Fall 2018 - Syllabus

EENG 3410 - Engineering Electromagnetics

Class meetings B227, Tuesday and Thursday 1 pm – 2:20 pm

Description

Electromagnetic theory as applied to electrical engineering: vector calculus; electrostatics and magnetostatics; Maxwell's equations, including Poynting's theorem and boundary conditions; uniform plane-wave propagation; transmission lines – TEM modes, including treatment of general, lossless line and pulse propagation; introduction to guided waves; introduction to radiation and scattering concepts. Credit hours: 3 hrs.

Prerequisite(s): EENG 2610, MATH 3310.

Instructor

Ifana Mahbub, Assistant Professor, Electrical Engineering Department
Office B208, Email Ifana.Mahbub@unt.edu, Office hours: Tuesday and Thursday 3:30 pm – 4:30 pm or by appointment.

Teaching Assistant

Melissa A. Sinclair, M.S. (Grad-track) Student
Office B210, Email melissasinclair@my.unt.edu, Office hours: Monday, Wednesday and Friday 3:30 pm – 4:30 pm or by appointment.

Format

• Lectures, based on textbook
• Online: announcements, grades via Blackboard learn https://learn.unt.edu

Grade

Home works: 15%
Quizzes: 20%
Mid-term test 1: 20%
Mid-term test 2: 20%
Final Exam 25%

Grade distribution

A=90-100, B=80-89, C=70-79, D=60-69, F=0-59

Schedules of exams

Final: According to UNT exam schedule: December 14, 10:30 am – 12:30 pm
http://registrar.unt.edu/exams/final-exam-schedule

Textbooks

Required: by William H. Hayt Jr. and John, A. Buck, 2012. Engineering Electromagnetics, Eighth Edition, Mcgraw- Hill. ISBN: 978-0-07-338066-7
Optional: Fundamentals of Applied Electromagnetics, 6th or 7th Edition, Fawwaz T. Ulaby, Eric Michielssen and Umberto Ravaioli, Prentice Hall, 2014.

Class Evaluation by Students

Student Perceptions of Teaching (SPOT) is a requirement for all organized classes at UNT and is available for your input at the end of the semester.

Topics

- Vector Analysis, Chapter 1, sections 1.1 – 1.7
- Coulomb's law and Electric Field Intensity, Chapter 2, sections 2.1 – 2.4
- Electric Flux Density, Gauss's law, and Divergence, Chapter 3, sections 3.1 – 3.6
- Energy and Potential, Chapter 4, sections 4.1 – 4.6
- Conductor's and Dielectrics, Chapter 5, sections 5.1 – 5.4
- Capacitance, Chapter 6, sections 6.1, 6.2, 6.5, 6.6
- The Steady Magnetic Field, Chapter 7, sections 7.1 – 7.5
- Magnetic Forces, Materials, and Inductance, Chapter 8, sections 8.1 – 8.4, 8.10
- Time-Varying Fields and Maxwell's Equations, Chapter 9, sections 9.1-9.4
- Transmission Lines, Chapter 10, sections 10.1-10.14
- The Uniform Plane Wave, Chapter 11, sections 11.1-11.5
- Plane Wave Reflection and Dispersion, chapter 12, sections 12.1 – 12.7
- Guided Waves, chapter 13,sections 13.1 -13.6
- Electromagnetic Radiation and Antennas, chapter 14, sections 14.1 – 14.3

Course Learning Outcomes (CLO):

Upon successful completion of this course, the students will be able to:

1. Understand the basic properties of transmission lines and analyze electromagnetic wave propagation in generic transmission line geometries.
2. Understand the meaning of divergence and curl; be able to calculate line integrals, surface and volume integrals.
3. Use Gauss's Law, Coulomb's law and Poisson's Equations to find fields and potentials for a variety of situations including charge distributions and capacitors.
4. Use numerical methods to solve for electric fields from charge distributions and conducting boundaries.
5. Understand the behavior of magnetic and electric fields in the presence of dielectric and magnetic materials; appreciate how to simply modify expressions for capacitance and inductance from free space expressions.
6. Understand the behavior of magnetic and electric fields in the presence of dielectric and magnetic materials.
7. Understand Maxwell's Equations for time-harmonic fields and the boundary conditions across media boundaries.
8. Analyze electromagnetic wave propagation and attenuation in various medium and propagation through boundaries between media.
9. Several homework assignments delving on core concepts and reinforcing analytical skills learned in class.
10. Opportunities to interact weekly with the instructor and the teaching assistant during regular office hours and discussion sections in order to further the students' learning experience and the students' interest in the material.

ABET Student Learning Outcomes (SO)

SO-1 Ability to apply mathematics, science and engineering principles.
SO-2 Ability to design and conduct experiments, analyze and interpret data.
SO-3 Ability to design a system, component, or process to meet desired needs.
SO-4 Ability to function on multidisciplinary teams.

SO-5 Ability to identify, formulate and solve engineering problems.
SO-6 Understanding of professional and ethical responsibility.
SO-7 Ability to communicate effectively.
SO-8 The broad education necessary to understand the impact of engineering solutions in a global and societal context.
SO-9 Recognition of the need for and an ability to engage in life-long learning.
SO-10 Knowledge of contemporary issues.
SO-11 Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

CLO	**ABET Student Outcomes**										
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	SO-7	SO-8	SO-9	SO-10	SO-11
1	X			X							
2	X										X
3	X										X
4	X				X						X
5	X										
6	X				X						
7	X			X							
8	X		X								
9	X								X		
10									X		

Policies

A. **Academic Integrity Standards and Consequences.** According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University. See full policy at https://policy.unt.edu/sites/default/files/06.003.pdf.

B. **ADA Accommodation Statement.** UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website at disability.unt.edu.

C. **Course Safety Procedures (for Laboratory Courses).** Students enrolled in [insert class name] are required to use proper safety procedures and guidelines as outlined in UNT Policy 06.038 Safety in Instructional Activities. While working in laboratory sessions, students are expected and

required to identify and use proper safety guidelines in all activities requiring lifting, climbing, walking on slippery surfaces, using equipment and tools, handling chemical solutions and hot and cold products. Students should be aware that the UNT is not liable for injuries incurred while students are participating in class activities. All students are encouraged to secure adequate insurance coverage in the event of accidental injury. Students who do not have insurance coverage should consider Standard Syllabus Statements Related Policy 06.049 Course Syllabi Requirements obtaining Student Health Insurance. Brochures for student insurance are available in the UNT Student Health and Wellness Center. Students who are injured during class activities may seek medical attention at the Student Health and Wellness Center at rates that are reduced compared to other medical facilities. If students have an insurance plan other than Student Health Insurance at UNT, they should be sure that the plan covers treatment at this facility. If students choose not to go to the UNT Student Health and Wellness Center, they may be transported to an emergency room at a local hospital. Students are responsible for expenses incurred there.

D. **Emergency Notification & Procedures.** UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Blackboard for contingency plans for covering course materials.

A. E. **Student Evaluation Administration Dates**. Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The survey will be made available during weeks 13, 14 and 15 of the long semesters to provide students with an opportunity to evaluate how this course is taught. Students will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Students should look for the email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation email that the survey has been submitted. For additional information, please visit the SPOT website at www.spot.unt.edu or email spot@unt.edu.

Tentative Course Calendar

A.

Week	Date	Topics	Reading
1	08/28	Vector Analysis	Ch. 1: 1.1 -1.7
	08/30	Coulomb’s law and Electric Field Intensity	Ch. 2: 2.1 -2.4
2	09/04	Electric Flux Density	Ch. 3: 3.1-3.3
	09/06		
3	09/11	Gauss’s law and Divergence	Ch. 3: 3. 4 – 3.6
	09/13		
4	09/18	Energy and Potential	Ch. 4: 4.1-4.3

	09/20		Ch. 4: 4.4 -4.6
5	09/25	Conductors and Dielectrics	Ch. 5: 5.1 – 5.4
	09/27	Review	
6	10/02	Exam #1	
	10/04	Capacitance	Ch. 6: 6.1, 6.2, 6.5,6.6, 6.8
7	10/09	The Steady Magnetic Field	Ch. 7: 7.1 -7.3
	10/11		Ch. 7: 7.4 – 7.5
8	10/16	Magnetic Forces, Materials, and Inductance	Ch. 8: 8.1 – 8.2
	10/18		Ch. 8: 8.3, 8.4,8.10
9	10/23	Time-Varying Fields and Maxwell's Equations	Ch. 9: 9.1 – 9.2
	10/25	Exam #2/Lecture	Ch. 9: 9.3 -9.4
10	10/30	The Uniform Plane Wave	Ch. 11: 11.1 -11.2
	11/01		Ch.11: 11.3 – 11.5
11	11/06	Transmission Lines	Ch. 10: 10.1 – 10.4
	11/08		Ch. 10: 10.5 – 10.8
12	11/13		Ch. 10: 10.9 – 10.14
	11/15	Plane Wave Reflection and Dispersion	Ch. 12: 12.1 -12.4
13	11/20		Ch. 12: 12.5 -12.6
	11/22	Thanksgiving Break	
14	11/27	Guided Waves	Ch. 13: 13.1-13.4
	11/29	Mutual Inductance	Ch. 13: 13.5 -13.6
15	12/04	Electromagnetic Radiation and Antenna	Ch. 14: 14.1 -14.3
	12/06	Review	
	12/14	Final Exam: December 13 10:30 am – 12:30 pm	