

## EEL 4936/EEL 6936 Wireless Communication Systems Lab Course Syllabus

### Course web site:

Course materials (lab manuals, equipment user guides, etc.): <http://wcsp.eng.usf.edu/courses/wcsl.html>

Video lectures, grades, and announcements:

The course page on USF Learn

### Term & Meeting Info: *Spring Semesters*

Class Hours: Friday, 10:05 to 11:55 (Location: ENG 4)

Lab Hours: Please see your session (Location: ENB 236)

### Instructor Info:

Dr. Huseyin Arslan

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Please, contact via email.

### Managing TAs for contact:

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Office: ENB 380B

Office Hours: Friday, 12:00-1:30 pm

### Catalog Description:

An extensive hands-on introduction to digital communications and wireless communication systems; involving testing, modeling, simulation, and measurements of the performance of digital communication systems at both sub-system and complete system levels. Not available on an S/U basis.

**Prerequisites:** Introduction to Communication Systems or equivalent.

**Suggested Co-requisites:** WAMI-I lab, DSP/FPGA labs, Personal & Mobile Communication, Advanced Topics on Wireless Communications, Digital Comm. Sys.

**Level:** *Senior level undergraduate and graduate*

**Credits:** 3

**Class Duration:** 110 minutes lecture (in class) + 4 hours lab

**Text Info:** *TAs will provide the required documents.* You are not granted permission to sell notes or tapes of class lectures.

**References** (supplemental reading): *Related reading materials (Manuals, declaration file, and supplement documents) are reachable via course web site.*

### Grading:

The following is tentative and subject to change:

Pre-Labs Quizzes		10%	Pop-quizzes at the beginning of some labs
Lab Reports		30%	Each lab report will be collected before the beginning of next lab
Project	Preliminary	10%	Presentation on Feb. 29 <sup>th</sup> , Report on March 21 <sup>st</sup>
	Final	25%	Last week of classes (during one of the lab sessions)
Final Exam		25%	Last week of classes (during the regular class hour)

**Course content:**

- 8 mandatory experiments (8 weeks).
- 1 elective experiment (1 week) – pick 1 out of 3 optional experiments.
- 1 project (4 weeks) – Students need to start thinking about the project well ahead of time (project reports and project presentations are due last day of classes – during the last week lab hours).
- 1 Final exam (last week of classes – during the regular class hour of last week).
- Quizzes (pop-quizzes at the beginning of some labs – related to pre-lab assignments, reading materials, and what is learned in the class etc. Note that within the same lab (let's say lab-5) a TA might apply pop-quiz, but, the other TA's might not).
- Lab reports (after each lab – will be collected before the next lab. Related to what is learned in the lab and commenting on the observations, relating it with the theory and expectations. Identifying the differences and commenting on why if any.).

**Late policy:**

Quizzes must be taken during scheduled times and pre-labs must be completed before the beginning of the laboratory session. Late pre-labs or make-up quizzes will not be accepted unless pre-arranged and with good reason. Laboratory reports are due the beginning of the subsequent laboratory session unless otherwise announced. **5 points (out of 40)** will be decreased up to **24 hours late submission**; **10 points** will be decreased **24 to 48 hours late submission**. **No late lab reports will be accepted unless pre-arranged and with good reason after 48 hours.**

**Attendance Policy and Open Lab Hours:**

You are expected to view all lectures and be present for all 3 hours and 50 minutes of each laboratory session. Anyone wishing to leave the lab early must have his/her data checked for completeness before leaving. You should not leave early unless you have every part of the lab complete, including calculations, and only have the report SUMMARY to finish.

**Laboratory hours:**

You will receive a schedule that details the operating hours for the Lab in ENB-236. The schedule will also be posted on the door.

Graduate students and some undergraduate students who are working on Senior Design Projects also have special access to the lab. You are asked not to attempt entry into the lab outside the scheduled hours, even if you see that there are some other non-TA students in the room. **This is a strict policy.**

**TA Signatures on Your Work:**

A TA signature must be on your work (cover page and all graphs/printouts, at a minimum) else it will not be considered complete when you submit your lab report. You should have the TA review and sign your work before you leave the lab.

**Cheating:** University Policies on cheating can be found in your student catalog.

**Laboratory Partners:**

Typically students will work in teams of two (at most three). The team members will be rotated weekly when possible; in the case that multiple laboratory exercises are addressed in a single session, the partners

will likely remain the same. Similarly, in the case of a lab exercise that will last multiple sessions, the partners will remain the same. The teaching assistant will make sure that on a given team, there is equal participation from each student and may make specific team assignments to address this point.

### **Laboratory Assignments:**

For many laboratories you will be required to complete a pre-laboratory assignment – this assignment must be turned in at the beginning of the lab period. For all laboratories you need to read over the previous lecture material and the laboratory assignment you are about to undertake. If you are not familiar with the background and procedures, you will have difficulty completing the laboratory on time. Short unannounced quizzes on this material may be given at the beginning of some laboratory sessions. You can work with your lab partner to complete the pre-laboratory assignments, but each of you must turn in your own work separately.

For each laboratory assignment you will also have to complete a post-laboratory report. For this report, you are strongly encouraged to collaborate with your partner and discuss the results, but the descriptions and conclusions must be completed individually. You will be graded primarily on the quality of the technical content, not the quantity or style of presentation. Your reports should be neat, accurate and concise (the Summary portion must be less than one page). Laboratory reports are due the week following the laboratory experiment, unless notified otherwise, and should be turned in to the TA at the start of the laboratory period.

### **General Instructions for Writing Your Laboratory Reports**

1. Your completed laboratory assignment is to consist of your original laboratory procedure sheets (with data tables and blanks filled in), plus a short report.
2. Each report is to include a ½ to 1 page SUMMARY.
3. For some laboratories, specific questions are asked and specific plots and figures are requested. These figures, graphs, tables and answers to specific questions specified in the lab write-up are to be included as additional pages under “Discussion of Results”. Make sure all figures include a description of what the figure represents (title or caption), and that x- and y-axes of all plots are clearly labeled.
4. Some laboratory procedures ask you to make OBSERVATIONS based on the data that you have recorded, and to perform specific calculations within the procedure. Make sure that you make every effort to respond to all data and observation requests throughout the procedure. Comments should be hand-written (in the interests of saving time).
5. You may also want to make a few additional notes while completing the experiments: **observe** the graphs and data, and try to **interpret** them. These notes will help you to write a good summary.
6. Ask questions during the laboratory period to aid in your understanding.
7. Your reports should be generated using a word processor. Hand-written tables, figure captions, etc. are allowed, but avoid using hand-written summaries and discussion.
8. While you are encouraged to discuss issues and trade ideas with your lab partner and other students in the lab, your lab SUMMARY and (where applicable) DISCUSSION OF RESULTS must be in your own words.
9. Do your best to reflect your understanding of the concepts related to the lab, and discuss the main results you achieved. **The clear communication of your interpretations on the relevant concepts of the experiment is the most important aspect of your report.**

The TAs will provide you a template to help you write your reports. Note that for some of the experiments, there may be additional guidelines.

## **Lab and Course Schedule – (tentative and subject to change)**

### ***Mandatory labs (weeks 1 through 8):***

1. An introduction to basic digital baseband communication through MATLAB simulation  
Understanding waveforms and their properties
2. SDR and lab equipment and introduction to digital measurements
3. Introduction to wireless radio front-end, radio impairments, and measurement techniques
4. Digital modulation and modulation domain analysis
5. Effects of filters in wireless communication systems and investigation of various pulse shaping filters
6. Multidimensional signal analysis
7. Synchronization in wireless systems (time/frequency/phase synchronization and channel estimation)
8. Wireless channel and channel impact in wireless communication

### ***Optional Labs (week 9, - pick 1 out of 3 experiments given below):***

9. Distortions in RF front-end  
Analysis of interference  
OFDM signal analysis

### ***Projects (weeks 10, 11, 12, and 13)***

By lab 7 (synchronization lab), students are expected to pick a project to carry out from week 10 until the last week of the semester. A project proposal and presentation are required just after taking the data during lab 7. The project proposal needs to be approved by the instructor. Unapproved projects and any delay due to the unapproval of the project are students' responsibilities. Therefore, students are required to work with the instructor well ahead of the time for identifying a proper project. Like the regular labs, projects will be carried out with teams of two students, and the partners will remain the same during the project period.

**Additional Course Features:** This course utilizes University of South Florida's state of the art wireless communication systems laboratory. Students work in 2-person laboratory teams that alternate throughout the semester.