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

MATLAB for Biomedical Sciences

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PET 5936 | Class # 28619 | 3 Credits | Fall 2022

Course Info

INSTRUCTOR

Zheng Wang, Ph.D.
Office: FLGym 146
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: CSE A101
Thursday 12:50- 3:50 pm

Online materials:

- Canvas on UF e-Learning (https://elearning.ufl.edu/) & the Canvas Mobile App by Instructure
- MATLAB Onramp Online course (https://www.mathworks.com/learn/tutorials/matlab-onramp.html)

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 & As 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 fields. Before taking this course, students shall have a fundamental understanding of linear algebra and matrix operations. Students who have already established their research projects and collected data for analysis will benefit the most from this course. Feel free to contact the course instructor if the students cannot evaluate whether this course is appropriate for them.

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 (https://info.apps.ufl.edu/). Students are recommended to get familiar with the UFApps before the first class. Training videos, FAQ page, and Help Request can be found at https://info.apps.ufl.edu/. **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 & As, 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. Develop fundamental programming and coding skills to inspect, postprocess, analyze, plot, and store research data using MATLAB.
2. Develop skills of data management.
3. Develop skills to problem solve and troubleshoot non-working codes.

Course & University Policies

ATTENDANCE POLICY

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 all faculty are bound by the UF policy for excused absences. Excused absences must be consistent with university policies in the Graduate Catalog (https://gradcatalog.ufl.edu/graduate/) and require appropriate documentation. Additional information can be found here: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

PERSONAL CONDUCT POLICY

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:
https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/
http://www.graduateschool.ufl.edu/

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.

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.

ACCOMMODATING STUDENTS WITH DISABILITIES

If you require classroom accommodation because of a disability, it is strongly recommended you register with the Dean of Students Office (https://dso.ufl.edu/) within the first week of class or as soon as you believe you might be eligible for accommodations. The Dean of Students Office will provide

documentation of accommodations to you, which you must then give to me as the instructor of the course to receive accommodations.

COURSE EVALUATIONS

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Getting Help

Students sometimes experience stress from academic expectations and/or personal and interpersonal issues that may interfere with their academic performance. If you find yourself facing issues that have the potential to or are already negatively affecting your coursework, you are encouraged to talk with an instructor and/or seek help through University resources available to you.

HEALTH & WELLNESS

- U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575
- Counseling and Wellness Center: https://counseling.ufl.edu/, 352-392-1575
- Sexual Assault Recovery Services (SARS) - Student Health Care Center, 392-1161
- University Police Department, 392-1111 (or 9-1-1 for emergencies) http://www.police.ufl.edu/

Do not wait until you reach a crisis to come in and talk with us. We have helped many students through stressful situations impacting their academic performance. You are not alone, so do not be afraid to ask for assistance.

ACADEMIC RESOURCES

- E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml
- Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling. https://career.ufl.edu/
- Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.
- Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. http://teachingcenter.ufl.edu/
- Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. http://writing.ufl.edu/writing-studio/
- Student Complaints On-Campus: https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/ On-Line Students Complaints: http://distance.ufl.edu/student-complaint-process/

INCLUSION, DIVERSITY, EQUITY, AND ACCESSIBILITY RESOURCES

For suggestions or concerns related to IDEA, please reach out to any of the following:

- Dr. Linda Nguyen, APK IDEA Liaison, linda.nguyen@hhp.ufl.edu
- Dr. Rachael Seidler, APK Graduate Coordinator, rachaelseidler@ufl.edu
- Dr. Joslyn Ahlgren, APK Undergraduate Coordinator, jahlgren@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 to show how they import, postprocess, analyze, plot, and export data collected through their research project. In the word document, 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.

GRADING SCALE

Point system used (i.e., how course points translate into letter grades).
Example:

Points earned	**1860-2000**	**1800-1859**	**1740-1799**	**1660-1739**	**1600-1659**	**1540-1559**	**1460-1539**	**1400-1459**	**1340-1399**
%	**93-100**	**90-92**	**87-89**	**83-86**	**80-82**	**77-79**	**73-76**	**70-72**	**67-69**
Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+
Points earned	**1260-1339**	**1200-1259**	**< 1199**						
%	**63-66**	**60-62**	**< 60**						

Letter Grade	D	D-	E

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.

Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	WF
Grade Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0.0	0.0
Letter Grade	I	NG	S-U										
Grade Points	0.0	0.0	0.0										

More information on UF grading policy may be found at:
https://gradcatalog.ufl.edu/graduate/regulations/#text

Weekly Course Schedule

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

Week	Date(s)	Topics	Due
1	08-25	**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	**08-31 (A)**
2	09-01	**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	**09-07 (A, L)**

3	09-08	**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	**09-14 (A, L)**
4	09-15	**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)**	**09-21 (A)**
5	09-22	**Calculations-2** • Generate random numbers/matrices • Performing descriptive statistical calculations with and without missing data Readings: Ch. 4 (4.4-4.6)	**09-28 (A)**
6	09-29	**Calculations-3** • Calculate with matrices Readings: Ch. 4 (4.7)	**10-5 (A, L)**
7	10-6	**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**)	**10-12 (A)**
8	10-13	**Contingencies-2** • Use the switch…case…end construct • Use the for…end construct Readings: Ch. 5 (5.1-5.3)	**10-19 (A)**
9	10-20	**Contingencies-3** • Use the while…end construct • If-ing instantly Readings: Ch. 5 (5.4-5.8)	**10-26 (A, L)**

10	10-27	**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)	**11-02 (A)**
11	11-03	**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)	**11-09 (A)**
12	11-10	**Data Plots** • Plots & graphics features • Kinematic data analysis Readings: Ch. 9 (9.1-9.7,9.10-9.12)	**11-16 (A)**
13	11-17	**Data Types** • Identify strings, numbers, and logical values • Convert across different data types • Kinetic data analysis-2 Readings: Ch. 7 (7.1-7.4)	**11-22 (A)**
14	**12-1**	**Final Project**	**12-12**

CRITICAL DATES & UF OBSERVED HOLIDAYS

- Labor Day – Monday, September 5
- Veterans Day – Friday, November 11
- Thanksgiving – Wednesday, November 23 - Friday, November 25
- Homecoming (observed) – TBD
- Complete list available here: https://benefits.hr.ufl.edu/time-away/holidays/

PRIVACY

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized sharing of recorded materials is prohibited.

For in-class recording, the following statement related to Florida's House Bill 233 is suggested but not mandatory:

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.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.