

EEL 4511: REAL-TIME DSP APPLICATIONS

INSTRUCTOR

Dr. Karl Gugel gugel@ufl.edu Off. Hours: MWF 10:30 -11:30 am, 2:50 - 3:50 pm, 265 NEB

LECTURES

EEL4924 MWF 3rd period (9:35 - 10:25 am) LAR 239 Senior Design

EEL4511 MWF 6th period (12:50 - 1:40 pm) NEB 202 RT DSP App.

EEL4924 MWF 7th period (1:55 - 2:45 pm) CHE 237 Senior Design

LAB SECTIONS (NEB 281)

Tue 23196 Per 5-6	Tue 23195 Per 11-E1	Wed 23193 Per E2-E3
Thur 23200 Per 3-4	Thur 23194 Per 9-10	Fri 23192 Per 7-8

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:

OFFICE HOURS & HOMEPAGE

My office hours are not flexible. If you can't attend them, see me between classes or visit a TA during their office hours. <http://www.add.ece.ufl.edu/4511>

HARDWARE PURCHASES

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

REQUIRED SOFTWARE

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

REFERENCE MATERIALS (Optional)

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

COURSE GRADE DETERMINATION

Exam #1*	10%	
Exam #2*	10%	
Homework/Quiz	5%	;pop quizzes are worth 50% of one homework
Laboratory	75%	;Lab weighting: Lab1= 0%, Lab2 = 5%, Labs3 – 8 = 8.75%, Lab9 = 17.5%

* When exams are handed back for review in class, **all re-grades are due the same day.**

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

1. No food, drinks, dancing or smoking in the Lab!
2. Students work ***individually*** on each Lab project.
3. It is the student's responsibility to return all equipment and clean her/his work area before leaving the Lab.
4. Students must attend labs during their assigned time.
5. Students must come prepared to the Lab. ***No student will be admitted to the Lab without the pre-lab work in hand***, i.e., printout(s) and a memory stick with hardware and software designs.
6. Labs are 2 hours long.
7. You must show up at the standard lab starting time for check-in. If you are late, you may miss a lab quiz and thus get a zero for the quiz.

Class Schedule (Part 1 of 2)

WEEK/DAY	DATE	HW	LAB #	Status	Comments
1	M	8/19		No Class	No Class Yet...
1	T	20	None		
1	W	21	None		Computer Architectures, Assembler Directives, Ex0.asm
1	Th	22	None		
1	F	23	None		DSP Programming Model – Ex0.asm
2	M	26			DSP Programming Model – Ex0.lst & Direct Addressing
2	Tu	27	1		
2	W	28	1		Assembly Language, Conditional Branches, Ex1.asm
2	Th	29	1		
2	F	30	1	1	GPIO & Watchdog Timer
3	M	9/2		No Class	Holiday
3	Tu	3	2		
3	W	4	2		Serial LCDs & I ² C (Bit-Banging GPIO)
3	Th	5	2		
3	F	6	2	2	Stack Software Design Concepts, Programming in C
4	M	9			FPU Instructions, FPU_Ex1.asm, C LCD Drivers
4	Tu	10	Workshop		
4	W	11	3		Fixed Pt. vs. Floating Pt. Implementations
4	Th	12	3		
4	F	13	3	3	IEEE Floating Pt. Format
5	M	16			Interfacing Parallel & Serial SRAM
5	Tu	17	3		
5	W	18	Workshop		Memory Timing Diagrams/Serial SRAM/SPI
5	Th	19	4		
5	F	20	4	4	Memory Timing Diagrams/Serial SRAM/SPI
6	M	23			Voltmeter Application: DSP's A/D & Timer 1 (Int. 13)
6	Tu	24	4		
6	W	25	4		CODEC related Topics
6	Th	26	Workshop		
6	F	27	Workshop		Exam I Review
7	M	30			Exam I in class
7	Tu	10/1	Workshop		
7	W	2	5		Analog I/O, Noise & Dynamic Range
7	Th	3	5		
7	F	4	5	5	Analog I/O, Noise & Dynamic Range
8	M	7			Exam I handed back
8	Tu	8	5		
8	W	9	Workshop		Sampling Theory/Echo & Reverb
8	Th	10	Workshop		
8	F	11	6	Workshop	Sampling Theory/Echo & Reverb
9	M	14			Digital Filtering (FIR)
9	Tu	15	6		
9	W	16	6		Digital Filtering (FIR)/Matlab/TFilter
9	Th	17	6		
9	F	18	6		Digital Filtering (IIR)

EEL 4511 Real-time DSP Applications Subjects

Class Schedule (Part 2 of 2)

WEEK/DAY	DATE	HW	LAB #	Status	Comments
10	M	21			Digital Filtering (IIR)
10	Tu	22		Workshop	
10	W	23		7	DFT
10	Th	24		7	
10	F	25		7	DFT/FFT with Matlab
11	M	28			Lab8 Preparation (TAs)
11	Tu	29		Workshop	
11	W	30		Workshop	DMA & Ping Pong Buffers (TAs)
11	Th	31		8	Halloween
11	F	11/1	7	8	Lab 9 Introduction & Discussion
12	M	4			Special Effects
12	Tu	5		8	
12	W	6		8	Special Effects
12	Th	7		Workshop	
12	F	8		Workshop	Exam II Review
13	M	11		No Class	Holiday
13	Tu	12		Workshop	
13	W	13		Workshop	Exam II in class
13	Th	14		Workshop	
13	F	15	8	None	Dual CPU (TAs)
14	M	18			Exam II handed back/Special Effects
14	Tu	19		Workshop	
14	W	20		9, Part I	Special Effects, DFT to FFT Notes
14	Th	21		9, Part I	
14	F	22		9, Part I	Lab 9 General Debug & Analysis /Speech Recognition
15	M	25			Lab 9 General Debug & Analysis /Speech Recognition
15	Tu	26		9, Part I	
15	W	27		None	No Class Holiday
15	Th	28		None	
15	F	29	9	None	No Class Holiday
16	M	12/2		No Lab	Lab 9, Part II - Special Effect Demos (160% Normal Lab)
16	Tu	3		No Lab	
16	W	4		No Lab	Lab 9, Part II - Special Effect Demos (160% Normal Lab)
16	Th	5		No Lab	Reading Day
16	F	6		No Lab	No Class Reading Day/End of Semester!

NOTE:

“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. Students should go to their designated registered lab/workshop section unless given prior approval by Dr. Gugel or our lab Teaching Assistants.