EEL 4511: REAL-TIME DSP APPLICATIONS

INSTRUCTOR

Dr. Karl Gugel   **gugel@ufl.edu**   Office Hours: MWF 10:30 – 11:30 am

LECTURES

NEB 202   MWF 9:35 – 10:25 am

LAB SECTIONS (NEB 281)

Tue 19428	Tue 19427	Wed 19425
11:45 am – 1:40 pm	6:15 – 8:10 pm	8:20 – 10:10 pm
Thur 19430	Thur 19426	Fri 19424
9:35 – 11:30 am	4:05 – 6:00 pm	1:55 – 3:50 pm

CATALOG DESCRIPTION

Real world digital signal processing (DSP) tasks are presented and solved in a lab environment that utilizes a 150 MHz Floating Point DSP & a sophisticated code development tools/hardware emulation.

COURSE OBJECTIVES (ABET Design Content 50%)

To understand the differences between floating point and fixed point DSP implementations. To be able to design and implement low, high and band pass filters in the digital domain. To study and accurately employ appropriate digital sampling and windowing of data techniques. To understand and use the Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT) algorithms in Spectrum analysis related problems.

TEXTBOOK

Not required, instead we will rely on various Texas Instruments data pages (technical documents) identified in the lab link on the below website:

HOMEPAGE

http://www.add.ece.ufl.edu/4511

HARDWARE PURCHASES

- TI TMS32028379 Development board & lab parts kit will be handed out or sent out later.
- Optional Wire-wrap tool and Soldering Iron, highly recommended for work at home.

REQUIRED SOFTWARE

Download TI's free software development tool, Code Composer Studio. Near the end of the class you will also need to use Matlab for filter design and FFT experimentation.

REFERENCE MATERIALS (Optional)

- Numerical Recipes in C by Press, Teukolsky, Vetteriling and Flannery, 2nd Ed. (ISBN#: 0521431085)
- Discrete-Time Signal Processing by Oppenheim and Schafer, 1st Ed. (ISBN#: 013216292X)

COURSE GRADE DETERMINATION

Homework	5%
Quizzes	25%
Laboratory	70% ; L1= 1%, L2 = 5%, L3 – L8 = 8% each, Final Project= 16%

WORKING TOGETHER

You are encouraged to work together on homework assignments and share ideas on lab assignments. However, you are not allowed to copy or duplicate any lab material (code, drawings, etc.) from another student. This work will be considered cheating and will be dealt with in a severe manner.

LABORATORY RULES (Labs will administered via Zoom)

1. Students must work ***individually*** on their Lab projects.   Every student should have their own unique design/approach and software.

2. Students must attend lab Zoom meetings during their assigned time.

3. Students must be prepared for the Lab Zoom meeting. ***No student will be admitted to the Zoom Lab Meeting without the required pre-lab work in hand***, i.e., circuits, flow charts and software designs submitted to your TA prior to the meeting.

4. You must log in at your standard lab meeting starting time for check-in. If you are late, you may miss a lab quiz and thus get a zero for this portion of the lab.

EEL 4511 Real-Time DSP Applications Schedule

Week	HW Due	Lab Start	Topics & Lecture Viewing
1 – Aug 23	**None**	**None**	***Review:*** Computer Buses & Memory Interfacing, Computer Architectures, Assembler Directives, DSP Programming Model With Ex0.asm, Lectures 1 – 6
2 – Aug 30	**H1:** Sept 3	**L1:** Aug 30	Assembly Language, Ex0.lst, Direct Addressing, Conditional Branches, Flags, Ex1.asm, GPIO & WD Timer, Lectures 7 - 9
3 – Sept 6	**H2:** Sept 10	**L2:** Sept 7	**Labor Day**, I^2 C Bus, Serial LCD, Bit Bang GPIO, Stack, Ex2.asm, Floating Pt. Instructions, FPU_Ex1.asm, Lect. 10 - 11
4 – Sept 13	**H3:** Sept 17	**L3:** Sept 15	Programming in C, C LCD Drivers, Fixed Pt. vs. Floating Pt., IEEE Flt. Pt. Format, SPI, SSRAM, Lectures 12 – 14
5 – Sept 20	**None**	**L4:** Sept 23	A/Ds & D/As, Internal DSP A/D, Codec IC, McBSP Peripheral Lectures 15 - 17
6 – Sept 27	**H4:** Oct 1	**None**	Sampling Theory, Aliasing, Fixed Pt. Filter Implementations, Digital Gain & Mixing, Lectures 18 - 20
7 – Oct 4	**None**	**None**	**Homecoming,** Interpolation & Decimation, A/Ds & D/A Noise/Dynamic Range, Reverb & Echo, Circular Buffers, Lectures 21A – 22
8 – Oct 11	**H5:** Oct 15	**L5:** Oct 11	Discrete Sine Generation, Magnitude & Phase, FIR Filters, Matlab Filter Coefficient Generation, Lectures 23 – 25
9 – Oct 18	**None**	**L6:** Oct 19	Catch up on previous topics, begin IIR Filters, Lecture 26-27
10 – Oct 25	**H6:** Oct 29	**L7:** Oct 26	IIR Filter, Lectures 27 – 28
11 – Nov 1	**H7:** Nov 5	**L8:** Nov 4	DFT, FFT, Block Processing, Ping Pong Buffers, Lectures 29 – 31
12 – Nov 8	**None**	**None**	Windowing Techniques, Special Effects, TI Library Filter Functions, Lectures 32 - 34
13 – Nov 15	**H8:** Nov 19	**L9:** Nov 15	Special Effects, Dual CPU, Speech Recog., Lectures 35 – 37
14 – Nov 22	**None**	**None**	Catch up previous lectures, **Thanksgiving,**
15 – Nov 29	**H9:** Dec 3	**Final Proj**	General Debug & Analysis, Speech Recognition, Lectures 38/39
16 – Dec 6	**None**	**Demos**	Reading Day Week, Final Project demos & reviews .

Weeks with Partial Labs: Students who did not have lab the previous week, due to it starting on Tuesday, Wednesday or Thursday, will complete lab the following week. i.e. Lab #2 starts on Tuesday, Sept 7th and so the Monday students should attend Lab #2 the following week, Monday, Sept 13th.

TA "Workshop" lab will be held on weeks where there is no assigned lab during the regularly scheduled lab time. A "Workshop" refers to an open lab intended to help students: (1) correct deficiencies from previous laboratory assignments; and/or (2) get an early start on the next laboratory assignment.   ***Please exercise patience when your TA is servicing multiple students.***