ECE 433 – Wireless and Cellular Communications I – Fall 2008
Course Project Information

Assignment

As part of this course, you are to propose and carry out a semester long project related to the field of wireless communications. The project should delve into one of the topics covered in the course or a related topic in greater depth than we can cover in lecture. Your goal should be to come away with a thorough understanding of the topic. The project will be presented in both oral and written forms near the end of the semester.

Note That: Some of these projects were originally intended to carry over to the follow-on course (EE434). As a result of scheduling issues, it is currently unclear if Dr. Anderson will be teaching EE434 in Spring 2009. Thus, students wishing to work on one of these projects will need to come up with a clearly defined endpoint for Fall 2008.

Project Topics and Groups

Students will generally be expected to work in groups of 2-3 on a single project topic (single-person groups will be authorized at the instructor's discretion). A list of potential project topics can be found at the end of this document. The list is not exhaustive, feel free to discuss or propose alternatives with the instructor.

★★★ *Prior to* submitting the project proposal, the project group must meet with Dr. Anderson to discuss their project topic. The goal of this discussion will be to define the specific goals and objectives of the project, define the 6-week and 12-week milestones, and ensure that the group has a strategy for success.

Important Project Dates

Last day to meet with Dr. Anderson:	Thursday, August 28
Project Proposals Due:	Friday, August 29
Last day for 6-week Milestones:	Monday, September 29
Status Report #1:	Friday, October 14
Last day for 12-week Milestones:	Monday, November 3
Status Report #2:	Wednesday, November 26
Written Reports Due:	Tuesday December 9, 5pm
Oral Project Presentation:	Final Exam Day

Project Proposals

Project proposals should be short (1 page maximum, 1 inch margins, single spacing, 10 point font), but they should clearly indicate:

- Title and topic of your project.
- A brief statement of work.
- The specific goals/objectives/results you expect to present for this project.
- A list of at least one reference/outside resource where you expect to obtain information.
- 6-week Project Milestones
- 12-week Project Milestones

Status Reports

Status reports are brief (1 page maximum plus figures, tables, references, etc.) reports to document progress made by the groups and to try and identify any major issues or sticking points. Detailed instructions will be provided at a later time, however, the basic content of each report is described below:

Status Report 1: Results of literature survey, preliminary design (block diagram, schematics), initial analysis, initial testing of components, and/or flowcharts/pseudo-code.

Status Report 2: Final (or nearly final) system architecture/design, initial analytical and/or simulation results, and a brief discussion of what will be necessary to complete the project.

Project Milestones

Because these projects are designed to be comprehensive semester-long efforts, 6-week and 12-week milestones will be defined to ensure groups are making reasonable progress throughout the semester and provide groups with feedback on their progress. In the proposal, each group will define a set of four (4) measurable milestones they expect to achieve at the 6-week and 12-week marking periods.

Milestones will be graded on essentially an "all-or-nothing" basis (best summed up in a statement by Dr. Dorsey of Aerospace Corporation: "Pick any milestones you want, but whatever you pick, I'm going to hold you to it"). Achieving all four milestones will result in a grade of 100%. Achieving 3 out of 4 will result in a grade of 85%. Achieving 2 or fewer milestones will result in a failing grade. Near misses will be handled *at the discretion of the instructor*.

Note that: milestone grades do not carry over to the next marking period—the goal here is to motivate groups that are falling behind to increase their efforts before the next marking period. It is possible to fail to achieve both 6-week and 12-week milestones and still receive an "A" on the overall project.

Written Reports

Projects will be documented in a written report. The report should be on 8½ x 11 paper, with 1" margins, and 1.5 lines spacing. The report is limited to a maximum of 6 pages including figures, graphs, tables, and references. External references should be documented in standard IEEE format.

A helpful hint for meeting the page limits of the written report: avoid summarizing or including lengthy derivations or calculations, especially if they are available in other sources. Simply include the pertinent information (usually just the result and any assumptions the authors made along the way) and reference the source.

Oral Project Presentations

Projects will be presented during the final exam period. Each project will be presented in a 25 minute time slot, with 20 minutes for presentation and 5 minutes for Q&A.

External Sources

You may consult and papers, texts, or confer with any faculty or student colleagues to complete this assignment. However, all work which is not your own must be properly referenced in your oral and written presentations.

List of suggested project topics

1. **USRP Daughterboard to Beagle Board Interface** (2-4 Students, 1 or 2 Semesters, Possible Senior Design Credit). This project involves developing an interface board between the receiver and transmitter boards for the Universal Software Radio Platform (www.ettus.com) and the TI BeagleBoard (beagleboard.org). EE433 will focus on developing the physical hardware on a Printed Circuit Board and validating basic operation of the interface board. EE434 will focus on refining the hardware (if necessary) and implementing simple waveforms (AM, FM, etc). External support will be provided by several open-source software defined radio developers.

2. **700 MHz Propagation Measurements and Modeling** (2-4 Students, 1 or 2 Semesters). This project involves using the WEM Lab's channel sounder to perform both outdoor and indoor wideband propagation measurements, post-process those measurements, and then develop simple channel models using the measurement data. Depending on obtaining broadcast permission, one semester will focus on outdoor measurements, the other semester will focus on indoor measurements. Students working on this project will need to be able to dedicate blocks of time (4-8 hour blocks) in order to perform measurements. Results from this project will likely lead to a Journal or Conference publication.

3. **Antenna Chamber Hardware/Software Development** (2-3 Students, 1 Semester). This project will develop a LabVIEW program to automate recording antenna pattern measurements for the new WEM Lab antenna test chamber. The LabVIEW software will control a precision positioning table and record data from a network analyzer, process the data, and save/display the antenna pattern.

4. **WiMAX vs HSDPA: The Debate** (2 or 4 Students, 1 Semester). WiMAX and HSDPA are two competing broadband wireless networking standards. Students will split into teams and research each of these standards to uncover their strengths, weaknesses, commercial successes, and failures. In lieu of a final presentation, a debate between the two sides will be held, where each side will attempt to convince their classmates that their standard provides the best solution.

5. **RF Over Digital Fiber Repeater/Distributed Antenna System** (2-3 Students, 2 Semesters, Possible Senior Design Credit). This project involves designing and building a fiber-optic based repeater to provide cellular phone communications in the basement of Rickover Hall. The first generation system will utilize a single antenna on the roof of Rickover and a single antenna in the basement of Rickover, but should be designed so that multiple antennas can be installed in Rickover (so that a true distributed antenna system could be implemented). Results from this project may lead to a publication.

6. **Counter IED Sensor Network/Network Defeat** (2-4 Students, 1-2 Semesters, Possible Senior Design Credit). This project involves building on the C-IED work of two senior design students from 2007 and deploying the C-IED sensor network. Alternatively, a secondary group could investigate ways of detecting/defeating the network. The network will be required to be deployed in operating condition in March so that various groups can evaluate its effectiveness in April/May.