Proposal Form For Addition And Revision Of Courses

1. Proposing College / School: Samuel Ginn College of Engineering
   Department: Electrical and Computer Engineering

2. Course Prefix and Number: ELEC 3310

3. Effective Term: Spring 2010

4. Course Title: Fundamentals of Applied Electromagnetics
   Abbreviated Title (30 characters or less): Fund. Applied Electromagnetics

5. Requested Action:
   - [ ] Renumber a Course
   - [ ] Add a Course
   - [ ] Revise a Course
   - [ ] Description

6. Course Credit:
   Contact/Group Hours: 3
   Scheduled Type: Lecture
   Weekly or Per Term?: Weekly
   Credit Hours: 3
   Anticipated Enrollment: 50

   Maximum Hours (Repeatability): 3

   Total Credit Hours: 3

7. Grading Type:
   - [ ] Regular (ABCDF)
   - [ ] Satisfactory/Unsatisfactory (S/U)
   - [ ] Audit

8. Prerequisites/Corequisites:
   Use "P: " to indicate a prerequisite, "C: " to indicate a corequisite, and "P/C: " to indicate a prerequisite with concurrency.
   P - MATH 2660
   P - ELEC 2110

9. Restrictions: List specific restriction in space above.
   - College
   - Major
   - Standing
   - Degree

10. Course Description:
    (20 Words or Less; exactly as it should appear in the Bulletin)
    Transmission lines are studied as a bridge to understanding electromagnetic theory. Then, electric and magnetic fields are studied using vector algebra, culminating in Maxwell’s equations.

11. May Count Either
    (Indicate if this particular course cannot be counted for credit in addition to another)
    Program Type or Program Title
    Requirement or Elective?

12. Affected Program(s):
    (Respond “N/A” if not included in any program; attach memorandum if more space is required)
    Major
    ELEC (Bachelor of Electrical Eng)
    Required
    Major
    WIRE (Bachelor of Wireless Eng)
    Required

13. Overlapping or Duplication of Other Units’ Offerings:
    (If course is included in any other degree program, is used as an elective frequently by other unit(s), or is in an area similar to that covered by another college/school, attach correspondence with relevant unit)
    - [ ] Applicable
    - [ ] Not Applicable
14. Justification:
Topics are being redistributed within the two-course sequence, ELEC 3310 - ELEC 3320, reflecting recent advances in teaching this material.

(Include a concise, yet adequate rationale for the addition/revision of the course, citing accreditation, assessments (faculty, graduate, and/or external) where applicable)

15. Resources:
None

(Indicate whether existing resources such as library materials, classroom/laboratory space, and faculty appointments are adequate to support the proposed addition/revision; if additional resources are required, indicate how such needs will be met, referencing the appropriate level of authorization -- i.e.: Dean -- where necessary; if no additional resources or shifting of resources will be necessary, respond "Not Applicable")

16. Student Learning Outcomes:
1. To understand and be able to design transmission lines and impedance matching networks
2. To gain proficiency in vector algebra
3. To gain proficiency working in Cartesian, cylindrical and spherical coordinate systems
4. To understand and be able to apply Maxwell's Equations

(State in measurable terms (reflective of course level) what students should be able to do when they have completed this course)

17. Course Content Outline:
1. Course introduction and overview (1 class)
2. General transmission lines (3 classes)
3. Smith chart and impedance matching (3 classes)
4. Transients on transmission lines (2 classes)
5. Coulomb's Law, Cartesian coordinates and vectors (1 class)
6. Electric fields, spherical and cylindrical coordinates (3 classes)
7. Gauss's Law and divergence (3 classes)
8. Electric potential and gradient (1 class)
9. Conductors and Ohm's Law, dielectrics (1 class)
10. Boundary conditions and capacitance (3 classes)
11. Magnetic fields and Biot-Savart's Law (2 classes)
12. Ampere's Circuit law and curl (2 classes)
13. Magnetic flux density, magnetic forces, magnetic materials (3 classes)
14. Boundary conditions and inductance (3 classes)
15. Dynamic fields and Faraday's Law (4 classes)
16. Displacement current and Maxwell's equations (1 class)
17. Lossless TEM waves, time-harmonic fields, phasors (3 classes)
18. Tests (3 classes)
19. MATLAB assignments (2 classes)

(Provide a comprehensive, week-by-week breakdown of course content, including assignment due dates)

18. Assignments / Projects:
Homework problems will be assigned regularly on the above-listed topics
There will be three in-term tests and a final exam.

(List all quizzes, projects, reports, activities and other components of the course grade -- including a brief description of each assignment that clarifies its contribution to the course's learning objectives)

19. Rubric and Grading Scale:
Homework (10%)
Tests (60%)
Final Exam (30%)

Grading Scale:
A: 90-100
B: 80-89
C: 70-79
D: 60-69
F: 0-59

(List all components of the course grade -- including attendance and/or participation if relevant -- with point totals for each; indicate point totals and ranges or percentages for grading scale; for S/U grading, detail performance expectations for a passing grade)

20. Justification for Graduate Credit: N/A
(Include a brief statement explaining how the course meets graduate educational standards (i.e.: rigorous standards for
evaluation, development of critical thinking and analytical skills, etc.))

(Include below are standard statements regarding course policies. If necessary, a statement may be altered to reflect the
academic policies of individual faculty members and/or the academic unit or department, provided that there is no conflict with the
Tiger Cub, Faculty Handbook, or any existing university policy.)

POLICY STATEMENTS

Attendance: Although attendance is not required, students are expected to attend all classes, and will be held responsible for any content covered in the event of an absence.

Excused Absences: Students are granted excused absences from class for the following reasons: illness of the student or serious illness of a member of
the student's immediate family, the death of a member of the student's immediate family, trips for student organizations sponsored by an academic unit, trips for
university classes, trips for participation in intercollegiate athletic events, subpoena for a court appearance, and religious holidays. Students who wish to have an
excused absence from class for any other reason must contact the instructor in advance of the absence to request permission. The instructor will weigh the merits of
the request, and render a decision. When feasible, the student must notify the instructor prior to the occurrence of any excused absences, but in no case shall such
notification occur more than one week after the absence. Appropriate documentation for all excused absences is required. Please see the Tiger Cub for more
information on excused absences.

Make-Up Policy: Arrangement to make up a missed major examination (e.g.: hour exams, mid-term exams) due to properly authorized excused absences
must be initiated by the student within one week of the end of the period of the excused absence(s). Except in unusual circumstances, such as the continued absence of
the student or the advent of university holidays, a make-up exam will take place within two weeks of the date that the student initiates arrangements for it. Except in
extraordinary circumstances, no make-up exams will be arranged during the last three days before the final exam period begins.

Academic Honesty Policy: All portions of the Auburn University student academic honesty code (Title XII) found in the Tiger Cub will apply to university
courses. All academic honesty violations or alleged violations of the SGA Code of Laws will be reported to the Office of the Provost, which will then refer the case to the
Academic Honesty Committee.

Disability Accommodations: Students who need special accommodations in class, as provided for by the Americans With Disabilities Act, should
arrange for a confidential meeting with the instructor during office hours in the first week of classes (or as soon as possible if accommodations are needed
immediately). The student must bring a copy of their Accommodation Letter and an Instructor Verification Form to the meeting. If the student does not have these
forms, they should make an appointment with the Program for Students with Disabilities, 1286 Haley Center, 844-2066 (V/TT).
ELEC 3310 - FUNDAMENTALS OF APPLIED ELECTROMAGNETICS

2000 Catalog Data: ELEC 3310.  FUNDAMENTALS OF APPLIED ELECTROMAGNETICS (3) LEC.
3.  Pr., ELEC 2110.  Transmission lines are introduced using circuit theory, leading to
the study of static electric and magnetic fields.  Time varying fields follow with an
introduction to Maxwell’s equations.

Reference: None
Coordinator:  T. H. Shumpert, Professor

Goals:  This course is designed to provide juniors in electrical engineering with an
introduction to transmission lines and the design of impedance-matching techniques.
Electrostatic and magnetostatic field theory is investigated.  Maxwell’s equations are
introduced along with dynamic fields.

Prerequisites by topic:
1.  Calculus and differential equations
2.  Basic electrostatics and magnetostatics (from second core Physics course)
3.  Sinusoidal steady state circuit analysis and phasor notation

Topics:
1.  Course overview and review of waves(1 class)
2.  The electromagnetic spectrum and review of complex numbers and phasors (1 class)
3.  Transmission Lines (4 classes)
4.  Transmission Line Techniques (4 classes)
5.  Transients on Transmission Lines (2 classes)
6.  Fields and Field Operators (2 classes)
7.  The Electrostatic Field (6 classes)
8.  The Magnetostatic Field (6 classes)
9.  Time Varying Fields (6 classes)
10.  Electrodynamics and Maxwell’s Equations (4 classes)
11.  Computer assignments (5 classes)
12.  Tests (4 classes)

Typical methods for evaluating student performance:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>15%</td>
</tr>
<tr>
<td>Programming assignments</td>
<td>15%</td>
</tr>
<tr>
<td>Tests</td>
<td>40%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
</tr>
</tbody>
</table>

Computer usage:

Each student will compose several programs in C or Fortran and use a math package, such as MATHCAD, to do
the following (for example):

1.  Model a terminated transmission line and extract such information as standing wave ratio and input impedance.
2.  Solve an integral equation for the charge distribution on a conducting surface held at constant potential.
   Program will solve Laplace’s equation using standard finite difference approximations to second order partial
differentiation in two independent variables.

Laboratory projects (including major items of equipment and instrumentation used):  None
Class attendance: Class attendance and its effect on course grade is the prerogative of the individual instructor and will be part of the course outline and announced the first day of class.

Policy on unannounced quizzes: Unannounced quizzes and their effect on course grade are the prerogative of the individual instructor and will be part of the course outline and announced the first day of class.

ABET category content as estimated by faculty member who prepared this course description:

- Engineering science: 2 credits or 67%
- Engineering design: 1 credit or 33%

Students who need special accommodations should make an appointment to discuss their needs as soon as possible.

Prepared by: Stuart M. Wentworth Date: 5/22/98
ELEC 3310 - FUNDAMENTALS OF APPLIED ELECTROMAGNETICS
(Required for ELEC, WIRE)

2010 Catalog Data: ELEC 3310. FUNDAMENTALS OF APPLIED ELECTROMAGNETICS (3). Pr. MATH2660, ELEC 2110. Transmission lines are studied as a bridge to understanding electromagnetic theory. Then, electric and magnetic fields are studied using vector algebra, culminating in Maxwell’s equations.


Reference: none

Coordinator: S. M. Wentworth, Associate Professor of Electrical and Computer Engineering

Course Objectives:
1. To understand and be able to design transmission lines and impedance matching networks
2. To gain proficiency in vector algebra
3. To gain proficiency working in Cartesian, cylindrical and spherical coordinate systems
4. To understand and be able to apply Maxwell’s Equations

Prerequisites by topic:
1. calculus, differential equations and vector math
2. basic electrostatics and magnetostatics (from second core Physics course)
3. Sinusoidal steady state circuit analysis and phasor notation

Typical topics:
1. Course introduction and overview (1 class)
2. General transmission lines (3 classes)
3. Smith chart and impedance matching (3 classes)
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5. Coulomb’s Law, Cartesian coordinates and vectors (1 class)
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19. MATLAB assignments (2 classes)

Typical Methods for Evaluating Student Performance:
1. Homework (10%)
2. Tests (60%)
3. Final Exam (30%)

Policy on unannounced quizzes: see Auburn University Tiger Cub
Policy on attendance: see Auburn University Tiger Cub
Computer Usage:
MATLAB will be routinely required for solution of homework problems.

Laboratory projects (including major items of equipment and instrumentation used):
none

Contribution of course to meeting the professional component:
Engineering topics: 3 credits
100% engineering science

Relationship of course to program outcomes:
Outcome 1: Ability to apply knowledge of math, science and engineering to solve problems.
Outcome 6: Proficiency in the use of computers and other modern tools to solve engineering problems.

Special Accommodations:
Students who need accommodations are asked to arrange a meeting during office hours the first week of classes, or as soon as possible if accommodations are needed immediately. If you have a conflict with my office hours, an alternate time can be arranged. To set up this meeting, please contact me by E-mail. Bring a copy of your Accommodation Memo and an Instructor Verification Form to the meeting. If you do not have an Accommodation Memo but need accommodations, make an appointment with The Program for Students with Disabilities, 1244 Haley Center, 844-2096 (V/TT).

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Prepared by: Stuart M. Wentworth           Date: 8/19/2009