

# DEPARTMENT OF BIOMEDICAL ENGINEERING

# **BME 210, Processing Fundamentals for Biological Signals**

## **Professor:**

Tara Alvarez, PhD. Email: alvarez@njit.edu

## **Class Hours**

Face to Face teaching on Wednesdays 10:00am to 12:50am in Fenster 636

TAs: Chris Morris Cjm64@njit.edu

#### **Office Hours**

Mondays 9:00am to 10:00am via <u>https://njit.webex.com/meet/alvareznjit.edu</u> Additional office hours may be scheduled by appointment.

#### Textbooks

- 1. MATLAB Programming for Engineers, Sixth Edition. Stephen J. Chapman. ISBN-13: 978-0-357-03039-4.
- 2. DSP First, Second Edition. McClellan, Schafer & Yoder. ISBN-13: 978-0-13-601925-1.
- 3. Supplemental handouts will be provided as needed. Course materials are available on Canvas.

#### **Course Description**

Prerequisites: Math 112.

This course teaches the fundamentals of computer programming and the application of digital signal processing to biomedical problems. MATLAB will be used for teaching computer programming and signal processing techniques.

#### **Learning Objectives**

- 1. Computer Programming: Understand the basics of computer programming through indexing, mathematical operations, plotting, for and while loops, and conditional statements.
- 2. Digital and Biomedical Signal Processing: Apply knowledge of math, engineering and science to understand the principle of biomedical signal processing. Understand how to apply specific mathematical techniques to solve problems in the areas of biomedical signals.
- 3. Data Interpretation: Learn to utilize MATLAB to design and analyze data. Apply knowledge of math, engineering, and science to interpret data. Develop an understanding of and develop the skills necessary to communicate findings and interpretations in an effective laboratory report.

Week	Date	Total 2 hours 50 minutes	Homework
1	9/6/2023	MATLAB Lecture 1: MATLAB Environment,	See lecture notes
		indexing, and mathematical calculations	
2	9/13/2023	MATLAB Lecture 2: Manipulation of matrices and plotting	See lecture notes
		Lab 1: Plotting	
3	9/20/2023	MATLAB Lecture 3: For and While loops	See lecture notes
		Lab 2: For and While Loops	
4	9/27/2023	MATLAB Lecture 4: Applying programming	See lecture notes
5	10/4/2023	DSP Chapters 1 and 2: Sinusoids	See lecture notes

#### **Course Outline\***

6	10/11/2023	DSP Chapter 2: Sinusoids	See lecture notes
		Lab 3: Phasors	
7	10/18/2023	Review for Midterm	See lecture notes
8	10/25/2023	Midterm Exam	
9	11/1/2023	DSP Chapter 3: Spectrum Representation	See lecture notes
10	11/8/2023	DSP Chapter 4: Sampling and Aliasing Lab 4:	See lecture notes
		Spectrums	
11	11/15/2023	DSP Chapter 4: Sampling and Aliasing	See lecture notes
12	11/15/2023	DSP Chapter 5: FIR Filters	See lecture notes
13	11/24/2023	Friday Class Schedule due to Thanksgiving	
		week	
14	11/30/2023	Lab 5: Sampling	See lecture notes
15	12/7/2023	Review for Final	See lecture notes
16		Final Exam Schedule TBA	

\*The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course outline.

Frading			
Item	Percentage of Grade		
Midterm Exam	20%		
Final Exam	30%		
Lab 1	8%		
Lab 2	8%		
Lab 3	8%		
Lab 4	8%		
Lab 5	8%		
Assignments	5%		
Attendance	5%		
Total	100%		

Final Grade Criteria: A: 90-100; B+: 84-89; B: 73-83; C+: 67-72; C: 60-66; D: 50-59; F: <50

<u>No makeup examinations will be administered.</u> If a valid, documented excuse that is approved by the Dean of Students for the missed Test 1 is provided, the weight of Test 2 (Final) will increase to 50% to compensate for the missed grade. Approval is at the discretion of the instructor.

#### Assignments (MATLAB exercise problems and Homework problems)

You are responsible for all weekly reading, homework, or MATLAB exercise assignments. Readings should be completed **before** class each week. All assignments are due **one week** after their assignment. Late submissions will not be accepted. Homework handed in late will receive a zero.

#### **Examinations**

The Midterm and Final Exam will both be administered in person in Fenster room 636. Students may use an 8.5 in x 11 in formula sheet. The structure and format of the examinations will be thoroughly explained during the class.

#### Labs

BME 210 uses computer programming labs to supplement the conventional lectures. In general, each lab

session will begin with a lecture, followed by a laboratory exercise that expands upon the lecture material. Students will need a computer with MATLAB installed to perform these laboratory exercises. Please use the NJIT software download page (<u>https://ist.njit.edu/software-available-download</u>) to download MATLAB software.

## Honor Code Violations/Disruptive Behavior

NJIT has a zero-tolerance policy regarding cheating of any kind and student behavior that is disruptive to a learning environment. Any incidents will be immediately reported to the Dean of Students. In any case in which Honor Code violations are detected, punishments may range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT with notations on students' permanent record. Avoid situations where honorable behavior could be misinterpreted.

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

#### http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by **cheating**, **plagiarizing**, **or using any online software inappropriately will result in disciplinary action**. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at <u>dos@njit.edu</u>.