Kimmel School  
Department of Engineering and Technology  

Course Syllabus for Spring 2017  

EE 322 – Electromagnetic Waves  
3 Credits

Instructor: Dr. Yeqin Huang

Contact Info: Office: Belk 337  
Office Hours: Posted on office door  
Office Phone: 227-2543  
E-mail: yhuang@email.wcu.edu

Meeting Periods: MW 9:30 – 10:45, Belk 355

Course Description: A study of Wave Propagation: Maxwell's equations and time dependent solutions, energy density of electromagnetic fields, magnetic and dielectric materials. Plane Waves: reflection, transmission, and oblique incidence. Guided Waves: transmission lines, waveguides and optical guides; Boundary value problems in electromagnetics.

Course Outcomes: 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 student will be able to accomplish the following:

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.

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


Instructional Approach: Course material will be introduced during lecture. Homework assignments will reinforce material covered in class.

Evaluation: Each student will be evaluated based on performance in the following areas. Respective weights of each performance area are as noted.

- Homework 25%
- Quiz 15%
- Two Tests 30%
- Final exam 30%
The grading scale below will be used to determine final grades:

<table>
<thead>
<tr>
<th>Numerical Course Average</th>
<th>Grade Assigned</th>
<th>Numerical Course Average</th>
<th>Grade Assigned</th>
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<tbody>
<tr>
<td>97–100</td>
<td>A+</td>
<td>72 – 77</td>
<td>C</td>
</tr>
<tr>
<td>92 – 96</td>
<td>A</td>
<td>70 – 71</td>
<td>C-</td>
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<tr>
<td>90 – 91</td>
<td>A-</td>
<td>68 – 69</td>
<td>D+</td>
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<tr>
<td>88 – 89</td>
<td>B+</td>
<td>62 – 67</td>
<td>D</td>
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<tr>
<td>82 – 87</td>
<td>B</td>
<td>60 - 61</td>
<td>D-</td>
</tr>
<tr>
<td>80 – 81</td>
<td>B-</td>
<td>0 - 59</td>
<td>F</td>
</tr>
<tr>
<td>78 – 79</td>
<td>C+</td>
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Attendance: Students are required to attend all lectures.

Examinations: Two tests and a final are anticipated. All exams are closed book and closed notes, unless otherwise stated by the instructor. Calculators are permitted on all exams.

Assignments: Timely and full completion of assignments is vital to student success in this course. To this end, the following policies will be in effect:

- Students are expected to submit work on time. Assignments submitted after the due date will not be accepted.
- No make-up exams will be given unless the instructor is notified prior to the absence and/or corroborating documentation of the reason for the absence is provided.
- Assignments missed due to an excused absence will be due during the next class period.

Honor Code: Students are expected to comply with the spirit and intent of the University Academic Honesty Policy as stated in the Undergraduate Catalogue. Visit WCU’s Undergraduate Student Handbook for all related policies and procedures. [Visit WCU’s Undergraduate Student Handbook](http://www.wcu.edu/studentd/StudentHandbook). Evidence of academic dishonesty will result in a grade of F (numerically “0”) for that assignment on the first infraction. A second infraction will result in a grade of F for the course.

Disabilities: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities and/or medical conditions. Students who require reasonable accommodations must identify themselves as having a disability and/or medical condition and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact the Office of Disability Services for more information at (828) 227-3886.

Classroom Policies: The following policies will be in effect during class meetings and project sessions:

- Cell phones must be turned off during class time.
- Drinks, food and tobacco are not permitted in classrooms or laboratories.
- Instant messenger, AOL or other non-instructional software is not permitted on classroom or lab computers. Printing of material in lab which is not course-related is also not permitted.
**CoursEval Dates:** April 2 – April 29 (8:00 AM)

**Tentative Course Schedule:**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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</thead>
</table>
| 01   | Vector calculus  
Maxwell’s equations |
| 02   | Martin Luther King Jr. birthday holiday (no class)  
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, 05/01/17 – 05/05/17 |