ENEE 428
COMMUNICATIONS DESIGN
LABORATORY

Spring 2019

Lab Lecture: Wednesday 10:00–10:50 am, AVW 1362
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Laboratory Sessions in AVW 1362:

0102 Wednesday 2:00–5:00 pm: S.A. Tretter
e-mail: tretter@umd.edu

0101 Friday 9:00 am–12:00 pm: Yongzhang Leng
e-mail: yleng@umd.edu

All lecture slides will be posted at
http://www.ece.umd.edu/~tretter
under the heading
ENEE 428 COMMUNICATIONS DESIGN LABORATORY
Lecture Slides for the TMS320C6713 DSK

The slides contain the latest updates. If the book and the slides
differ, follow the instructions in the slides.
ENEE 428 COMMUNICATIONS DESIGN LABORATORY

Prerequisites: ENEE 322 Signals and Systems and ENEE 324 Engineering Probability; Working knowledge of PC’s and C programming

Corequisites: ENEE 420 Communication Systems or ENEE 425 Digital Signal Processing


Optional Reference Books:


2. A good book to learn C from.

WARNING: Do not sign up for this class unless you like to work with PC’s and enjoy programming!

COURSE DESCRIPTION

The goal of the Communication Design Laboratory is to explore the signal processing and communication system theoretical concepts presented in ENEE 420 Communication Systems and ENEE 425 Digital Signal Processing by implementing them on actual hardware in real time. In the process, you will gain experience using equipment commonly used in industry, such as, oscilloscopes, spectrum analyzers, error rate test sets, channel simulators, digital signal processors, analog-to-digital and digital-to-analog converters, and signal generators. The experiments will be based on using a Texas Instruments TMS320C6713 DSP Starter Kit (DSK) which is a relatively low cost stand-alone board that communicates with the PC through a USB port. For our lab, the DSK has been mechanically installed inside the PC case. The DSK contains a TMS320C6713 floating point digital signal processor and stereo A/D and D/A converters. Software support includes a TMS320C6x assembler, and C compilers for the PC and DSP. You should have a good working knowledge of PC’s and some familiarity with C. The lab has eight stations and students will work in pairs.
Experiments, Lab Reports, Grading, Etc.

Experiments that Will be Done
All students must complete the following items. Each experiment corresponds to one chapter in the text and may take more than one week.

1. Chapter 1. Brief Overview of the Hardware and Software Tools
2. Chapter 2. Learning to Use the Hardware and Software Tools by Generating a Sine Wave
3. Chapter 3. Digital Filters
   Only C implementations of FIR and IIR filters will be done. All assembly language implementations will be skipped.
4. Chapter 5. Amplitude Modulation
   We will only do the following from this chapter:
   (a) Slides 5-11 thorough 5-16 on the Hilbert Transform, pre-envelope, and complex envelope
   (b) Slides 5-30 and 5-31 for Hilbert transform experiments
5. Chapter 9. Pseudo-Random Binary Sequences and Data Scramblers
6. Chapter 11. Digital Data Transmission by Baseband Pulse Amplitude Modulation (PAM)
8. New Chapter 20. Frequency Shift Keying (FSK)
   In the following order:
   (a) PAM signal generation
   (b) Signal spectrum
   (c) Demodulation by a frequency discriminator
   (d) Demodulation using tone filters
   (e) Demodulation by a phase-locked loop if time permits
9. Additional experiments for extra credit if time permits

NOTE: You should read over the experiments before coming to lab and do any preliminary work necessary.

Grading Criteria
Your grade will be determined by the following items:
• Grades on lab reports

• Attendance at lecture and lab. Lack of attendance at either will reduce your grade.

• Opinion of TA and instructor on your contribution to work in lab

• Work done beyond minimum requirements

Lab Reports
Inform your TA when you have completed an experiment (chapter), or part of a chapter. Your TA will then ask you to demonstrate at a work station that your implementation is working correctly.

Individual written lab reports are required. Part of what you will gain from this course is practice writing well organized reports. Documenting and communicating your work will be very important in your future jobs. The reports should be turned in usually one week after you complete a chapter and will be graded by your TA on the basis of 20 points. Your TA will set deadlines for when the reports must be completed. Points will be deducted for late reports. No lab report is required for Chapter 1.

When turning in your lab reports, please include all of the items listed below. (Your TA may modify these requirements.)

1. Include the experiment title, your name, and your partner’s name on the first page.

2. A printed listing of your commented C and, if used, assembly source code. It is not necessary to include standard header (.h) or other accessory files unless you created or modified them for the experiment.

3. Answers to all questions asked in the lab manual and slides.

4. Include data listings and output from the various filter design programs when relevant. Include plots of filter frequency responses.

5. Number pages, figures, and tables.

6. Be sure to label the axes of plots.

7. Any additional items requested by your TA.

8. A short introduction discussing the experiment at the beginning, and a section with your conclusions at the end.

Lab Access
The lab has a university ID card reader on the door. I will submit a class roster to the ECE office and you should then have access to the lab from 7 AM to 11 PM every day as long as you are not interfering with another class.
Using the Lab Computers

Use your standard university user name and password to log on to the lab computers. This is a private account for you.

In addition, each lab group will be given a private directory on the network server (ecelabsvr) that both group members can share. No other groups can read your directory. However, all administrators (including TA’s) can access it.

Please do your program development in your network group directory so the local hard drive does not get cluttered up. The hard drives are re-imaged each time a PC is rebooted and any files you stored on them will be lost.

**WARNING: Disk drives and networks sometimes crash! To be safe, you should back up your programs on a USB memory drive or elsewhere before you leave for the day.** Last semester some students found that some files were changed or deleted from their ecelabsvr space.

You can also use WinSCP to transfer files to and from your Glue account. If the network is down you can work from the local disk since all our utility software is stored on the C hard disk.