ECE 410 – Principles of Discrete Time Signal Processing
Department of Electrical and Computer Engineering
George Mason University
Spring 2009

Class Meeting Information
Day and Time: Tuesday and Thursday, 10:30-11:45 am
Location: Science and Technology I, Room 120

Instructor Information
Instructor: Dr. Jill K. Nelson
Office: 241 Science and Technology II
Phone: 703-993-1598
Email Address: jnelson@gmu.edu
Office Hours: Wednesday, 4:30 – 6 pm, or by appointment

Course Website
http://gmu.blackboard.com

The course website is located within Blackboard. You can log into Blackboard using the same login name and password you use to log into your GMU email account. You will need to be registered for the course in order to access the course website.

Reading assignments, practice problems, projects, solutions, announcements, and any miscellaneous handouts will be posted on the website. Please check it frequently for updates.

Required Textbook

Supplementary Textbook

Prerequisites
• ECE 320 – Signals and Systems II -- grade of C or better
• This class also assumes you have some experience with Matlab. If your Matlab background is weak, you will need to work through the online tutorials available on the Mathworks website.

Course Topics
• Properties of discrete-time signals and systems
• Convolution and system impulse response
• The discrete-time Fourier transform
• The z-transform and z-transform analysis
• Discrete-time processing of continuous-time signals
• Frequency response and transform analysis
• Discrete-time filter structures
• Discrete-time filter design
• The discrete Fourier transform
• The fast Fourier transform
Class Format
There will be assigned reading associated with each class period; it will be posted on the course website. You are expected to complete the assigned reading before coming to class. You will need material in the assigned reading in order to successfully complete group exercises assigned in class.

Each class period will begin with a very short quiz designed to assess your understanding of the material covered in the previous class period. These quizzes are to be completed individually – no collaboration is allowed. The purpose of these quizzes is to ensure that you keep up with the course material, as well as to help you identify topics that require additional study. The lowest quiz grade will be dropped when computing each student’s overall quiz score.

Following the quiz, each class period will include a combination of lecture and in-class problems. The in-class problems will be solved in groups and will give you a chance to apply the material you have learned from your reading and from the lecture. Your performance on the in-class problems will be evaluated with respect to both approach to the problem and effectiveness of group effort. The lowest in-class problem grade will be dropped when computing each student’s overall in-class problem score.

Because some class time is devoted to quizzes and problem-solving sessions, not all material will be covered in a lecture format. You are responsible for material covered in the reading but not in lecture, and such material may be included in practice problems, quizzes, projects, or exams.

You are expected to attend each class period. While attendance is not explicitly recorded, absences will be apparent in your quiz and in-class problem performance. If you are not present, you are responsible for the material covered during the class and for obtaining notes from another student. Additionally, you are responsible for turning in any assignments due at the beginning of the class period.

Practice Problems
Practice problems will be given approximately weekly and will be posted on the course website. These problems will not be collected. The purpose of the practice problems is to help you learn the course material in preparation for quizzes and exams. Solutions to the practice problems will be posted on the course website. You are encouraged to work on the problems in groups. However, since quizzes and exams are completed individually, it is important that you are able to solve the problems on your own.

Projects
Two Matlab projects will be assigned during the course. The assignment and due dates will be posted in the calendar on the course website. Projects are due at the beginning of the class period on the due date. No late projects will be accepted without prior permission of the instructor. Copying or other forms of cheating will not be tolerated.

Some projects will require use of the Signal Processing Toolbox for Matlab, which is available on the PCs in the ECE and IT&E labs.

Exams
The course will include two mid-term exams (given during class) and one final exam. The dates for these exams are posted in the calendar on the course website.

Each of the mid-term exams will focus on the material that has been covered since the previous exam. However, much of the material in the course builds on the material that is covered before it. Hence, even though the in-class exams are not explicitly cumulative, they will require an understanding of the basic material on which the tested material builds. The final exam will be cumulative, explicitly evaluating your understanding of all material covered in this course.
All exams will be closed book and closed notes unless otherwise stated by the instructor. Absolutely no collaboration is allowed on exams.

**Grading**
Your final score will be based on a weighted combination of your scores on quizzes, in-class problems, projects, and exams as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>15%</td>
</tr>
<tr>
<td>In-Class Problems</td>
<td>10%</td>
</tr>
<tr>
<td>Matlab Projects</td>
<td>20%</td>
</tr>
<tr>
<td>Mid-term 1</td>
<td>15%</td>
</tr>
<tr>
<td>Mid-term 2</td>
<td>15%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
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A request for a grade change for any assignment must be provided to the instructor within two class periods after the assignment is returned. The request must include the graded assignment in question and a written statement describing why a grade change is requested.

**Honor Code**
All students are expected to abide by the George Mason University Honor Code. Any reasonable suspicion of an honor code violation will be reported.

**Tentative Weekly Schedule**
- Week 1 – Discrete-time signals and systems review
- Week 2 – LTI Systems, convolution, difference equations
- Week 3 – Z-transforms
- Week 4 – Discrete-time Fourier transform
- Week 5 – Frequency Response
- Week 6 – Sampling and reconstruction
- Week 7 – Sampling and reconstruction, continued
- Week 8 – Multirate sampling
- Week 9 – All-pass systems, generalized linear phase
- Week 10 – FIR filter design
- Week 11 – IIR filter design
- Week 12 – Discrete-time filter structures
- Week 13 – Discrete Fourier transform
- Week 14 – Fast Fourier Transform