UNIVERSITY OF TEXAS AT EL PASO
Spring 2014 Syllabus: EE5371 DIGITAL SIGNAL PROCESSING
(Version 1, January 22, 2014)

INSTRUCTOR: SERGIO D. CABRERA, Associate Professor
OFFICE ROOM: Engineering Annex **309**

OFFICE HRS.:

Monday & Wednesday	4:30 – 5:00 PM (after class)
Tuesday & Thursday	11:20-12:20 PM
Friday (unless other meetings)	11-12 noon (send e-mail or call before)

E-MAIL: sergioc@utep.edu (best form of communication)
TELEPHONE: Direct (915)747-6968 (for urgent & important matters)
ECE Dept. (915)747-5470, FAX (915) 747-7871
COURSE DETAILS: **Call Number:** 22043
CLASS TIME/PLACE: **M,W 3:00 – 4:20 PM, Hudspeth Hall 213 (may try to change room)**
(#30 in the UTEP map, see http://www.utep.edu/search/campusmaplarge.html)

TEXTBOOK: Digital Signal Processing: A Computer-Based Approach (Fourth Edition), by Sanjit K. Mitra, 2011, McGraw-Hill Higher Education. **ISBN:** 0073380490. The third edition may be OK if you can track the existence of new problems, the end-of-chapter problem number changes, and the section number changes (see textbook URL http://www.mhhe.com/engcs/electrical/mitra/).

PREREQUISITES: A first course (undergraduate) in Digital Signal Processing (DSP), such as our own EE4383, is the ideal background but this will not be assumed. A course on Signals and Systems or good general Math. background should be enough if you are willing to put in extra effort. The following topics are typically covered in a first DSP course and they will consist of the first half of EE5371: bilateral z-transform, discrete-time Fourier transform (DTFT), Discrete Fourier Transform (DFT/FFT), FIR filters, IIR filters, basic Sampling Theory. Students are expected to have (or quickly develop) proficiency in the use of the Matlab software package for weekly homeworks and for the Project.

OVERVIEW OF THE COURSE:

This is a solid graduate-level course in Digital Signal Processing with special emphasis on *multirate DSP*. This latter topic has relevance to ongoing UTEP faculty research as well as to its ever increasing relevance to applications in real world systems. The course emphasis is on deterministic (not random) signals and systems making use of Matlab as a complement to the mathematical theory.

COURSE GRADING:

Two in-class semester Exams:	55 %
Homeworks, Quizzes, and Computer Projects	25 %
Semester Project	20 %
TOTAL	**100 %**

KEY DATES:

Exam 1 tentative date:	March 5 (Wednesday)
Spring Break:	March 10-14
Exam 2 tentative date:	April 21 (Monday)
Project deadline	May 19 (Monday) 5:00 PM

COMPUTER USAGE: The MATLAB software package (with many Toolboxes) is made available via a DVD to all Engineering Students from the Engineering Technology Center (ETC)
Engineering building E351D (3rd floor between CRBL and Eng. Bldg.) http://etc.utep.edu/
Mon. – Thu: 8AM – 7PM; Friday 8AM – 5 PM, Tel. (915)747-5223, E-mail: etchelpdesk@utep.edu

DISTRIBUTION OF TOPICS COVERED FROM THE INDICATED CHAPTERS.

Chaps. 3 and 4: Discrete-Time Fourier Transform and the Frequency Response of LTI Systems (quick review of selected topics)

Chap. 6: The z-Transform (quick review of selected topics)

Chap. 7: LTI Discrete-Time Systems in the Transform Domain (review of basics and special system issues applicable in multirate DSP)

Sect 3.8: Digital Processing of Continuous-Time Signals (sampling theory review suitable for understanding multirate DSP)

Chap. 5, Sect. 11.3: Finite-Length Discrete Transforms (orthogonal transforms, review DFT & FFT.

Spectrum Analysis using DFT and Intro. to Short-Time FT (Oppenheim and Schafer supplement)

Chap. 10 FIR Digital Filter Design (emphasis on methods related to multirate filter banks)

Chap. 13 Multirate Digital Signal Processing Fundamentals

Chap. 14 Multirate Filter Banks and Wavelets (with some supplementary material)

PROJECT: To be determined based on a topic of research interest and/or on applications of DSP mentioned in the additional material in the CD of the textbook (4th edition). Here is the table of contents of that additional material which I will send you. Please give input about your preference for Project or no project.

Applications of Digital Signal Processing 1

Additional Policy and Guidelines for Homeworks
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I- Working in Groups: Group discussions and team problem solving is allowed to the degree that everybody will contribute and understand everything that has been worked on. This approach should be joint effort where all parties benefit.

II- ***Theory problems*** must always be written-up by each student *individually and* ***uniquely*** in his/her own handwriting and in his/her own style (NOTE: exams will be solved in a handwritten way and thus this is the preferred way to solve theory problems). Present solutions to theory problems in the order in which the problems were assigned. Do everything that is asked keeping in mind that sometimes there may be multiple possible correct approaches. Theory problems will be graded pass/fail to verify that you have attempted the problems. You can check your own work since solutions will be provided for your own personal use (you must agree not to give these to anyone else).

III- ***Matlab projects*****:** Each person should try to do their own computer implementations (writing MATLAB code), simulations (running MATLAB code), plots (generating them and adding them to an electronic report) and write-ups (presentation and discussion of results in the form of a report). If you prefer to work with others, this ***should be reported up-front on the title page of the assignment***. Teams greater than 2 people are not allowed.

Your Matlab project solution should be in the form of a report integrated into a single file to be submitted via e-mail to the class account: scabrer1_ee5371@yahoo.com . The report file should have a name that starts with your Last Name, for example: ***Lee_HW3_Matlab_EE5371Sp2013.pdf***
Include your MATLAB code (with comments) in your electronic report. Include plots (with titled and labels) to present as many of your solutions as possible in a visual form. A printout of a list of numbers should be a last resort. *Stem* plots are preferred for time-domain or spatial-domain short-duration signals. *Continuous* curves (use of "plot" command) are best for frequency domain plots. Unless otherwise noted, show only magnitude plots of complex functions. Include a write-up with an explanation and discussion for each exercise and include answers to the questions asked. Number all figures and refer to them using that figure number.

IV- Creating electronic documents from Matlab: Consider using the menu option "publish to" which will produce a file (html which can be converted to MS Word) with your code and the resulting figures all in a single file. To add your input, edit the file produced by Matlab and finalize it as a PDF file or leave it as an MS Word document.