

# COURSE SYLLABUS

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## 1 ECE 3690 - Engineering Electromagnetics

### 2 Meeting Information

4 credits, 5 contact hours Three 50-minute lectures & One 100-minute Practicum Session

a. **Section 001:**

Lecture: MWF from 01:30 pm to 02:20 pm, **Tolentine Hall 316**

Lab: W from 02:30 pm to 04:10 pm, **Tolentine Hall 215**

### 3 Course Instructor(s), TA(s)

a. **Section 001:**

Class Instructor: [Ahmad Hoorfar](#)

Office Hours: M& W 12:00PM–1:00PM (or by appointment), or by appt.

Lab Instructor: [Ahmad Hoorfar and TA](#)

Office Hours: , or by appt.

TA(s):

Office Hours: , or by appt.

### 4 Textbook

Shen, Liang Chi & Kong, Jin Au, *Applied Electromagnetism, 3rd edition*, Brooks/Cole., 1995. ISBN: 0-534-94722-0. **REQUIRED.**

a. **Other Supplemental Materials:** Other Supplemental Materials: Extensive 'Hand-Out' Notes & CAD software tools and accompanying documentation

b. **References:**

F. T. Ulaby "Electromagnetics For Engineers", Prentice Hall, 2005.

### 5 Specific Course Information

a. **Catalog Description**

Maxwell's equations, plane waves, dissipative media, reflection and transmission of waves at an interface, metallic and optical waveguides, transmission lines, linear and array antennas. Practicum includes computer projects, laboratory demonstrations and problem solving. Three lecture hours and a two-hour practicum per week.

b. **Prerequisites:** MAT 2500 and PHY 2402; **Co-requisites:** None

c. Required for B.S. Electrical Engineering

### 6 Course-specific Goals

a. Upon completing the course, among the various student outcomes will achieve are: 1) understand the basic theoretical principles of classical time harmonic electromagnetic field theory as given by the Maxwell equations.; 2) apply these theoretical principles to modern engineering

problems in wave propagation in dielectric media, metallic and dielectric waveguides, coaxial lines and optical fibers 3) the use of the Smith Chart to solve impedance transformation and impedance matching problems; and 4) the ability to perform literature survey in modern RF, microwave and radar related topics, and write technical reports based on the analysis, design and simulation of electromagnetic fields in free-space as well as in microwave guiding structures.

b.

ABET Student Outcomes						
1	2	3	4	5	6	7
X	X	X	X			

The above student outcomes are defined by the Accreditation Board for Engineering and Technology (ABET) as:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

## 7 List of Covered Topics

1. Introduction, Complex and Vector Algebra
2. Maxwell's Equations
3. Electrostatics and Magnetostatics
4. Uniform Electromagnetic Waves
5. Wave Propagation in Lossy Media
6. Boundary Conditions
7. Reflection and Transmission of Waves
8. Waveguides and Resonators
9. Transmission Lines
10. Smith Chart and Impedance Matching
11. Antennas ( if time permits )

## 8 Tentative Schedule

Tentative schedules for all sections follow. Be sure to refer to the schedule for your specific section, if more than one is provided.

## Tentative Schedule for **All Sections**

Week	Topics
1	Introduction, Complex and Vector Algebra
2	Maxwell's Equations
3	Electrostatics and Magnetostatics
4-5	Uniform Electromagnetic Waves and Polarization
6	Wave Propagation in Lossy Media
7	Boundary Conditions
7-8	Reflection and Transmission of Waves
9-10	Waveguides and Resonators
11	Transmission Lines
12-13	Smith Chart and Impedance Matching
14	Introduction to Antennas (if time permits )

## 9 Grading Policy

Homework 10 %  
Practicum & computer projects 17 %  
Research paper & PowerPoint presentation 8 %  
2 Tests 18 % each  
Final Exam 29 %

No make-up test will be given for any reason. Instead, the percentage of the grade associated with each test missed will be added to the final examination percentage. No credit for late assignments will be allowed.

The final letter grades will be determined based on curving of cumulative average of Homework, Practicums, Research presentation, 2 Tests and the Final Exam, with the class average set as C or C+.

## 10 HW Assignment and Laboratory Report Submission Policy

1) Practicum: Practicum sessions will include computer projects and student project presentations. Some of the practicum sessions may be allocated to problem-solving sessions and/or exams.

2) Homework: No credit will be given for late weekly homework assignments for any reason. It is extremely important that the homework problems be worked regularly - not only for the sake of the grade, but also to ensure sufficient facility in problem solving so that you can perform well within the constraints of an hour's test or final exam.

3) Miscellaneous (please read this carefully!) Please note that group study for working out solutions to homework problems and computer projects is acceptable, and helpful to many students. However, the homework or project report you turn in should be written out on your own, and not

copied verbatim from another student's work or from the material found Online. It should reflect your understanding of the material. Homework problems or practicum reports which are turned in and found to be verbatim copies of each other will be given zero credit, regardless of which is the original work. All work on an exam is to be entirely on your own.

## 11 Attendance Policy

Attendance at lectures is required, attendance in practicum sessions is strongly recommended. You are responsible for whatever is presented in the class. Attendance is required for all examinations.

Please note: Unauthorized use of all Laptops, tablets, smart phones, cell phones, and iPad or PDAs, are prohibited during lecture hours.

Whenever possible, students should inform the instructor if they plan to be late or absent from class. In all cases, documentation is required to petition for *excused* absences to the Associate Dean for Student and Strategic Programs, Dr. Stephen Jones. The excused absence form is posted at: <https://www1.villanova.edu/villanova/engineering/resources/undergraduates.html>.

Excused absences do not count towards a failure in the course for first year students. Absence from class does not release the student from assigned work. Students who miss an in-class obligation such as an exam, a presentation, etc., due to an excused absence will not be penalized - the instructor may offer a make-up test, arrange an alternative time for a presentation, exempt a student from the assignment, or provide another arrangement. In the case of illness or injury, the form must be submitted within 24 hours of missing a class. The University's list of excused absences for all students includes the following:

1. Participation in NCAA athletic competitions
2. Participation in special academic events such as: conferences, field trips, project competitions, etc., and in official university business such as student representatives attending meetings related to university governance
3. Attendance at significant events of the immediate family such as: funerals, weddings, etc.
4. Religious holidays - see the University's policy on Religious Holidays
5. College-approved participation in placement activities such as: job interviews, graduate school interviews, job fairs
6. Legally required absence such as: jury duty, court appearance, short-term military service
7. Documented serious illness or disability

## 12 Examination Policy

The College of Engineering has adopted the following general examination guidelines:

1. Students must arrive before the start of the examination. Under exceptional circumstances a student may need to arrive late, but he/she can enter the examination room no later than five (5) minutes after the start of the exam.
2. Cell phones must be turned off until the student exits the examination room.
3. The official Villanova class attendance policy must be followed when requesting excuses for absences or lateness to an examination.
4. Each student must write and sign the following statement, "I have neither given nor received any unauthorized assistance in the completion of this examination."

5. For online examinations, the instructor may implement video proctoring or other measures to ensure academic integrity. For consent purposes, the instructor will inform students in advance if (s)he plans to use any form of video-proctoring and whether the examination will be recorded.

## 13 Academic Integrity Policy

The College of Engineering is committed to creating an environment of academic integrity and ethical decision-making that we hope is reflected in the actions of our students and graduates. As Villanova students, integrity is central to the University mission. As engineers, our code of conduct requires us to place honor and integrity at the forefront of everything we do. As engineering students, it is expected that you will begin to adopt these values and instill them into your work habits. Students violating the academic integrity policy will receive a zero on that assignment or exam and the violation will be reported to the Associate Dean for Academic Affairs. The University's academic integrity policy can be found on the following web page:

<https://www1.villanova.edu/villanova/provost/resources/student/policies/integrity.html>.

## 14 Adherence to the Student Code of Conduct

Students are expected to act in a professional and respectful manner to their fellow students, faculty, and staff. Students should become acquainted with and understand the responsibilities set forth in the Student Handbook, especially those in the sections on Policy and Regulations. Adherence to university regulations is expected and required for successful completion of the program of studies. Enforcement within the classroom of policies regarding classroom behavior is the responsibility of the faculty member. All other discipline problems are to be referred to the Dean of Students.

## 15 Online Expectations

To foster a professional environment, please wear appropriate clothes, mute if you are not talking to cut down on background noise, refrain from eating, and select an appropriate setting when we are meeting online.

## 16 Inclusive Classroom

This classroom is a place where you will be treated with respect; we welcome individuals of all ages, backgrounds, beliefs, ethnicities, gender, gender identities and expressions, sexual orientation, and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming, and inclusive environment to allow all among us to learn and flourish.

## 17 Students with Disabilities

It is the policy of the university to make reasonable academic accommodations for qualified individuals with disabilities. If you are a person with a disability (non-physical) please register with the office of Learning Support Services (LSS) by emailing [Learning.support.services@villanova.edu](mailto:Learning.support.services@villanova.edu) or by phoning 610-519-5176 as soon as possible. Registration is *required* in order to receive accommodations.

The Office of Disability Services (ODS) collaborates with students, faculty, staff, and community members to create diverse learning environments that are usable, equitable, inclusive and

sustainable. The ODS provides Villanova University students with physical disabilities the necessary support to successfully complete their education and participate in activities available to all students. If you have a diagnosed disability and plan to utilize academic accommodations, please contact and register with Gregory Hannah, advisor to students with disabilities at 610-519-3209 or visit the office on the second floor of the Connelly Center.

## 18 Tutoring Services

Villanova's tutoring services include The Writing Center, The Learner's Studio, and The Center for Speaking and Presentation. These services are offered free of charge to students. Drop in as-needed or book a regular weekly session to supercharge your academic success. Sessions can be 30 or 60 minutes in length.

Register for an account and book sessions in advance at [villanova.mywconline.com](http://villanova.mywconline.com). If you don't see your class listed, request a tutor for a missing subject at: [tutorrequest.villanova.edu](mailto:tutorrequest.villanova.edu) For more information, contact Juliana Struder at [juliana.studer@villanova.edu](mailto:juliana.studer@villanova.edu) or at 610-519-5862.

## 19 Electronics Policy

The use of electronic devices, such as phones, laptops, tablets, calculators, etc., during class is generally allowed, unless their use causes a disturbance to others. During examinations, the use of any electronic device is prohibited, unless it is expressly authorized by the instructor.

Students are prohibited from making any audio or visual recordings (including taking photographs) of lectures, discussions, or other classroom activities, unless a student (1) has written permission in advance from the instructor, or (2) is permitted to record under terms and conditions as approved by the University's Office of Disability Services or Learning Support Services. Students who have received approval to record classes as an academic accommodation must provide supporting documentation from the Office of Disability Services or Learning Support Services in advance of any recording. Students may use authorized recordings only for the purposes of individual study in the course, and may not disseminate or share them with a wider audience without explicit permission.

## 20 Copyright Policy

The materials used in Villanova University courses ("Course Materials") generally represent the intellectual property of course instructors, third parties and/or the university which may not be disseminated or reproduced in any form for public distribution (e.g., sale, exchange, etc.) without the written permission of the course instructor. Course materials include all written or electronic documents and materials, including syllabi, current and past examination questions/answers, and presentations such as lectures, videos, slides, etc., provided by a course instructor. Course materials may only be used by students enrolled in the course for academic (course-related) purposes.

Published course readings (book chapters, articles, reports, etc.) available in "Blackboard" are copyrighted materials. These works are made available to students through licensed databases or fair use. They are protected by copyright law, and may not be further disseminated or reproduced in any form for distribution (e.g. uploading to websites, sale, exchange, etc.) without the permission of the copyright owner.

Follow these links for more information on [Intellectual Property](#), [Copyright](#), and [Computer Acceptable Use](#).

## 21 Professorial Duties

It is important to note that teaching is one of the many duties that professors perform as part of their job responsibilities. In addition to teaching, professors perform research, advise graduate students, edit journals and review journal articles, serve on committees for the university and professional societies, travel to conferences to remain abreast of current developments and to present their results... to name just a few commitments.