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 7440/7446
   3. Effective Term: Spring 2010

4. Course Title: Wireless Communication Theory
   Abbreviated Title (30 characters or less): Wireless Communication Theory

5. Requested Action:
   - Renumber a Course
   - Add a Course
   - Revise a Course
   - Current Course Number:
   - Proposed Course Number:
   - Type of Revision:

6. Course Credit:
   Contact/Group Hours: 3
   Scheduled Type (e.g.: Lab, Lecture, Practicum, Directed Study):
   - Lecture
   Weekly or Per Term?: Weekly
   Credit Hours: 3
   Anticipated Enrollment: 20
   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 - ELEC 3400 or equivalent
   P - ELEC 7410

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)
    The basics of design, analysis and performance limits of wireless communication systems.

11. May Count Either
    (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)
    | Program Type | Program Title | Requirement or Elective? |
    |--------------|---------------|-------------------------|
    | Major        | MS in Electrical Engineering | Elective |
    | Major        | PhD in Electrical Engineering | Elective |

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: In-depth coverage of wireless communication theory is necessary to support research, design and analysis of modern wireless systems.

(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. This course will be taught by current ECE faculty in the wireless communication group.

(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 gain in-depth understanding of fundamentals of performance limits of wireless communications
2. To gain in-depth understanding of characterization of wireless channels
3. To gain in-depth understanding of advanced transmission and reception techniques for wireless communications

(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. Wireless channel models: path loss and shadowing, statistical multipath channel models (6 classes)
2. Capacity of wireless channels. (3 classes)
3. Digital modulation/demodulation techniques and performance analysis over wireless channels. (6 classes)
4. Equalization and diversity techniques. (4 classes)
5. Adaptive modulation for fading channels. (3 classes)
6. Multiple antennas and space-time communications. (4 classes)
7. Multicarrier modulation and OFDM. (6 classes)
8. Multiuser systems and multiple access techniques: FDMA, TDMA and spread spectrum multiple access, channel capacity. (8 classes)
9. Wireless systems and standards. (3 classes)
10. Tests. (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 two 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 20%
Tests (2) 50%
Final examination 30%

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

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: This course provides more in-depth coverage of wireless communication theory to support graduate-level research and design of modern wireless systems, beyond the coverage provided in undergraduate or split undergraduate-graduate communication systems courses.

(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, subpoenas 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 notifies the instructor of the need for arrangements. 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, 1288 Haley Center, 844-2096 (V/T).

ELEC 7440/7446 - WIRELESS COMMUNICATION THEORY

Catalog Data: ELEC 7440/7446. WIRELESS COMMUNICATION THEORY (3) LEC. 3. Pr., ELEC 7410 and an undergraduate communications course (e.g. ELEC 3400). The basics of design, analysis and performance limits of wireless communication systems.


Coordinator: J.K. Tugnait, Professor of Electrical & Computer Engineering

Course Objectives:
1. To gain in-depth understanding of fundamentals of performance limits of wireless communications
2. To gain in-depth understanding of characterization of wireless channels
3. To gain in-depth understanding of advanced transmission and reception techniques for wireless communications

Prerequisites by topic:
1. A first-year graduate level course in probability, random variables and random processes.
2. Introductory communication theory.

Topics:
1. Wireless channel models: path loss and shadowing, statistical multipath channel models (6 classes)
2. Capacity of wireless channels. (3 classes)
3. Digital modulation/demodulation techniques and performance analysis over wireless channels. (6 classes)
4. Equalization and diversity techniques. (4 classes)
5. Adaptive modulation for fading channels. (3 classes)
6. Multiple antennas and space-time communications. (4 classes)
7. Multicarrier modulation and OFDM. (6 classes)
8. Multiuser systems and multiple access techniques: FDMA, TDMA and spread spectrum multiple access, channel capacity. (8 classes)
9. Wireless systems and standards. (3 classes)
10. Tests. (2 classes)

Typical methods for evaluating student performance:

Homework 20%
Tests (2) 50%
Final examination 30%

Computer usage:

Homework may require use of MATLAB to solve problems and carry out simulations.

Laboratory projects (including major items of equipment and instrument 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.
Contribution of course to meeting the professional component

Engineering topics: 3 credits
- 83% engineering science (2.5 credits)
- 17% engineering design (0.5 credits)

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.

Special Considerations for COE Distance Education Courses

ELEC 7446 would require submission of homework assignments, two midterm exams, and a final exam.

Methods of Delivery: The AU College of Engineering (COE), through its Graduate Outreach Program (GOP), offers selected graduate-level course work to off-campus students by various means, primarily streaming video delivered via the Internet or DVDs. On-campus classes are held in specialized classrooms and are recorded each class day. Streaming video is available within a few minutes. DVDs are shipped the same day. Handout material made available to on-campus students is posted on the Internet or sent to off-campus students along with the DVDs.

Instructor/Student Communication: Typically, students and professors communicate via telephone and e-mail, and by exchanging documents via various means. Internet sites and discussion groups may be used to facilitate communication among the students as well as with the instructor.

Exam/Test Security: All off-campus students are required to have test proctors. These proctors serve on behalf of the instructors to maintain the integrity of the program. Proctors must be approved at the departmental level and by the Director of the GOP. Ideally, the proctor is someone in the human resources, personnel, or training and development section of the company, or agency, where the student is employed. On occasion, other personnel ranking at least one administrative level above the student serve as the proctor. In special cases, local librarians, or college testing services personnel may serve as the proctor. Responsibilities of proctors are clearly defined and, prior to approval, all proctors must agree to abide by rigorous rules related to the receipt, handling, administration, and return of tests and examinations.

Prepared by: J.K. Tugnait  Date: August 26, 2009