PHYS 3323 – Electromagnetic Field Theory  
Fall 2010

Catalog Description: (3 hr credit: 3 hr lecture)  
A mathematical treatment of the fundamentals of classical electromagnetic theory. Topics  
include electrostatics and electrodynamics, vector calculus, theory of dielectrics, magnetostatic  
fields, electromagnetic induction, magnetic fields of currents, and Maxwell's equations.  
Prerequisites: PHYS 2326 and 2126; credit or registration in MATH 3415 or MATH 3320.  
This course is required of Physics majors; it is an elective for all others.

TAMUK contact faculty: Paul H. Cox, Professor  
Office: Hill 211 Phone: (361)593-2623; or department phone 2618.  
email: phcox at tamuk.edu Department fax number: (361)593-2184  
webpage: http://physics.tamuk.edu/~cox/ (Note no www on the front.)

Office hours:  
Scheduled office hours (subject to change): 9:30-10:50, 12:00-12:50 MTWRF  
Note: I may be elsewhere in the building during these times, but what I'm doing will usually be interruptable.  
Unscheduled Office Hours by appointment; Informal office hours when in


This is a jointly offered TTVN course originating at Tarleton State University. The TSU syllabus is as follows:

ENPH/PHYS 332 Electromagnetic Field Theory

Department: Engineering and Physics

Credit Hours: 3

Current Catalog Description:  
Electrostatics; Laplace’s Equation; the theory of dielectrics; magnetostatics; electromagnetic  
induction; magnetic fields of currents; Maxwell’s equations. Credit for both ENPH 332 and PHYS 332 will not be awarded.

Course Schedule:  
3 lecture hr/wk, 0 lab hr/wk

Textbook(s):

Instructor:  
Dr. F. Ahmad  
office: HYEG 112  
office hours: by appointment  
email: ahmad@tarleton.edu
Phone: 968-1894

Course Grading:
Homework 35%
Three quizzes 45% (15% each)
Final 20%

Prerequisites by Topic:
PHYS 242 – Principles of Physics II (pre-requisite)
MATH 306 – Differential Equations (co-requisite)
MATH 333 – Calculus III (co-requisite)

Course Learning Goals and Program Outcomes Map:
The Program Outcomes for Engineering Physics are:

A. an ability to apply knowledge of math, engineering & science
B. an ability to design and conduct experiments, as well as to analyze and interpret data
C. an ability to design system, component or process to meet needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
D. an ability to function on multi-disciplinary teams
E. an ability to identify, formulate, and solve engineering problems
F. an understanding of professional and ethical responsibility
G. an ability to communicate effectively
H. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
I. a recognition of need for, and ability to engage in life-long learning
J. a knowledge of contemporary issues
K. an ability to use techniques, skills, and modern engineering tools necessary for engineering practice.
L. a depth and breadth of knowledge in engineering and physics necessary to work in a multidisciplinary environment

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<tr>
<th>Course Goals</th>
<th>Program Outcome(s):</th>
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<tr>
<td>Upon completion of this course, students will</td>
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<tr>
<td>1. know Coulomb’s law and be able to use it to solve for the electrostatic force applied upon a point charge by a collection of other point charges.</td>
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<td>2. know the definitions of standard terms in electromagnetism including electric potential, electric field, magnetic field, magnetic vector potential, induction, capacitance, etc.</td>
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<td>3. know the formula for the electric field due to an infinitesimal point charge and be able to use it to calculate the electric field due to either a collection of discrete point charges or a continuous surface, line or volume charge density.</td>
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<tr>
<td>4.</td>
<td>know the formula for the electric potential due to an infinitesimal point charge and be able to use it to calculate the electric potential due to either a collection of discrete point charges or a continuous surface, line or volume charge density.</td>
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<td>5.</td>
<td>be able to find the electric field at a point in space given the electric potential</td>
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<td>6.</td>
<td>be able to apply Gauss’ Law to solve for the electric field in an electrostatic problem that involves a high degree of symmetry.</td>
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<td>7.</td>
<td>be able to apply various solution techniques including the method images, separation of variables, and multipole expansions to solve Poisson’s and Laplace’s Equations.</td>
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<td>8.</td>
<td>know the meanings of polarization, displacement vector, and dielectric constant and be able to use these concepts to solve problems involving dielectric media.</td>
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<td>9.</td>
<td>be able to determine the magnetic field created by either a line, area, or volume current density.</td>
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<td>10.</td>
<td>be able to write Maxwell’s equations in both integral and differential form.</td>
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<td>11.</td>
<td>be able to show that the solution to Maxwell’s equations for time-varying fields in free space are electromagnetic waves with the</td>
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<td>12.</td>
<td>be able to apply mathematical techniques necessary to solve E&amp;M problems including the application of vectors, vector and integral calculus, Dirac delta functions, and Kronecker delta functions.</td>
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**Notes:**

1. Make-up quizzes and final are not given.
2. The final exam will be administered at the scheduled time.
3. Each student should be able to communicate mathematical and scientific information in written form. This includes individual problems, exams, and laboratory reports.
4. Students with documented disabilities may request reasonable accommodations that will enable them to participate in and benefit from all educational programs and activities. Successful accommodations often require advance planning. Therefore, all concerned students are strongly encouraged to make early contact with the Teaching and Learning Center at extension 9480.
5. Students are responsible for knowing and abiding by the policies and information contained in the Tarleton State University Student Handbook. [TSUSH].
6. Students guilty of academic dishonesty, cheating, or plagiarism in academic work shall be subject to disciplinary action, [TSUSH]. The instructor may initiate disciplinary action in any case of academic misconduct.
7. Class absence policies will be established and enforced by the individual instructor. The instructor may recommend to the Dean of Students that a student be dropped from the course if excessive absences prevent satisfactory progress, [TSUSH]. Students must not assume that they will be automatically dropped from the course if they fail to attend.
8. Drop policy for this course in accordance with the current TSU Catalog.
9. Student Disabilities Services, Room 201 Math Bldg. Students who have special instructional needs because of a physical handicap or a learning disability should discuss their special needs with Ms. Trina Geye, Director of Student Disabilities Services. Call 968-9400 to schedule an appointment before the 3rd class day. Teaching and Learning Center, Thompson Student Center, Rm. 15: Frequently tutoring through the Teaching and Learning Center (968-9480) is also available (at no charge) for students desiring extra help. Other departmental tutors including the Language Laboratory Assistants provide tutoring for a small fee. Please ask your instructor for details.

10. The material stated in this syllabus is subject to change without notification.

This ends the TSU syllabus. Additional syllabus elements required at TAMUK:

**Students with Disabilities**, including learning disabilities, may have reasonable accommodations made if appropriate notice is given. This normally requires registration, including appropriate documentation, with the Services for Students with Disabilities office.

**Misconduct**: See the Student Handbook, available at the [Dean of Students' website](http://osa.tamuk.edu/dean/). Students who engage in any form of misconduct are subject to disciplinary procedures. This includes academic misconduct which specifically includes plagiarism and all forms of cheating.

The faculty reserves the right to check submitted work for plagiarism, including by the use of suitable software.

**DROPS**: The following provision (new in Fall 2007) does not apply to students with Texas public college or university credits prior to Fall 2007. The Texas legislature has enacted a limit to the number of course drops allowed to a student. Under earlier policy, dropping a course after the official census date but before midterm meant that a grade of Q appeared on your record, and the course did not count toward academic progress, but it also did not count in your GPA. Under the new policy, you are allowed six drops in your college career which have that effect, but represented by a QI grade; after six, the grade will be QF which counts as an F in your GPA. (Some exceptions qualify for a QE instead.)

The following come from a TAMUK source:
Nov. 3: Last day to drop with an automatic Q or QI if you are allowed that.
Dec. 6: Last day to drop on any terms, or to withdraw from the University.