UF Department of Applied Physiology and Kinesiology
College of Health and Human Performance
UNIVERSITY of FLORIDA

MATLAB for Biomedical Sciences

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APK6704 | Class # 22833 | 3 Credits | Spring 2026

Course Info

INSTRUCTOR

Zheng Wang, Ph.D.
Office: FLG146
Office Phone: 352-273-6450
Email: zheng.wang@ufl.edu
Preferred Method of Contact: email

OFFICE HOURS

By appointment

MEETING TIME/LOCATION

In-person session:
Classroom: FLG245
Thursday | Period 10 - E1 (5:10- 8:10 pm)

Online materials:

- Canvas on UF e-Learning & the Canvas Mobile App by Instructure
- MATLAB Onramp Online course

COURSE DESCRIPTION

This course introduces MATLAB foundations to code, compute, analyze, and plot research data in biomedical sciences. Each week, the course consists of a 1-hour didactic lecture and a 2-hour lab session dedicated to Q & A and troubleshooting non-working codes.

PREREQUISITE KNOWLEDGE AND SKILLS

This course is open to all graduate students in Applied Physiology and Kinesiology, Rehabilitation Science, Psychology, and other Biomedical Science related fields. Students are encouraged to contact the course instructor to evaluate whether this course is a good fit.

REQUIRED AND RECOMMENDED MATERIALS

Required:

1. Textbook: Rosenbaum, D. A., Vaughan, J., & Wyble, B. (2014). MATLAB for behavioral scientists, 2nd Edition, Routledge (ISBN-13: 978-0415535946). This book is **required** for weekly lectures and assignments.
2. A personal laptop (PC or Mac) to access the UFApps. Students are recommended to get familiar with the UFApps before the first class. **Students can also email the course instructor to get a UFApps**

manual prior to the first class. The instructor will provide general instructions on accessing MATLAB through the UFApps during Week 1 of the course. Students shall contact the UF HELP desk (352-392-HELP) for more individualized assistance.

Optional:

Textbook: Rosenbaum, D. A. (2019). MATLAB Blues. Routledge (ISBN-13: 978-1138480544)

COURSE FORMAT

This course consists of a 1-hour didactic lecture and a 2-hour lab coding session for Q & A, debugging codes, and analyzing different biomedical science data. **All students shall read the directed book chapter(s) before attending the class.**

Weeks 1-13

Students are **required** to read the directed book chapters prior to the class. During the class, the instructor gives a 1-hour lecture to walk students through the MATLAB commands, functions, and contingencies. Students will use the rest of the 2 hours to practice MATLAB commands and codes of the week. They will work on assignment problems and troubleshoot non-working codes. Students are also welcomed to explore other MATLAB functions related to their research projects. The instructor supervises the lab session and posts a summary of the lab session Q & As on Canvas each week. Students will complete their weekly assignments (13 in total). They will complete lab assignments that are only available in Weeks 2, 3, 6, and 9 (4 in total).

Week 14

The final week is dedicated to a final project. Students code independently to inspect, analyze, and save biomedical science data collected from their studies. Students will upload their MATLAB scripts and a word document introducing the data analysis procedures on Canvas to receive the final grade.

COURSE LEARNING OBJECTIVES:

Following completion of the course, students will be able to:

1. Create MATLAB scripts to inspect, post-process, analyze, plot, and store research data.
2. Create batch-run scripts to execute multiple commands in a serial order.
3. Create contingency scripts using for, while, and switch...end commands
4. Troubleshoot non-working codes.

University Policies

Policies are summarized at the Academic Policies & Resources page. This link will direct students to a separate webpage that will provide all required academic policies, such as attendance, grading, personal conduct, DRC and evaluation verbiage, as well as campus academic, health, and wellness resources.

Course Policies

ATTENDANCE

Excused absences will be handled in accordance with UF policy for excused absences. In other cases, attendance to all exams and class activities is mandatory.

If possible, faculty should be informed of absences prior to the time of the scheduled activity (exam, assignment deadline), unless it is an illness or emergency. (See the Make-up Policy below related to missing assignment and final project.)

Please note that all faculty are bound by the University of Florida policy on excused absences. Excused absences must be consistent with university policies as outlined in the Graduate Catalog and must be supported by appropriate documentation. Additional details regarding attendance policies are available through the UF Attendance Regulations.

PERSONAL CONDUCT & ACADEMIC INTEGRITY

Students are expected to act in accordance with the University of Florida policy on academic integrity. As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge:

"We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity."

You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied:

"On my honor, I have neither given nor received unauthorized aid in doing this assignment."

It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For additional information regarding Academic Integrity, please see Student Conduct and Honor Code or the Graduate Student Website for additional details.

For success in this course and in all courses at UF, students should aim for the highest levels of integrity and avoid things like cheating, lying, misrepresentation, or any kind of plagiarism.

APPROPRIATE USE OF AI TECHNOLOGY

The UF Honor Code strictly prohibits *cheating.* The use of any materials or resources prepared by another person or Entity (inclusive of generative AI tools) without the other person or Entity's express consent or without proper attribution to the other person or Entity is considered *cheating.* Additionally, the use of any materials or resources, through any medium, which the Faculty / Instructor has not given express permission to use and that may confer an academic benefit to a student, constitutes *cheating*.

IN-CLASS RECORDING

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in

preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

MAKE-UP POLICY

Excused absences will be handled in accordance with UF policy for excused absences. In other cases, make up work is not otherwise permitted unless arrangements have been made with the instructor. Coordination of any make-up work with instructor is encouraged to take place in advance (at least one week ahead of the time) whenever possible. When make-up work is approved by the instructor, it is the student's responsibility to ensure they understand the specific guidelines and due dates associated with make-up work arranged with the faculty.

COURSE EVALUATIONS

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online. Students can complete evaluations in three ways: (1) The email they receive from GatorEvals, (2) Their Canvas course menu under GatorEvals, or (3) The central portal. Guidance on how to provide constructive feedback is available at the gator evals site. Students will be notified when the evaluation period opens. Summaries of course evaluation results are also available at the gator evals site.

DEPARTMENT ADMINISTRATORS

For suggestions or concerns related to APK courses or programming, please reach out to any of the following:

- Dr. David Vaillancourt (he/him), APK Department Chair, vcourt@ufl.edu
- Dr. Demetra Christou (she/her), APK Department Vice Chair, ddchristou@hhp.ufl.edu
- Dr. Steve Coombes (he/him), APK Graduate Coordinator, scoombes@ufl.edu
- Dr. Anna Gardner (she/her), APK Undergraduate Coordinator, akgardner@ufl.edu

Grading

The grade for the course will be calculated based on the following criteria:

1. **Weekly assignment (100 points each week ×13 weeks=1300 points; 60%):** The weekly assignment includes a MATLAB Onramp online course series and regular course assignment. MATLAB Onramp is a free online course series offered by MATLAB Academy (https://matlabacademy.mathworks.com/). Students will register for this course online using their UF email account. Students will complete the assigned online courses each week to receive points. For the regular assignment, students will solve MATLAB problems in the textbook as well as those provided by the instructor. Students will need to upload MATLAB scripts on Canvas on a weekly basis for grading.

2. **Lab assignment (100 points each week ×4 weeks=400 points; 20%)**: The lab assignment allows students to troubleshoot and debug problematic codes. Practice problems were carefully selected from Rosenbaum, D. A. (2019). MATLAB Blues. Routledge (ISBN-13: 978-1138480544). Students will troubleshoot 3-6 complex MATLAB codes/scripts through each lab assignment. Students will need to upload MATLAB scripts on Canvas for grading.

3. **Final Project (300 points in total; 20%):** Students will upload MATLAB scripts and a word document (i.e., project report) to show how they import, postprocess, analyze, plot, and export data collected

through their research project. In the project report, students will 1) specify what type of research data is selected for the final project and what research questions are associated with analyzing the data (60 points); 2) specify which variables need to be calculated/derived from the data that allow the students to address their proposed research questions (60 points); 3) create a MATLAB script (or programming flow chart) to import (20 points), manipulate (e.g., filter, detrended, and so on) the data (20 points), and compute (20 points) dependent variables; 4) create figures that are associated with each step of the data analysis (60 points); and 5) interpret the dependent variables and final results (60 points). Each step of the data analysis needs to be performed in a logical, accurate, and organized manner to receive the full points. Figures need to demonstrate all necessary steps of the data analysis to allow knowledgeable individuals (i.e., the instructor and other students in the class) to be able to understand the logic of the analysis.

Good -Excellent	76%-100% points	The project report includes all four sections: 1. Research questions, study aims, and hypotheses 2. Data types (e.g., time series, categorical variable, logical variable, string variable, etc.) and structures (e.g., matrix, singular data entry, cell array, structural array, etc.) 3. Data analytical procedures 4. Data interpretations MATLAB scripts include two parts: 1. Command lines to import and post-process the raw data, compute dependent variables that address the research questions and aims, and create graphs to present research findings. 2. Contingency commands to support batch-runs, user-friendly features (e.g., pop-up windows, warning messages, etc.), logical decisions, and so on. MATLAB codes run smoothly without errors.
Fair - Good	50% -75% points	The project report includes two to three sections. MATLAB scripts only include the first part without errors. MATLAB codes generate =<5 fixable/minor errors (e.g., typos, calling a wrong column of data, feeding functions with wrong variables, syntax errors when using contingency functions, etc.).
Unacceptable - Fair	< 50% points	The project report includes zero to one section. MATLAB scripts include the first part with errors, or MATLAB scripts do not execute at all. MATLAB codes generate >5 errors.

GRADING SCALE

Information on UF grading policy may be found at: University grades and grading policies.

Letter Grade	Percent of Total Points Associated with Each Letter Grade	GPA Impact of Each Letter Grade
A	93.00-100%	4.0
A-	90.00-92.99%	3.67
B+	87.00-89.99%	3.33
B	83.00-86.99%	3.0
B-	80.00-82.99%	2.67
C+	77.00-79.99%	2.33
C	73.00-76.99%	2.0
C-	70.00-72.99%	1.67
D+	67.00-69.99%	1.33
D	63.00-66.99%	1.0
D-	60.00-62.99%	0.67
E	0-59.99%	0

Please be aware that a C- is not an acceptable grade for graduate students. The GPA for graduate students must be 3.0. in all 5000 level courses and above to graduate. A grade of C counts toward a graduate degree only if a sufficient number of credits in courses numbered 5000 or higher have been earned with a B+ or higher.

Weekly Course Schedule

CRITICAL DATES & UF OBSERVED HOLIDAYS

- January 19: Martin Luther King, Jr. Day (Monday)
- March 14 – 22: UF Spring Break (Monday - Friday)
- April 23 – 24: UF Spring Semester Reading Days (Thursday – Friday)

A denotes the weekly assignment due; **L** denotes lab assignment due

Week	Date(s)	Topics	Due
1	01-15	**Introduction & interacting with Matlab-1** • Introduction (Programming basics) • MATLAB environment (Learn how to interact with MATLAB windows, and MATLAB scripts) • Basic MATLAB functions Readings: Chs. 1, & 2 (2.1, 2.2) Lab 1: Explore the MATLAB environment and help center	**01-21 (A)**

2	01-22	**Interacting with MATLAB-2 & Matrices-1** • Writing tiny programs • Allowing or suppressing outputs • Writing, saving, and running larger programs as scripts • Creating matrices • Specifying elements of matrices Readings: Chs. 2 (2.3-2.8) & 3 (3.1) Lab 2: Debug errors in Matrices-1	**01-28 (A, L)**
3	01-29	**Matrices-2** • Concatenating and transposing matrices • Size and status of matrices • Empty matrices Readings: Ch. 3 (3.2-3.8) Lab 3: Debug errors in Matrices-2	**02-04 (A, L)**
4	02-05	**Calculations-1** • Learn a variety of calculations in MATLAB (e.g., adding, subtracting, multiplying, dividing, raising values to a power, rounding) • Ordering calculations Readings: Ch. 4 (4.1-4.3, 4.10) Lab 4: Debug errors in Calculations 1-3 (**This lab assignment is for Weeks 4-6; lab assignment due on 10-5)**	**02-11 (A)**
5	02-12	**Calculations-2** • Generate random numbers/matrices • Performing descriptive statistical calculations with and without missing data Readings: Ch. 4 (4.4-4.6)	**02-18 (A)**
6	02-19	**Calculations-3** • Calculate with matrices Readings: Ch. 4 (4.7)	**02 – 25 (A, L)**
7	02-26	**Contingencies-1** • Use the if…else…end construct Readings: Ch. 5 (5.1) Lab 5: Debug errors in Contingencies 1-3 (**This lab assignment is for Weeks 7-9; lab assignment due on 10-26**)	**03-04 (A)**

8	03-05	**Contingencies-2** • Use the switch…case…end construct • Use the for…end construct Readings: Ch. 5 (5.1-5.3)	**03-11 (A)**
9	03-12	**Contingencies-3** • Use the while…end construct • If-ing instantly Readings: Ch. 5 (5.4-5.8)	**03-25 (A, L)**
10	03-26	**Input-Output** • Learn how to import/load/read and export/write/save data • Rehab science data import and export Readings: Ch. 6 (6.1-6.3, 6.12, 6.15)	**04-01 (A)**
11	04-02	**Modules and Functions** • Learn how to create "chunks" of programs/ functions in MATLAB to facilitate complex coding/programming • Kinetic data analysis-1 Readings: Ch. 8 (8.1-8.3, 8.4, 8.6)	**04-08 (A)**
12	04-09	**Data Plots** • Plots & graphics features • Kinematic data analysis Readings: Ch. 9 (9.1-9.7,9.10-9.12)	**04-15 (A)**
13	04-16	**Data Types** • Identify strings, numbers, and logical values • Convert across different data types • Kinetic data analysis-2 Readings: Ch. 7 (7.1-7.4)	**04-22 (A)**
14		**Final Project** Online submission	**04-29**