Scientific Computing in Matlab

26:112:611 – Spring Semester, 2023

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# Instructor Information

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# Course Description

Matlabis one of the main tools for the analysis of scientific data. This course will introduce the student to scientific computing, data analysis, and statistics in Matlab. Students learn general programming techniques, based on specific examples from the field of Neuroscience; including the analysis of behavioral data, functional imaging, and electrophysiological recordings.

## Course Objectives

Upon completion of the course, you will be able to

* Use the Integrated Development Environment to write, debug, and document code.
* Write well-documented, structured, readable, efficient, and reusable programs.
* Read data from any source and represent them efficiently, using appropriate data structures.
* Use the powerful visualization capabilities of Matlab to present results for scientific presentations and publications.
* Use a range of techniques to analyze neuroscience data.
* Use Git and GitHub to store and maintain analysis code.

# Office Hours

Please email the TA or instructor to schedule time for a virtual face-to-face meeting.

# Course Delivery

The primary content will be delivered online, in instructional videos. The videos will introduce programming and data analysis concepts and introduce assignments.

The assignments are key to learning in this course; students should use any resources at their disposal to complete the assignments, as the effort to finding a solution is a key part of learning to program.

Students receive (written) feedback on their solutions to the assignments from the instructors.

During the in-person, or synchronous online sessions, instructors discuss common problems and solutions, and answer student questions. Attendance at these synchronous sessions and active participation (e.g., raising questions) is required.

***Note that this is a Flipped Class. For instance, if the (synchronous) class session for Module 1 is on Wednesday, then you view videos, study the materials, and work on the assignments of Module 1 in the week before that Wednesday. Assignments are due 1 days before the class (e.g., Tuesday at midnight). Even if you could not complete every assignment in the Module, you must submit what you could complete up until that time. Try to make at least some progress on each assignment. The instructors use the submitted (partial) solutions to discuss common problems in class, and students are encouraged to ask many questions during the synchronous class.***

# Important Dates

Please consult the course schedule on Canvas.

Textbooks & Materials

There is no textbook for the course. All materials, including videos, assignments, example scripts, functions, and other written materials will be made available on GitHub, one Module at a time.

For those with a limited background in Matlab, the (free) Coursera course ‘Introduction to Programming with MATLAB’ is a good place to prepare for this course. The special Matlab Basics Module on GitHub will guide you through this material to help you assess on which topics you may have to spend some extra time ***before the class starts.***

# Prerequisites

You will need:

* Computer, Internet access, webcam, microphone.
* Access to a computer running the latest version of Matlab (R2022b). You can install this on your own computer from software.rutgers.edu. BNS students can also use the computers in the Student Lounge (ARC 202).

# Technical Problems

In the online environment, there is always a possibility of technical issues (e.g., lost connection, hardware or software failure). Many of these can be resolved relatively quickly, but if you wait to the last minute before due dates, the chances of these glitches affecting your success are greatly increased. Please plan appropriately. If a problem occurs, it is essential you take immediate action to resolve the problem. Technical questions should be directed to the TA.

# Grading

Students will be judged on the correctness, efficiency, correct code-documentation, and robustness of the implementation of the coding assignments and a final project.

## Assignments

Each Module contains one or more assignments. Students work on the assignments in the week before the Module’s class and hand them in (by pushing the corresponding repository to GitHub) at the assigned deadline (typically the day before class). Assignments handed in late result in a fail for that module. In the week after the Module’s class, students continue working on their submitted code to address any issues noted by the instructors. These improvements must be submitted before the following week’s class, together with the assignments for the next Module.

At the end of each module, the instructors determine, for each student, whether they have completed enough of the assignments for a pass. The score for in-class participation is based on the number of passes and accounts for 40% of the final grade.

## Project

Students develop a project during the course. Project topics should be drawn from the student’s own research. The code developed for the project should include at least the following components: data reading, data preprocessing/selection, data analysis (using one of the techniques learned in the course), and publication-quality visualization. Feedback on the project will be given throughout the semester. The project accounts for 60% of the final grade.

## Scale

Final grades will be assigned according to the following scale:   
**>=**80: **A** 79-72: **B+** 71-65: **B** 64-56: **C+** 55-51: **C**  **F** = 50 or below

# Late Submissions

Unless otherwise noted, all written assignments, projects, etc., are due at the assigned time and date. If you experience an unavoidable personal situation that prevents you from completing work on time, please inform the instructor prior to the date the work is due. Late work will result in points taken off, a lowering of the assignment grade, and/or an “F,” depending on the assignment.

# Communication

Please post your course-related questions to the GitHub Discussion Forum that every student can read. This allows other participants with the same question to benefit from the responses. Also, make sure you review this Forum prior to posting a question; it may have already been asked and answered in previous posts. We also use the GitHub Discussion Forum to post course related announcements. If you have a personal or confidential question, please email the question to the instructors, or ask to setup a face-to-face meeting.

## Netiquette

When posting to the discussion forum or communicating with others in our class, please be courteous. Below are the guidelines we will follow in this course.

* Be professional and courteous, be respectful of other points of view.
* Avoid using slang and abbreviations because they can lead to misinterpretation.
* Do not capitalize all letters because this suggests shouting.
* Think and proofread before you submit.

# Attendance Policy

## Time Commitment

To be successful in this course, we estimate that you will need to commit to at least 9 hours per week for each week in the semester. Some weeks will require more time, some less. Note that this is the standard expectation for a 3-credit course. You are expected to login to the course at least three times per week to ensure you do not miss pertinent postings, messages, or announcements.

## Dropping the Course

To withdraw from a course, it is not enough to stop posting assignments or contributing to discussion. In accord with university policy, students wishing to withdraw from a course must do so formally through the Registrar’s office. It is the student’s responsibility to complete all forms. If this is not done, the instructor must assign a grade of F at the end of the semester**.**

# Academic Integrity

Students at Rutgers University are expected to maintain the highest ethical standards. The consequences of academic dishonesty, including cheating and plagiarism, are very serious. Rutgers’ academic integrity policy is at [academicintegrity.rutgers.edu.](http://academicintegrity.rutgers.edu/) When you submit an exam or assignment, you need to abide by the honor pledge of “On my honor, I have neither received nor given any unauthorized assistance on this examination (assignment)."

# Serving Students with Disabilities

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and [provide documentation](https://ods.rutgers.edu/students/documentation-guidelines). If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the [Registration form on the Office of Disability Services web site](https://ods.rutgers.edu/students/getting-registered).