are required to attend all lectures. In the event that a student must miss a class they should inform the instructor and be able to provide ample evidence to justify the absence.

Timely Submissions:

Typically assignments must be submitted on time or they will receive a grade of zero. The instructor MAY exercise discretion in the instance a student can demonstrate extenuating circumstances.

Expectations for Submitting Required Work:

Work will be completed to professional standards. Hand written work must be written legibly. Digital submissions will be done for some assignments.

Technology:

The School of Engineering + Technology requires that all students have a laptop computer capable of running standard software and accessing the internet. Many of the applications can be accessed without installation using virtual.wcu.edu. Mobile devices, such as phones, cannot replace a laptop.

Student Resources

Writing and Learning Commons (WaLC):

The Writing and Learning Commons (WaLC), located in BELK 207, provides free [course tutoring](#), [writing tutoring](#), [academic skills consultations](#), [international student consultations](#), and online writing and learning resources for all students. To view schedules and make appointments for any of these services, visit tutoring.wcu.edu or call 828-227-2274.

Math Tutoring Center:

The Mathematics Tutoring Center (MTC) in Stillwell 455 provides drop-in tutoring for math courses and math-related content across the curriculum, workshops on study skills specific to math courses, and graduate and professional exam preparation resources. Tutoring is available on a drop-in basis, MTWR 9:00am-9:00pm and Friday 9:00am-5:00pm. For more information, please visit <http://mtc.wcu.edu/> or contact us at 828-227-3830.

Hunter Library:

Hunter Library provides students with access to group and individual study spaces and to thousands of information resources: print and electronic books, newspapers, and scholarly journal articles.

These resources can be searched online and often accessed there (<http://www.wcu.edu/hunter-library>) or library staff and subject specialists skilled in their specific disciplines can be contacted via the library's research guides (<http://researchguides.wcu.edu/>).

Blackboard Support:

The learning management system for this class is Blackboard and can be found at <http://wcu.blackboard.com>

Additional help with Blackboard can be found at tc.wcu.edu, (828) 227-7487 or by visiting the Technology Commons located on the ground floor of the Hunter Library.

Academic Toolbox:

The Academic Toolbox is available in all WCU courses via the course Blackboard site. It can be found in the left-hand side column. The Academic Toolbox contains information and contact information for nearly all of the resources needed by WCU students, including but not limited to: technology assistance, academic services, student support, co-curricular programs and university policies.

Academic Calendar

This includes dates for all breaks, university closures, final exams, etc. The academic calendar can be found at <http://www.wcu.edu/learn/academic-calendar.asp>

Final Exam

The university final exam schedule can be found at <http://www.wcu.edu/learn/academic-services/registrars-office/>

Syllabus Updates

This syllabus, along with its course schedule, is based on the most recent information about the course content and schedule planned for this course. Its content is subject to revision as needed to adapt to new knowledge or unanticipated events. Updates will remain focused on achieving the course objectives and students will receive notification of such changes. Students will be notified of changes and are responsible for attending to such changes or modifications as distributed by the instructor or posted to Blackboard.

Academic Integrity Policy and Reporting Process

This policy addresses academic integrity violations of undergraduate and graduate students. Graduate students should read inside the parenthesis below to identify the appropriate entities in charge of that step of the process.

Students, faculty, staff, and administrators of Western Carolina University (WCU) strive to achieve the highest standards of scholarship and integrity. Any violation of the Academic Integrity Policy is a serious offense because it threatens the quality of scholarship and undermines the integrity of the community. While academic in scope, any violation of this policy is by nature, a violation of the Code of Student Conduct and will follow the same conduct process (see Article VII.B.1.a.). If the charge occurs close to the end of an academic semester or term or in the event of the reasonable need of either party for additional time to gather information timelines may be extended at the discretion of the Department of Student Community Ethics (DSCE).

General:

This policy addresses academic integrity violations of undergraduate and graduate students. Students, faculty, staff, and administrators of Western Carolina University (WCU) strive to achieve the highest standards of scholarship and integrity. Any violation of this policy is a serious offense because it threatens the quality of scholarship and undermines the integrity of the community. Instructors have the right to determine the appropriate academic sanctions for violations of the Academic Integrity Policy within their courses, up to and including a final grade of “F” in the course in which the violation occurs.

Definitions:

Cheating – Using, or attempting to use, unauthorized materials, information, or study aids in any academic exercise.

Fabrication – Creating and/or falsifying information or citation in any academic exercise.

Plagiarism – Representing the words or ideas of someone else as one’s own in any academic exercise.

Facilitation – Helping or attempting to help someone to commit a violation of the Academic Integrity Policy in any academic exercise (e.g. allowing another person to copy information during an examination).

Undergraduate and Graduate Academic Integrity Process:

Additional information is available on the Student Success website under Student Community Ethics: <http://www.wcu.edu/experience/dean-of-students/academic-integrity.aspx>