George Mason University  
Electrical and Computer Engineering Department  
ECE 320: Signals and Systems II  
Syllabus  
Spring 2017

Professor: Kathleen E. Wage  
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703-993-1579  
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Class: Mon./Wed. 10:30-11:45am  
Art & Design, Rm 2003

Office hours: Monday 3:30pm-5pm  
Thursday 4:15-5:15pm  
other times by appointment

Prerequisites: Grade of C or better in ECE 220 and Math 203

Required Text: *Linear Systems and Signals, 2nd edition* by B.P. Lathi  
(same book used for ECE 220)

Course Webpage: located within Blackboard ([http://mymason.gmu.edu](http://mymason.gmu.edu))

Teaching Assistant: Gaurav Kolhe

**Course Description**

ECE 320 covers the core concepts in signals and systems, focusing primarily on time- and frequency-domain analysis techniques for linear, time-invariant systems. This course expands upon the continuous-time concepts presented in ECE 220, and presents the corresponding concepts for discrete-time systems. ECE 320 also presents the sampling theorem and explores the relationships between continuous-time signals and their sampled counterparts. The course will also provide an introduction to the discrete Fourier transform and FIR and IIR filters.

The workload for this course consists of the following: two class meetings per week, regular homework assignments, and two computer-based projects. Class time is divided between short lecture segments on key concepts and in-class group exercises. Students are expected to do the assigned reading prior to coming to class so that they are adequately prepared to participate in the interactive problem-solving sessions. The course grade is based on performance on the readiness assessment tests, weekly homework assignments, computer projects, two in-class examinations, and a comprehensive final examination. The remainder of this handout describes the course requirements in more detail.

**Prerequisites**

The prerequisites for this course are a C or better in ECE 220 and Math 203. You are assumed to be familiar with the Matlab software package, which you used in ECE 201 and ECE 220. Most importantly, I will assume that you have an interest in and a commitment to developing a deep understanding of signals and systems concepts. The material that we will study in this course provides important foundations for senior level courses in communications, signal processing, and control. A lack of effort in ECE 320 will almost certainly result in substantial difficulties in senior level courses.

**Learning Outcomes**

By the end of the course the successful ECE 320 student will achieve a number of desired learning outcomes:

- Student recognizes the need for and has the ability to engage in life-long learning.
- Student will be able to apply mathematical techniques and concepts to analyze systems. For example, given information about a discrete-time system, the student will be able to assess whether it is causal, linear, time invariant, stable, and/or memoryless.
• Student will be able to design linear time invariant (LTI) filters to meet specifications. Given a filter, student will be able to determine if it meets specifications.

• Student can compute the output of an LTI system using several different methods:
  – Convolution of time domain signals
  – Multiplication of Fourier transforms (and the ability to compute Fourier transform/inverse transform)
  – Z transform methods (including the computation of inverse transforms via partial fraction expansion)

• Student will be able to assess a problem and determine the best approach to solve it, e.g., determine whether to solve it using time domain or frequency domain methods.

• Student will be able to select a sampling frequency that guarantees that signals will not be aliased.

• Student will be able to implement an LTI system using the Discrete Fourier Transform (DFT). Specifically, they will understand circular convolution and how to avoid adverse affects of circular convolution in their implementation.

• Student will be able to accurately plot the Fourier transform of a signal using the DFT. In particular they will understand how to relate frequency bins to actual analog frequencies (assuming the sampling frequency is known).

• Given a pole-zero plot, the student will be able to sketch both the impulse response and the frequency response of the system.

• Student will be able to apply Fourier transform properties to simplify the analysis of signals or systems.

**Students as Scholars Learning Outcomes**

In addition to content-specific objectives, this course is also designed to engage students in scholarship within the discipline of electrical and computer engineering. The course is designated as a Scholarly Inquiry Course. As part of the course, students will articulate and refine an engineering problem, follow professional ethical principles during the inquiry process, gather scientific evidence related to the engineering problem, and situate the engineering problem within a broader engineering context. More information about Masons Students as Scholars program can be found at [http://oscar.gmu.edu/fac-staff/rs-courses.cfm](http://oscar.gmu.edu/fac-staff/rs-courses.cfm).

**Preparation for Class**

*You are required to come to class prepared.* As you progress in your career as an engineer, it is essential that you acquire the skill of reading a book to learn necessary information about a technical problem. In your professional life, you will have to solve many problems that are not taught in classes here, and engineering textbooks or journals will be your only resource. This course will provide an opportunity for you to develop your technical reading skills. To motivate you to prepare for lecture, you will be required to complete a short (5-10 minute) Readiness Assessment Test (RAT) prior to class. Your grade on these RATs will be 5% of your final grade for the class. Note that the lecture schedule has a complete list of reading assignments for the semester. The homework assignment will provide additional guidance about how to prepare for the following week’s classes. The RATs will be administered in Blackboard starting the week of January 30. More information will be posted prior to the first RAT.

**Class Meetings**

Class will meet Tuesdays and Thursdays from 10:30am to 11:45am. It is assumed that you will attend all of
the classes, though attendance will not be formally recorded. If missing a class is absolutely unavoidable, you should check with your classmates to obtain the notes for that day and check the website to obtain any handouts.

Class meetings will combine short lectures on key points in the material with collaborative problem solving sessions. I feel that the time spent on the problems is much more educational than watching me lecture for the entire period. The shortened lecture puts a responsibility on you to be prepared for class by completing the reading the night before. In my experience, students who come prepared to this type of class find that they understand more about the material and homework problems than if they had attended a traditional lecture. Students who are not prepared are more lost and confused than they are in traditional classes. Homeworks and exams may include topics that are in the reading but not covered in lecture, so again, it is important to keep up with the reading to do well in the course.

All alarms, ringers, etc., must be turned off during class. Using your laptop or mobile device for something other than ECE 320 work is considered a distraction to the instructor and is disrespectful to the other members of the class. Students engaging in non class-focused activities will be asked to leave the classroom.

**Homework**

There will be regular homework assignments. These will be distributed via the course website. The homework will consist of two parts: journal assignments and problem sets. The journal assignments will ask you to reflect on what you are learning and how well you are learning it. The problem sets will ask you to apply what you have learned to solve a set of problems. You are expected to do ALL the assigned problems. In making up the exams and in assigning a final grade, I will assume that you have worked ALL the problems. Most exams will include one problem very similar to one of the homework problems. Thus, there will be a very immediate benefit to doing the homework completely and diligently. Each homework will also include the reading to prepare for the following week’s classes. Again, you are required to do this reading before the class meets. **Homeworks (journals and problem sets) must be turned in via Blackboard.**

**Late homeworks will not be accepted, as this would prevent prompt posting of the solutions.** To submit handwritten homework in Blackboard, it must be scanned and saved as a single file. Scanning software must be used – photos of homework solutions are not acceptable. Note that at the end of the term, we will drop the lowest homework grade from your overall homework score. Additional guidelines for the homework are posted on the website.

**Matlab Projects**

There will be two projects to be done in Matlab. You are expected to do ALL the projects, and they will be thoroughly evaluated. Like problem sets, projects must be submitted in Blackboard. **Late projects will not be accepted.**

**Office Hours**

Office hours are a time for you to get help with homework, help in understanding the assigned reading, or answers to any other questions about ECE 320 material or the ECE program. Please take advantage of office hours!

**Exams**

There will be two in-class exams during the semester and one comprehensive final exam during exam week.

Exam 1: Tuesday, February 28 10:30-11:45am
Exam 2: Tuesday, April 4 10:30-11:45am
Final Exam: Tuesday, May 16 10:30am-1:15pm

These exams will be given in the usual classroom. As noted above, it is likely that most of the exams will include a problem which is very similar to one of the homework problems. All of the exams are closed book and calculators and notes **will not be allowed.**
Course Grade
The final grade in the course is based on my best assessment of your understanding of the material and participation during the semester. The exams, problem sets, and projects are combined with the following rough weighting to give a preliminary final grade:

- Exam 1 20%
- Exam 2 20%
- Final Exam 25%
- Matlab Projects 20%
- Homework 10% (lowest score will be dropped)
- Readiness Assessment Tests (RATs) 5% (lowest score will be dropped)

A student requesting a grade change for any assignment must provide the instructor with the following within 1 week after the work is returned: the assignment and a paragraph describing why you feel you should receive additional points for the work. Note that in some cases, it is possible that what you wrote for the assignment indicated a better understanding of the problem than you actually possess. If the paragraph you submit indicates that you don’t understand the problem as well as the grader thought you did, then your score may be reduced.

Academic Integrity
GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. All ECE 320 students are expected to abide by the George Mason University Honor Code and the rules outlined below. Any reasonable suspicion of an honor code violation will be reported.

Three fundamental principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. Plagiarism means using the exact words, opinions, factual information, graphs or figures from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Note that paraphrased material must also be cited. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.

One important goal of this class is to help you learn to work collaboratively in a group. You will be working as a group during all the in-class interactive problem-solving sessions. You are also encouraged to collaborate on the homework assignments. Talking to other students, explaining your ideas and questioning their ideas, is a great way to learn. However, you must write up your own solution for the homework problems. In doing this, you MUST identify at the top of the assignment any students you collaborated with to complete the assignment. In signing your own name to the assignment, you are certifying that the work reflects your own understanding of the problems. Simply copying someone else’s answer is not working collaboratively, and is not permitted.

The same rules that apply to homeworks also apply to the Matlab assignments. Moderate discussion of ideas on the projects is permitted, but copying code or lab reports is explicitly forbidden.

The examinations are strictly your own effort, and I will be looking for consistency between the homework performance and the exam performance on those exam problems closely related to the problem sets.

Reposting of Course Material to Other Websites
The course materials (lecture notes, homeworks, projects, exams, solutions, and anything else posted on the course website) are copyrighted. You may not upload them to any other website or share them with any
on-line or off-line test bank.

**GMU Email Accounts**
Students must use their Mason email account to receive important University information, including messages related to this class. See [http://masonlive.gmu.edu](http://masonlive.gmu.edu) for more information.

**Office of Disability Services**
If you are a student with a disability and you need academic accommodations, please see the professor and contact the Office of Disability Services (ODS) at 993-2474. All academic accommodations must be arranged through the ODS. [http://ods.gmu.edu](http://ods.gmu.edu)

**Other Useful Campus Resources:**

- **WRITING CENTER**: A114 Robinson Hall; (703) 993-1200; [http://writingcenter.gmu.edu](http://writingcenter.gmu.edu)
- **UNIVERSITY LIBRARIES** Ask a Librarian [http://library.gmu.edu/mudge/IM/IMRef.html](http://library.gmu.edu/mudge/IM/IMRef.html)
- **COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS)**: (703) 993-2380; [http://caps.gmu.edu](http://caps.gmu.edu)
- **UNIVERSITY POLICIES** The University Catalog, [http://catalog.gmu.edu](http://catalog.gmu.edu), is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at [http://universitypolicy.gmu.edu/](http://universitypolicy.gmu.edu/). All members of the university community are responsible for knowing and following established policies.