

EE 5372/7372: Topics in Digital Signal Processing Fall 2010

General Course Information

Lecture: MW 11:00 - 12:20 PM, Junkins 203

Description: EE5372/7372 is intended to provide an extended coverage of discrete-time signal processing. Discrete-time signals and the analysis of systems in both the time and frequency domains are reviewed. Other topics covered include multi-rate signal processing, digital filter structures, filter design, and power spectral estimation.

Prerequisite: EE 3372, "Introduction to Signal Processing"

Instructor Information

Instructor: Joseph Cleveland, Ph.D., Junkins 347,
Phone: (O) 214.768.3205, (M) 469.766.6119
email: jclevela@lyle.smu.edu

Office Hours: MW 9:30 – 10:50 AM, 12:30-1:45 pm
Other times by appointment

Text (required)

Discrete-Time Signal Processing, 3rd ed., Alan V. Oppenheim and Ronald W. Schaffer, Prentice Hall, 2010.

Optional Reading Materials

- *Digital Signal Processing: A computer based approach, 3rd ed.*, Sanjit K. Mitra, McGraw-Hill, 2006.
- *Digital Signal Processing: Principles, Algorithms, and Application*, Fourth Edition, J.G. Proakis and D.G. Manolakis, Pearson Prentice Hall.
- *Digital Signal Processing*, Thomas J. Cavicchi, Wiley, 2000

Course Objectives

- Provide mathematical fundamentals of digital signal processing, along with an understanding the many areas in which it is applied.
- Develop analytical skills in digital signal processing
- Understand digital signal processing design principles.
- Develop an in-depth understanding of different DSP techniques commonly used in wireless communication industry.
- Exposure to examples of real-world DSP problems.
- Enable students to identify interesting and important topics for senior design projects and for further learning and research.

Topics Covered

- Sampling & Reconstruction of Signals
- Correlation and Convolution
- Discrete Time Fourier Transform
- Power Spectrum Estimation
- Z-Transform
- Digital Filter Implementation
- Digital Filter Design
- Filter Banks
- Multirate Signal Processing

- Linear Prediction and Optimum Linear Filters

Course Policies

Homework – Homework will be assigned weekly and will be due one week after the assignment for all on-campus students. Students in Section 418 will have one extra day to submit their assignments. Due to work or travel obligations, off-campus Distance Education students may take an additional 4 days to submit assignments. Late homework will be accepted until the solutions are posted, but with a 15% reduction in the maximum score for each day past the due date. Matlab will be required for some homework assignments. (Distance Education students will need to purchase their own copy of *Student Version of Matlab*.) Those enrolled in EE 7372 may have a different problem set than those in EE 5372.

All work must be your own; copying another student's homework is considered cheating. Also, use of the solutions manual is not allowed (note that the answers are not always correct). To solve homework problems you are allowed to access books and papers but you must cite the source of any of your work.

Exams – Note that time-limited exams are always challenging. I recommend that you practice working problems from the book, example problems, and homework problems. Use a timer so that you practice working problems under pressure. EE7372 students may have different exams than EE5372 students. There will be one mid-term exam and a final exam per the following schedule:

Mid Term Exam: Wednesday, October 6 (Wednesday preceding spring break)
Final Exam: TBD

Key formulas will be provided for each exam.

Section 418 students will take the exams at the scheduled times. Distance Education students are responsible for scheduling the respective exam with their proctor.

Term Project – Each student will submit a term paper that extends digital signal processing techniques covered in class. Your choice of project should be agreed with me; the easiest way is probably via email. A list of ideas will be discussed in class. The use of Matlab is highly encouraged. The project must be the result of your own efforts.

- Select 2-3 important papers on your topic
 - Provide a summary of the key points
 - Compare and contrast the ideas from the different papers
- Identify possible weaknesses in the papers
- Suggest areas where the work can be improved or extended
 - Any topic related to digital signal processing with sufficient scope and technical depth should be okay. Speak with me about any ideas for the project before the proposal deadline if you are unsure about the topic acceptability.
- Term Project Proposal
 - Two-page description of project topic
 - Briefly summarize the topic papers
 - Describe the key idea(s) and result(s) that you intend to achieve or extend.
 - Develop Matlab programs that perform signal processing calculations.
 - Submit the topic proposal via email to me by TBD.
- Term Project Report
 - 5-7 pages (11 point, single spaced), plus figures and/or plots.
 - 2-column, IEEE journal article format.

- Tentative due date: TBD.

Attendance and Class Participation - Questions and discussion in class is encouraged. Participation will be noted. Please be aware that *participation is not the same as attendance*.

<u>Grading</u> -	Homework	20%
	Term paper/project	20%
	Midterm exam	20%
	Final exam	<u>40%</u>
		100%

Each student's grade for the course will be based on a curve of the weighted scores. The final exam will be comprehensive.

SMU Incomplete Grades Policy:

An Incomplete (I) may be given if the majority of the course requirements have been completed with passing grades but for some justifiable reason, acceptable to the instructor, the student has been unable to complete the full requirements of the course. Before an (I) is given, the instructor should stipulate, in writing, to the student the requirements and completion date that are to be met and the grade that will be given if the requirements are not met by the completion date. The maximum period of time allowed to clear the Incomplete grade is 12 months. If the Incomplete grade is not cleared by the date set by the instructor or by the end of the 12-month deadline, the (I) may be changed to an F or to another grade specified by the instructor. The grade of (I) is not given in lieu of an F, WP, or other grade, each of which is prescribed for other specific circumstances. If the student's work is incomplete and the quality has not been passing, an F will be given. The grade of (I) does not authorize the student to attend the course during a later semester. Graduation candidates must clear all Incompletes prior to the deadline in the official University Calendar, which may allow less time than 12 months. Failure to do so can result in removal from the degree candidacy list and/or conversion of the (I) to the grade indicated by the instructor at the time the (I) was given.

Disability Accommodations: Disability Accommodations: If you need academic accommodations for a disability, you must first contact Disability Accommodations & Success Strategies (DASS) at 214-768-1470 or www.smu.edu/alec/dass.asp to verify the disability and to establish eligibility for accommodations. Then you must schedule an appointment with the professor to make appropriate arrangements.

Religious Observance: Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. (See University Policy No. 1.9.)

Excused Absences for University Extracurricular Activities:

Students participating in an officially sanctioned, scheduled University extracurricular activity will be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. (University Undergraduate Catalogue)