

ENEE 222 – Elements of Discrete Signal Analysis

Department of Engineering, Physical and Computer Sciences
Montgomery College, Rockville, MD
Spring, 2019

Instructor contact information:

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Office hours and locations: see posted schedule

Texts:

Adrian Papamarcou, *A New Sequence in Signals and Linear Systems* (available at no cost, link provided)

J. G. Proakis and D. G. Manolakis, *Digital Signal Processing*, 4th edition, Pearson/Prentice Hall, 2006

Objectives:

Introduction to discrete-time and continuous-time signals. Topics covered include sampling, linear transformations, discrete Fourier Transform and its properties/applications, Fourier Series, and discrete-time linear filters and their applications. Example problems in the context of electrical engineering applications are solved using a variety of software tools, including structured programming and high-level computational packages such as Matlab. Prerequisite(s): ENEE 140. Corequisites: MATH 182 or higher.

Outcomes:

Upon course completion, a student will be able to:

- Utilize basic linear algebra tools for practical modeling of signals and systems modeling.
- Demonstrate understanding of important concepts, such as Fourier series/transforms, used in frequency analysis of discrete-time signals.
- Demonstrate a basic knowledge of digital filters and their implementation in signal processing.
- Program effectively in MATLAB.

Topics:

Complex Algebra Review

Complex Exponentials, Continuous-Time Sinusoids

Phasors, Discrete-Time Sinusoids

Sampling of Continuous-Time Sinusoids

Aliasing, Nyquist Theorem

Matrix-Vector Product, Matrix-Matrix Product

Cascaded Linear Transformations, Matrix Transpose

Matrix Inversion, Gaussian Elimination

Inner Products, Norms and Angles; Projection

Introduction to Fourier Series, Fourier Transform

Discrete Fourier Transform

Examples of DFT and its Inverse; DFT of a real valued Signal
Introduction to Linear Time-Invariant Filters, Convolution
FIR filters, Frequency Response

Course Organization:

Course Blackboard site

There will be a course website through Blackboard that will contain information and handouts, including course guidelines, homework, labs, etc. Within the Blackboard site will be a link to a shared spreadsheet that will be updated throughout the term with a summary of the readings, homework and due dates for each week. If you are unsure of a deadline, this is a good place to check. It is suggested that you download the link to this spreadsheet so that it is easily accessible.

Course communication

Course announcements will be sent to the Montgomery College-generated email list or via GroupMe. A link to join the ENEE 222 TuTh 9:30 am group will be provided; participation is required. Use of any group communication tools is governed by the MC Student Code of Conduct.

Quizzes

The course will include in-class quizzes to reinforce:

- lecture material
- homework/practice problems
- reading assignments

Lectures in this course build cumulatively upon each other. Quizzes are an aid in keeping pace in the course. There are no make-up quizzes, but the lowest quiz will be dropped from the final course grade.

Homework/practice problems will be assigned to reinforce the course material. Homework will be collected electronically. Credit will be given based on effort (but the problems themselves will not be graded; solutions will not be distributed). To receive credit, homework must be turned in as a single scanned PDF file via Blackboard with a timestamp anytime on the due date. (useful app: Turboscan).

The quizzes and homework count 80%/20% respectively towards the Quiz/HW portion of the final grade.

Laboratories

The laboratory, ENEE 222L, is a co-requisite of ENEE 222. A written laboratory report or check-off list will be due for each lab as specified in the laboratory guidelines.

Exams

There will be two exams and a final exam. The final exam must be taken in the time period designated in the MC exam schedule. Please do not leave the classroom in the middle of an exam, unless you have finished the exam and wish to turn it in.

Grading

Quizzes/HW	15%
Laboratories	15%
Exam 1	20%
Exam 2	20%
Final exam	30%

A: 90-100%; B: 80-89%; C: 70-79%; D: 60-69%; F: below 60%

Additional information:

Attendance/Late policies

Students are expected to attend all class sessions. "Excessive absence" is defined as one more absence than the number of times the class meets per week during a fall or spring semester (with the number of absences to be prorated for accelerated sessions.) For example, in a Monday-Wednesday-Friday class, four absences would be considered excessive. If you miss a class session, it is your responsibility to find out what you have missed. Source: Collegewide Policies and Procedures Manual: Academic Regulations: Class Attendance (Section 9.823). If a student has any documented excused lateness or absences, please email the instructor within 24 hours.

Absolutely no assignments will be accepted after official deadlines. Missing assignments will be dropped only in cases of *bona fide*, documented emergencies. Under certain circumstances, assignments will be accepted after due date with 10% deducted per day until graded assignments are returned to the class. There are no make-up quizzes for in-class quizzes missed.

Support Services

Any student who may need an accommodation due to a disability, please make an appointment to see me during my office hour. A letter from Disability Support Services authorizing your accommodations will be needed. Any student who may need assistance in the event of an emergency evacuation must identify to the Disability Support Services Office; guidelines for emergency evacuations for individuals with disabilities are found at

<http://www.montgomerycollege.edu/dss/evacprocedures.htm>

Basic Needs

MC Rockville Campus Food Pantries Quick Info:

- Hallway outside of MT212, M-F 9 am-5 pm

- Science Center, 2nd floor hallway, M-F 9 am-5 pm

Any student who has difficulty accessing sufficient food to eat every day, or who lacks a safe and stable place to live, is urged to contact the *Dean of Students Affairs* on your campus. Furthermore, please notify the professor if you are comfortable in doing so. This will enable the professor to provide any resources that they may possess. We know this can affect performance in the course and Montgomery College is committed to your success.

Health and wellness/Fuel for Success website. This website offers information about resources for food on our campuses and in the community and has links for community resources. The site offers the schedule for the mobile markets, locations of the food pantries as well as a link for those who wish to contribute their time or money to support our students
<http://cms.montgomerycollege.edu/student-health-and-wellness/fuel-for-success/>

Academic Honesty

All homework, quizzes, labs, and examinations are to be the results of a student's own efforts. Any cheating, copying, or academic dishonesty could result in a failing grade for the assignment and the course. You may discuss your homework and labs with classmates to the point of exchanging general ideas, but you may not copy from one another. You may also not give any paper or electronic copies of any parts of your work to other students to look at. Course material is for internal MC use only. No posting of course materials (written or audio) to the internet.

Common examples of academic dishonesty and misconduct can be found below and in the Student Code of Conduct, Section IV. These examples are not an exhaustive list of all prohibited behavior. If you are in doubt about what constitutes academic dishonesty, consult your instructor or the Student Code of Conduct. Faculty members may choose to impose grade sanctions for violations of academic ethics, normally ranging from a minimum of an "F" on the assignment in which dishonesty occurred, to a maximum of an "F" in the course. Faculty members may choose to impose different sanctions. Faculty members also have the prerogative of referring a case to the campus Dean of Student Development with a specific request that the dean consider imposing additional sanctions. Source: Collegewide Policies and Procedures Manual: Student Code of Conduct: Academic Dishonesty and Misconduct (Section IV)

In addition to course requirements and objectives that are in this syllabus, Montgomery College has information on its web site (see link below) to assist you in having a successful experience both inside and outside of the classroom. It is important that you read and understand this information. The link below provides information and other resources to areas that pertain to Student Success such as: Student Behavior (Student Code of Conduct); Student e-mail, College Tobacco Free Policy; Course Withdrawal and Refund Information; Resources for Military Service Members, Veterans and Dependents; how to access information on delayed openings and closings; how to register for Montgomery College's Alert System and how closings and delays can impact your classes. Important Link:
<http://cms.montgomerycollege.edu/mcsyllabus/>