

The Wireless Communications Laboratory deals broadly with the foundations of wireless communication. In this course we focus mainly on basic QAM transmission, reception, extensions to OFDM, and their practical implementations. As you might expect, the field of wireless communication is changing rapidly as engineers discover new problems, find new applications for existing problems, and develop new algorithms. Keeping up with the field requires research and dedication to continued professional learning through reading journals such as the *IEEE Transactions on Signal Processing*, *IEEE Transactions on Communications*, *IEEE Transactions on Wireless Communications*, and the *IEEE Transactions on Vehicular Technology* and attending conferences (or reading proceedings) such as the ICC, GLOBECOM, Vehicular Technology Conference, Wireless Communications and Networking Conference, etc. Since this course is primarily an undergraduate level introduction to wireless communication, graduate students taking the EE 381V option are required to complete a term project. The project is designed to allow you to delve into a topic of your choice, not covered in class, in more detail. The final project grade is 20% of the grade for the class. Projects with groups of 2 or individual projects are acceptable. Group projects will be graded with different consideration. In other words they are expected to be more refined and polished relative to a single student project. For group projects, a document must be attached with the final report clearly specifying each person's contributions to assist with grading.

There are three possible projects. You can choose any project option you like based on your interests.

(1) System Implementation Here the final deliverable is an implementation of a wireless communication system of your choice. The idea is that the implementation will deal with either a different system than we considered in class, or a similar system with enhancements such as space-time coding, MIMO, or more advanced transceiver design. This project will require code that is well documented, can be made available online, and appropriate written documentation preferably in the form of a web page that can be linked to the class page. Demo and all related code will be turned in. It must work for full credit. You can use the wireless communication lab facilities for your implementation or you can use the GNU radio platform (see <http://hydra.ece.utexas.edu>) and use the Hydra / GNU physical layer framework

(2) Survey Paper Here the final deliverable is a research paper in the format of a journal or conference paper that provides a survey of a given topic. This project should have a detailed survey component and a simulation component for full credit. The paper will be graded as a conference or journal paper. You will be able to choose the format that suits your project and I will grade accordingly (by format I mean appropriate page length, etc). Suggested formats are *IEEE Communications Magazine* and *IEEE Wireless Communications*. The final project report must be written in LaTeX. Possible topics include a broad survey of software-defined radio or more detail surveys of specific areas including synchronization, OFDM, or channel estimation. Survey papers should be unbiased and well written.

(3) Research Paper Here the final deliverable is a research paper in the format of a journal or conference paper. This project should contain some element of innovation, even if it is small or incremental. The paper will be graded as a conference or journal paper. You will be able to choose the format that suits your project and I will grade accordingly. The final project report must be written in LaTeX. Possible topics include efficient filtering, synchronization, implementation architectures, channel estimation, MIMO communication, space-time code design, etc.

Note on Avoiding Plagiarism

At The University of Texas we take plagiarism in all of its forms very seriously. The penalty for plagiarism on this final project is a failing grade in the course. If you have any questions about originality and plagiarism please do not hesitate to ask me. All reports will be run through automatic plagiarism checkers.

Here are some examples that hopefully will help you avoid plagiarism.

- You should never copy a figure from a paper and include in your paper without a reference at a minimum. Please note, in your final project you should redraw all figures yourself. The reason is that the original copyright holder has the rights.
- You should never copy text from another source without quotations and a direct reference.
- You should never paraphrase text from another source without providing a reference. Extensive paraphrasing even with a reference is considered cheating.
- You cannot reuse any material from another course project, unless your project builds substantially on the prior project. If that is the case you need to provide a reference to the prior project and provide a complete copy of that report. Be very careful that everything in this project is new.
- You cannot reuse any code that you did not create without at minimum a reference and permission. The main exception is that you may use code developed in this lab course but you must reference what you modified in your documentation.
- All of the above applies to copying material from the web.

Project Deliverables

For each project there will be a number of deliverables throughout the semester including:

Project Proposal: Due October 22 at 5pm in the box outside Prof. Heath's office.

Project Progress Reports: Small status reports will be required for certain homework assignments as needed. This is to check that you are thinking about the problem and for me to give you an opportunity for feedback.

Final Written Report: Due December 5 at midnight in the box outside my office. Electronic files of your presentation and writeup should be emailed to me. For the system implementation project, demonstration performed during last week of class (documented code received by December 7). Using LaTeX for the written report is required. I suggest that you use the IEEEtran.cls file to help format your paper. You may also find using BibTex useful along with the converter on <http://www.bibconverter.net/ieeexplore/> to facilitate creating a bibliography.

EE 381V Proposal Evaluation

Name: _____

Research – 45/50 points

_____ (10 points) Introduction

- Background on the area, where your project fits in, what applications it impacts. Clearly indicates what type of project (literature review, research, implementation).

_____ (15 points) Problem Statement

- Problem that you are trying to solve. Setup and key assumptions. Methods to be used in solving the problem. For a survey project this should be a more detailed overview of the area.

_____ (10 points) Preliminary results.

- Some progress has been made beyond the literature review.

_____ (10 points) Plan of action.

- Realistic and detailed plan of action proposed including action items and a timeline.

Format -- 5/50 points

_____ (5 points) Meet formatting, spelling, grammar, and reference requirements. Should be 2-3 pages in length (total) with 11pt or 12pt font, single spacing, and standard 1 inch margins all around. At least three journal papers that you've read are cited correctly and discussed.

EE 381V Final Project Evaluation – System Implementation

Name: _____

Implementation -- 50/100 points

_____ (20 points) Project is sufficiently challenging and goes beyond what is done in the lab.

_____ (30 points) Code implemented correctly.

Demo -- 30/100 points

_____ (20 points) Demo works.

_____ (10 points) Good selection of graphs and plots.

Documentation -- 20/100 points

_____ (10 points) Web page documentation of demo, what it does, how to download.

_____ (10 points) Code is documented, functions labeled, suitable use of VIs, coherent naming strategies.

EE 381V Final Report Evaluation – Survey Article

Name: _____

Research -- 75/100 points

_____ (10 points) Description of context of the project - this is typically in the **Introduction**.
○ Background on the general area, need for a review, why a survey article is important.

_____ (10 points) Relevant and important references chosen – reflects the quality of the references used.
○ Important references are identified. Good cross-section of references. Primarily journal papers cited (unless good reasons to cite a conference paper). Both older and recent references included as appropriate for the survey topic.

_____ (50 points) Survey of area – this is the meat of the paper.
○ 10 points Introduction to the area to be surveyed.

○ 15 points Detailed description of contributions in different papers.

○ 10 points Compare and contrast different contributions.

○ 10 points Some numerical results, analytical or numerical.

_____ (10 points) Conclusion and directions for future work.
○ Gives insight into the paper and provides relevant suggestions for future

Format -- 25/100 points

_____ (5 points) Grammar/spelling.

_____ (10 points) For conference submission: meets 10-page limit with 1 inch margins, 12pt font, double spaced, not including title, abstract, and table-of-contents. References may be 10pt. Not less than 8-pages. For journal submission (full length, not correspondence or letter): please indicate the journal for submission and I will grade accordingly. Suggested journals are *Communications Magazine*, or *Wireless Communications*

_____ (5 points) Format of references and cite references in text.

_____ (5 points) Identify at least three key journal papers in the area.

EE 381V Final Report Evaluation – Research Paper

Name: _____

Research -- 75/100 points

_____ (10 points) Description of context of the project - this is typically in the **Introduction**.

- Background on the area, where your project fits in, what applications it impacts, clear statement of contributions.

_____ (10 points) Description of objectives - this is typically in the **Introduction**, may also be in **Problem Statement** or **System Description**.

- The goals for the project. Ideally they should be similar to the objectives as outlined in your project proposal.

_____ (50 points) Description of results - this is typically the *meat* of the paper.

- 10 points Problem statement, setup, and key assumptions.
- 15 points Description of methods (any derivations, explanation of simulations, etc.).
- 15 points Insight into problem and innovation (new results, new contributions).
- 10 points Well chosen analytical and/or simulation results.

_____ (5 points) Conclusion and directions for future work.

- Gives insight into the paper and provides relevant suggestions for future work. .

Format -- 25/100 points

_____ (5 points) Grammar/spelling.

_____ (10 points) For conference submission: meets 10-page limit with 1 inch margins, 12pt font, double spaced, not including title, abstract, and table-of-contents. References may be 10pt. Not less than 8-pages. For journal submission (full length, not correspondence or letter): please indicate the journal for submission and I will grade accordingly.

_____ (5 points) Format of references and cite references in text.

_____ (5 points) Identify at least three key journal papers in the area (more desired).