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 3320
   3. Effective Term: Spring 2010

4. Course Title: Electromagnetics for Wireless Communications
   Abbreviated Title (30 characters or less): Electromag. for Wireless Comm.

5. Requested Action:
   - Renumber a Course
   - Add a Course
   - Revise a Course

6. Course Credit:
   Contact/Group Hours  Scheduled Type (e.g.: Lab, Lecture, Practicum, Directed Study)
   Weekly or Per Term?
   Credit Hours  Anticipated Enrollment

   Maximum Hours (Repeatability): 3
   - Lecture
   - Weekly
   - 3
   - 50
   Total Credit Hours: 3

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

8. Prerequisites/Corequisites:
P: ELEC 3310

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)
    Maxwell’s equations are used in the study of plane waves, guided waves, fiberoptics, electromagnetic compatibility and interference, antennas and radiation, and satellite communication systems.

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

12. Affected Program(s):
    (Respond “N/A” if not included in any program; attach memorandum if more space is required)

<table>
<thead>
<tr>
<th>Program Type</th>
<th>Program Title</th>
<th>Requirement or Elective?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
<td>ELEC (Bachelor of Electrical Eng)</td>
<td>Required</td>
</tr>
<tr>
<td>Major</td>
<td>WIRE (Bachelor of Wireless Eng)</td>
<td>Required</td>
</tr>
</tbody>
</table>

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. Apply Maxwell’s equations to understand plane waves
2. To become familiar with waveguide, including optical fiber
3. To become familiar with antennas and antenna arrays
4. To be able to apply MATLAB in problem solving

(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 overview and review of fundamental electromagnetics (1 class)
2. Plane waves (3 classes)
3. Power flow and the Poynting theorem (1 class)
4. Wave polarization (1 class)
5. Reflection and transmission of waves at boundaries (3 classes)
6. Basic operation of rectangular waveguide (2 classes)
7. Basic operation of dielectric waveguide and optical fiber (2 classes)
8. Electromagnetic interference issues (1 class)
9. Antennas (5 classes)
10. Simple antenna arrays (2 classes)
11. The Friis transmission equation and radar (3 classes)
12. Microwave circuits (1 class)
13. Basic microwave components (1 class)
14. MATLAB assignments (2 classes)
15. Tests (3 classes)

Discretionary topics: 13 classes are devoted to a selection from the following topics at the instructor’s discretion

16. Fields in rectangular waveguide (3 classes)
17. Development of dielectric waveguide equations (2 classes)
18. Development of optical fiber equations (2 classes)
19. Fiber optic communications (2 classes)
20. Electromagnetic compatibility (2 classes)
21. Antenna arrays (2 classes)
22. Impedance matching using lumped elements (2 classes)
23. Scattering parameters (2 classes)
24. Microwave Couplers (1 class)
25. Microwave Filters (2 classes)
26. Microwave amplifiers and receivers (3 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:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>(10%)</td>
</tr>
<tr>
<td>Tests</td>
<td>(60%)</td>
</tr>
<tr>
<td>Final Exam</td>
<td>(30%)</td>
</tr>
</tbody>
</table>

Grading Scale:
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.).)

(Included 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, 1298 Haley Center, 844-2006 (V/TT).
ELEC 3320 - ELECTROMAGNETICS FOR WIRELESS COMMUNICATIONS

2000 Catalog Data: ELEC 3320. ELECTROMAGNETICS FOR WIRELESS COMMUNICATIONS (3)
LEC. 3. Pr., ELEC 3310. Maxwell’s equations are used to investigate plane waves and guided waves with an emphasis on fiber optics, electromagnetic compatibility and interference, antennas and radiation, and satellite communication systems.


Reference: None

Coordinator: T. H. Shumpert, Professor

Goals: This course continues the study of Electromagnetics, with a heavy emphasis fiberoptic waveguides, EMC/EMI, radiation and antennas, and satellite communication systems.

Prerequisites by topic:
1. Propagation on transmission lines
2. Electrostatic and magnetostatic fields
3. Maxwell’s equations

Topics:
1. Plane wave propagation (5 classes)
2. Wave reflection and transmission (6 classes)
3. Guided waves and Microstrip (3 classes)
4. Fiber optics (6 classes)
5. Electromagnetic compatibility and interference (6 classes)
6. Radiation and antennas (6 classes)
7. Satellite Communication Systems (4 classes)
8. Computer assignments (5 classes)
9. Tests (4 classes)

Typical methods for evaluating student performance:

<table>
<thead>
<tr>
<th>Assignment</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. Determine the modes and cutoff frequency for waveguide with physical dimensions as input variables.
2. Estimate crosstalk between adjacent microstrip transmission lines.
3. Perform a power budget study on a satellite communication system.

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: 1.5 credits or 50%
Engineering design: 1.5 credits or 50%

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

Prepared by: Stuart M. Wenworth  Date: 5/22/98
ELEC 3320 - ELECTROMAGNETICS FOR WIRELESS COMMUNICATIONS
(Required for ELEC, WIRE)

2010 Catalog Data: ELEC 3320. ELECTROMAGNETICS FOR WIRELESS COMMUNICATIONS (3). Pr., ELEC3310. Maxwell's equations are used in the study of plane waves, guided waves, fiberoptics, electromagnetic compatibility and interference, antennas and radiation, and satellite communication systems.


Reference: none

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

Course Objectives:
1. Apply Maxwell's equations to understand plane waves
2. To become familiar with waveguide, including optical fiber
3. To become familiar with antennas and antenna arrays
4. To be able to apply MATLAB in problem solving

Prerequisites by topic:
1. Electrostatic and magnetostatic fields
2. Maxwell's equations

Core topics:
1. Course overview and review of fundamental electromagnetics (1 class)
2. Plane waves (3 classes)
3. Power flow and the Poynting theorem (1 class)
4. Wave polarization (1 class)
5. Reflection and transmission of waves at boundaries (3 classes)
6. Basic operation of rectangular waveguide (2 classes)
7. Basic operation of dielectric waveguide and optical fiber (2 classes)
8. Electromagnetic interference issues (1 class)
9. Antennas (5 classes)
10. Simple antenna arrays (2 classes)
11. The Friis transmission equation and radar (3 classes)
12. Microstrip (1 class)
13. Basic microwave components (1 class)
14. MATLAB assignments (2 classes)
15. tests (3 classes)

Discretionary topics: (13 classes are devoted to a selection from the following topics at the instructor's discretion)
16. Fields in rectangular waveguide (3 classes)
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23. Scattering parameters (2 classes)
24. Microwave Couplers (1 class)
25. Microwave Filters (2 classes)
26. Microwave amplifiers and receivers (3 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
  50% engineering science
  50% engineering design

Relationship of course to program outcomes:
Outcome 1: Ability to apply knowledge of math, science and engineering to solve problems.
Outcome 2: Ability to apply in-depth knowledge of one or more disciplines within electrical engineering to the solution of engineering problems.
Outcome 3: Ability to design an electrical component or system to meet desired needs.
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).

Academic Honesty Policy:
All portions of the Auburn University student academic honesty code (Title XII) found in the Tiger Cub will apply to this class. 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.

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