Syllabus
EE 3210
Signals and Systems

Description: Topics related to the analysis of linear time invariant continuous and discrete systems and signal transformations, convolution, frequency spectra, Laplace transforms, Z transforms, and fast Fourier transforms. Lecture and lab combination. Laboratory activities to include the computer simulation, analysis, and numerical modeling of signals and systems.

Instructor: Dr. Fon Brown, 626-7781 (Office), Building 4, Room 421G
Office Hours (Ogden, Room 421G) TR 10:30-11:30 PM.
Office Hours (Davis, Room 304A) MW 3:00-4:00 PM.
E-mail: fonbrown@weber.edu

Location: 5:00 MW Room D333.

Prerequisite: EE 2260 Fundamentals of Electrical Circuits or EE 3010 Electric Circuits, MATH 2250 Linear Algebra and Differential Equations or MATH 2260 Linear Algebra and MATH 2280 Ordinary Differential Equations.

Text: Lathi, Signal Processing & Linear Systems, 1998 Oxford University Press.

Student Learning Outcomes: The students will demonstrate:

1. The knowledge of how to represent signals in the time, frequency, Laplace, and Z domains.
2. The knowledge of how to perform both discrete and continuous convolution.
3. The ability to design, build, and analyze linear time invariant systems.
4. The ability to program simple scripts and functions in Matlab.

Homework: Homework is due two class periods after it is assigned. Homework must be clear and well organized on engineering paper. Homework should conform to the attached homework guidelines. Use only one side of each sheet and submit folded lengthwise, with your name, the class (EE 3210) and the assignment number written on the outside. Do not use multiple columns, use horizontal bars to separate problems and box your answers. Homework that does not conform to this format will be penalized one point. Late homework will be accepted and may be graded if time permits, but a 20% penalty will be assessed.

Quizzes: Quizzes will be unannounced and be given in class.

Exams: There will be two midterm exams and a final exam. The final exam is scheduled at 5:30pm, Monday December 10th. All exams are open-text, open-note.

Labs: Laboratory assignments will be made in class and may be done individually or in groups of two. Each student is required keep a lab notebook that conforms to the

guidelines given in this syllabus. Labs must be signed off within one week of the date they are due, otherwise a 20% penalty will be assessed.

Grading: Grades are based on the weighted average of the exams, laboratory assignments, homework and quiz scores as shown below. Scores may be normalized to the high in the class (at the instructor's discretion).

Homework & Quizzes	25%
Laboratory Assignments	25%
Mid-term Exams (each)	15%
Final Exam	20%

Letter grades are assigned according to the scale below. Borderline cases may be promoted (again, at the instructor's discretion).

A	93% or more
A-	90% - 92.99%
B+	87% - 89.99%
B	83% - 86.99%
B-	80% - 82.99%
C+	77% - 79.99%
C	73% - 76.99%
C-	70% - 72.99%
D	60% - 69.99%
F	below 60%

Topic Outline:

1. Continuous-time and discrete-time signals
2. Linear time invariant systems
3. Time Domain Analysis
4. Convolution (continuous)
5. Stability
6. Fourier Series
7. Fourier Transformation
8. Sampling
9. Discrete (and Fast) Fourier Transforms
10. Circular Convolution (discrete)
11. Laplace transform
12. Analog Filters
13. Z Transform

Services for Students with Disabilities: Any student requiring accommodations or services due to a disability must contact Services for Students with Disabilities (SSD) in Room 181 of the Student Services Center. SSD can also arrange to provide course materials (including the syllabus) in alternative formats if necessary.

EE 3210 Tentative Course Schedule:

Date	Reading	Description	Homework (Assigned)	Lab
8/27	1.1-1.5	Introduction to Signals	#1) 1.1-3, 1.1-6, 1.3-3, 1.4-2, 1.4-4bdf, 1.4-5abf, 1.8-1 1.8-2	No Lab
8/29	1.6-1.8 2.1-2.2	Systems, Zero input response	#2) 2.2-1, 2.2.4, 2.3.1, 2.3.2	
9/3		Labor Day		L1. Introduction to MatLab
9/5	2.3-2.4	Impulse response, zero state response, convolution	#3) 2.4-5, 2.4-6, 2.4-8, 2.4-9 4.4-14	
9/10	2.6-2.7	Graphical convolution, System Stability & Behavior	#4) 2.6-1, 2.6-2, 2.7-1, 2.7-2, 2.7-3	L2. Signal Reconstruction
9/12	3.1-3.3	Orthogonal Signals, Correlation		
9/17	3.4-7	Fourier Series	#5) 3.1-2, 3.2-1, 3.4-1, 3.4-2, 3.4-10	L3. System Response to Periodic Signals
9/19	4.1-2	Fourier Transform	#6) 3.5-3, 3.5-7, 4.1-5, 4.1-6, 4.2-4	
9/24	4.3	Fourier Transform Properties Review		No Lab
9/26		Exam I (Chapters 1-3)		
10/1		Go over exam		L4. Impulse Response
10/3	4.4-4.6	Signal Transmission through a System	#7) 4.3-2 (f_2 & f_5 only), 4.3-7a, 4.3-10	
10/8	4.9, 5.1	Sampling & Windowing	#8) 4.4-1, 4.4-2, 4.5-2, 4.5-3, 4.6-5	L5. System Response to periodic signals.
10/10	5.2-5.3	DFT/FFT		
10/15	6.1	Laplace Transform	#9) 5.1-2, 5.1-6, 5.2-1, 5.2-3, 5.2-5	
10/17	6.2	Laplace Transform Properties	#10) 6.1-1d, 6.1-2b, 6.1-3abf	
10/22	6.3, 6.4	Solving Electric Circuits with Laplace	#11) 6.2-1ag, 6.2-3a, 6.3-1ab	L6. Fast Fourier Transform
10/24	6.5	System Realization		
10/29	6.6	Realization w/op-amps		L6. Continued
10/31	6.7	Feedback & Control	#12) 6.4-2, 6.4-9, 6.5-1, 6.6-8i,ii 6.6-9 realizing $-H(s)$ is acceptable	
11/5		Catch-up day		L7. System Realization & Frequency Response
11/7		Review, Distribute Exam II (Chapters 4-6)		
11/12	7.1-7.2	System Response and Bode Plots		No Lab - Use the time for the take-home exam
11/14	7.5-7.7	Application: Butterworth & Chebyshev	#13) 7.1-1a, 7.2-1ab, 7.5-1, 7.5-2a, 7.6-1, 7.6-2	
11/19	8.2-8.4	Discrete Time Signals	#14) 7.7-1	L8 Filter Design
11/21	9.1-9.4,9.6	Discrete Time Systems	#15) 8.2-2de, 8.2-3, 8.2-5, 8.5-2	
11/26	10.1-4, 6	DTFT Signal Processing with the DTFT	#16) 9.2-1, 9.3-1, 9.4-2, 9.4-6	L8 Continued
11/28	10.7, 11.1-2	Z Transform	#17) 10.2-1, 10.2-3	
12/3	11.4-5	Z- Transform vs. Laplace	#18) 11.1-2ab, 11.1-3ab 11.2.2 11.2-3ac, 11.3-9, 11.3-13, 11.3-14a	L9 – Discrete Time System Resposne
12/5		Review/Catch-up		

Homework Guitelines

	Month / Day / Year	*Course Number*	*Name (Last, First)*	1/2
○ 1.1 a	Complete Problem Definition. Including figures, graphs, schematics, etc. May be copied directly from the assignment. ↕ *Leave some space between definition and solution* Show Problem Solution. SHOW ALL WORK Box Final Answer and Units Separate parts with one line ↓			
1.1 b ○	Separate problems with a double line. ↓			
1.2	Repeat the above format for all remaining problems.			
○	**NOTES:** 1. Use only one side of engineering paper [E-2]. 2. Number all pages (page # / of #). 3. You can work more then one problem per page if space is 4. available. Use PENCIL and eraser. 5. PRINT, no script. All printing must be neat and horizontal. 6. Each problem definition should have all pertinent 7. information required to understand the problem without referring to the textbook. Organize your solution so that it can be easily followed. 8.			

Lab Book Guidelines

Keeping a proper lab book is important because it can be used in a court of law to establish ownership of intellectual property (which is, after all, the primary output of all engineering). You are required to use a lab book in ECE3210 and to follow the guidelines listed below.

General Guidelines

1. Lab books must be bound such that pages cannot be inserted or deleted without leaving evidence. Three ring binders, spiral bound notebooks or books that use glue bindings are not acceptable.
2. All pages must be numbered. If the lab book does not have pre-printed page numbers, it is acceptable to number each page by hand as it is used.
3. All work must be legible and in ink.
4. Printed work may be included in the lab book if it is glued or taped such that it cannot be removed without leaving evidence.
5. Each page must be signed (or initialed) and dated as it is used. If a page contains work from different dates, it must be separated with horizontal lines, and each section must be signed (or initialed) and dated.
6. Blank pages or large blank spaces are not acceptable. If you wish to leave a blank page or large blank space, draw a diagonal line from one corner to another, then initial and date it.
7. Do not obliterate. Obliteration is defined as (a) overwriting something, (b) scribbling out something or (c) using white-out to cover something. The correct way to handle a small error is to strike it out with a single horizontal line. For large errors, use a single diagonal line. If the strikeout occurs on a different day, then it must also be initialed and dated.
8. Use your lab book as a workbook. Do not transfer notes from scratch paper into your lab book.

Guidelines Specific to EE3210

9. Start each lab at the top of a new page. For each lab, write a title and a short description.
10. Use the first page in your lab book as a table of contents. Each time you start a lab, add an entry with its title, date and page number.
11. Conclude each lab with a signed, dated summary or conclusion that briefly describes the lab results. The summary should also mention what problems were encountered and what, if anything, can be improved.