The University of Texas at Tyler
Department of Electrical Engineering

EENG 3303 – Electromagnetic Fields (Required)

Syllabus

Catalog Description:

Vector analysis; static electric field; steady electric currents; static magnetic fields; time varying fields and Maxwell's equations; plane electromagnetic waves; transmission lines; introduction to waveguides; introduction to antennas.

Prerequisites:	MATH 3404, MATH 3305, PHYS 2326, and PHYS 2126
Credits:	3 (3 hours lecture, 0 hours laboratory per week)
Text(s): (Required)	1. Elements of Electromagnetics by Matthew N. O. Sadiku, Sixth Edition, Oxford University Press
Additional Material: (Recommended)	Reference(s): 1. Matlab® 2. Instructor's lecture notes
Course Coordinator:	Premananda Indic, PhD

Topics Covered:

1. Vector Analysis
2. Static Electric Fields
3. Steady Electric Currents (Circuit Theory)
4. Static Magnetic Fields
5. Time Varying Fields
6. Maxwell Equations
7. Electromagnetic Waves
8. Introduction to Transmission Lines, Antennas, and Waveguides

Evaluation Methods: (only items in dark print apply):

1. Examinations / Quizzes
2. Homework
3. Report
4. Computer Programming
5. Project
6. Presentation
7. Course Participation
8. Peer Review

Course Learning Outcomes (formerly Objectives)[1]: By the end of this course students will be able to:

1. Formulate the electric field and potential expressions due to various charge distributions [1]
2. Calculate electrostatic energy and capacitance due to various charge distributions [1]
3. Solve static electric field problems using analytical techniques [1]
4. Solve static magnetic field problems using analytical techniques [1]
5. Formulate a boundary value problem in electromagnetic fields [1,4,5]
6. Solve a boundary value problem in electromagnetic fields [1,4,5]
7. Solve a 2-D electrostatic problem using a numerical technique
8. Write and present a report on the solution of a 2-D electrostatic problem using experimental, analytical, and numerical techniques [3]

9. Use modern engineering tools including modeling and simulation software [3,4,5]
10. Develop the principles of time-varying fields and Maxwell's equations [1]
11. Solve Maxwell for uniform plane waves [1]
12. Write a paper on the impact of electromagnetics on society [3]
13. Develop transmission lines distributed model [1]

[1]Numbers in brackets refer to method(s) used to evaluate the course objective.

Relationship to Student Outcomes (only items in dark print apply)[2]: This course supports the following Electrical Engineering Student Outcomes, which state that our students will possess:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics; [1, 5, 6, 10, 11,13]
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; [2, 3, 4, 8]
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; [12]
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions; [7, 9, 10]
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

[2]Numbers in brackets refer to course learning outcomes/objective(s) that address the Program Outcome.

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:	0	hours
Engineering Sciences and Design:	3.0	hours
General Education Component:	0	hours

Prepared By:	Hassan El-Kishky	Date:	07/15/2011
Modified:	Seyed Ghorshi	Date:	08/22/2018 08/24/2019 05/28/2020

EENG 3303: Electromagnetic Fields

Fall 2020 Syllabus

Instructor Information:

Premananda Indic, PhD
Department of Electrical Engineering,
The University of Texas at Tyler
Office: RBN 2010,
Phone: 903-566-6208,
email:pindic@uttyler.edu (preferred)

Office Hours: (All appointments are via zoom and prior confirmation is required)

Monday	: 10AM to 11:00AM
Wednesday	: 10AM to 11:00AM
Friday	: 10AM to 11:00AM
Additional Hours	: By appointment

Course Description:

The objective of this course is to study Vector analysis; static electric field; steady electric currents; static magnetic fields; time varying fields and Maxwell's equations; plane electromagnetic waves; transmission lines; introduction to waveguides; introduction to antennas.

The primary student learning objectives are:

1. Formulate the electric field and potential expressions due to various charge distributions
2. Calculate electrostatic energy and capacitance due to various charge distributions
3. Solve static electric field problems using analytical techniques
4. Solve static magnetic field problems using analytical techniques
5. Formulate a boundary value problem in electromagnetic fields
6. Solve a boundary value problem in electromagnetic fields
7. Solve a 2-D electrostatic problem using a numerical technique
8. Write and present a report on the solution of a 2-D electrostatic problem using experimental, analytical, and numerical techniques
9. Use modern engineering tools including modeling and simulation software
10. Develop the principles of time-varying fields and Maxwell's equations
11. Solve Maxwell for uniform plane waves
12. Write a paper on the impact of electromagnetics on society
13. Develop transmission lines distributed model

Recommended Textbook:

Elements of Electromagnetics by Matthew N. O. Sadiku, Sixth Edition, Oxford University Press

Evaluation and Grading:

The course grade will be based on the following activities:

1. **Homework Assignments (60%):**
   Homework will be assigned as mentioned in the course outline below. There will be six homework assignments and it should be submitted through canvas using pdf or word format. **No late submissions allowed** **(see Late Assignments and Make-up Policy below)**. Collaboration on homework assignments is strongly encouraged, however expecting a disclaimer statement at the end of your assignments if you have discussed with the students in the class or someone outside. All resources, including materials obtained from internet should be properly acknowledged.

2. **Tests (20%):**
   There will be four tests of duration 1 hour each as given in the outline. There will be a grade replacement policy ONLY for tests. For example, if your Test 2 grade is better than Test 1, then Test 1 grade will be replaced with the Test 2. This approach will be followed for other tests. For Test 4, you will get a score of at least an average of three previous tests.**NO Grade Replacement policy for midterm. However, one retake is allowed**. It is important that you should attend all tests and should score at least 50% in each test to be eligible for grade replacement policy.

3. **Midterm Exam (10%):**
   There will be a midterm exam of duration 1 hour as mentioned in the outline

4. **Final Exam (10%):**
   Final exam as per University Schedule

Grading Scale

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

Late assignments and make-up policy:

Accommodation of the following absences will be ensured.

1. Extra-curricular activities as a representative of UT Tyler (e.g., sponsored sports, band, conference presentations, etc.).
2. Military service (including National Guard, ROTC).
3. Officially mandated court appearances (including jury duty).

In all cases, the person or agency responsible for the event or activity should provide participants with a letter explaining the proposed absence and its duration, including travel times for off-campus events and activities. Students must provide this documentation to instructors **at least two weeks prior** to the activity or event, except when such notice is not possible.

Other Absences Granting requests for accommodating other absences is at the discretion of the instructor. That is, the instructor will review the situation in an effort to provide a reasonable accommodation and arrange for possible make-up when possible to do so, without fundamentally altering a course or creating an undue burden for the instructor or department. Official documentation is required whenever possible and must be provided at the earliest opportunity. This policy is intended primarily for the following situations:

4. Medical excuse.
5. Family emergency.
6. Religious observances and practices. Students who request religious accommodation should do so in writing during the first week of the semester. Students may seek assistance from Dean of Students Office.

Students are encouraged to read the academic honesty policy (Student Standards of Academic Conduct).

Virtual Class Room

Join Zoom Meeting
https://uttyler.zoom.us/j/95019800433?pwd=MDkvTk5na3Vibk9tdjdVTldaK1Vkdz09

Meeting ID: 950 1980 0433
Passcode: 239924
One tap mobile
+13462487799,,95019800433# US (Houston)
+16699006833,,95019800433# US (San Jose)

Dial by your location
+1 346 248 7799 US (Houston)
+1 669 900 6833 US (San Jose)

+1 253 215 8782 US (Tacoma)
+1 301 715 8592 US (Germantown)
+1 312 626 6799 US (Chicago)
+1 646 876 9923 US (New York)
Meeting ID: 950 1980 0433
Find your local number: https://uttyler.zoom.us/u/a3oVwPmCY

Join by SIP
95019800433@zoomcrc.com

Join by H.323
162.255.37.11 (US West)
162.255.36.11 (US East)
115.114.131.7 (India Mumbai)
115.114.115.7 (India Hyderabad)
213.19.144.110 (EMEA)
103.122.166.55 (Australia)
64.211.144.160 (Brazil)
69.174.57.160 (Canada)
207.226.132.110 (Japan)
Meeting ID: 950 1980 0433
Passcode: 239924

Course Outline:

Schedule	Topics	Assignments
Week 1: (August 24)	Vector Algebra Coordinate Systems and Transformations	Review Syllabus Read Chapter 1, Read Chapter 2
Week 2: (August 31)	Vector Calculus	Read Chapter 3, HW1 due on 9/9/2020
Week 3: (September 7)	Electrostatic Fields Test 1 topics include Week 1 and Week 2	Read Chapter 4 Test 1 on 9/16/20 (11:15AM to 11:45 AM)
Week 4: (September 14)	Electric Fields in Material Space	Read Chapter 5 HW2 due on 9/23/20
Week 5: (September 21)	Electrostatic Boundary Value Problem Test 2 topics include Week 3 and week 4	Read Chapter 6 Test 2 on 9/30/20 (11:15AM to 11:45AM)
Week 6: (September 28)	Magnetostatics Fields	Read Chapter 7, HW3 due on 10/7/20
Week 7: (October 5)	Magnetic Forces, Materials and Devices	Read Chapter 8
Week 8: (October 12)	Midterm Week: Topic Week 1 to Week 7	Midterm on 10/21/20 (11:15AM to 12:10PM)
Week 9: (October 19)	Maxwell's Equations	Read Chapter 9, HW4 due on 10/28/20
Week 10: (October 26)	Electromagnetic Wave Propagation	Chapter 10, Test 3 on 11/04/20 (11:15AM to 11:45AM)
Week 11: (November 2)	Transmission Lines	Read Chapter 11 HW5 due on 11/11/20
Week 12: (November 9)	Waveguides	Chapter 12 Test 4 on 11/15/16 (11:15AM to 11:45 AM)
Week 13: (November 16)	Antennas	Chapter 13 HW6 due on 12/02/20
Week 14: (November 30)	Review via zoom	
Week 15: (December 7)	Final Exam	As per university schedule