

## **MATLAB BOOTCAMP SYLLABUS – SEPTEMBER 2020**

SIO 209, section 20946, 1 unit S/U

*Instructor:* Sarah Giddings, [sgiddings@ucsd.edu](mailto:sgiddings@ucsd.edu)

*Class meetings (online!):* 28 - 29 Sept 08:30-13:00 (with breaks!)

*Zoom lecture link:* contact instructor or view through Canvas

*Zoom office hours:* 28 Sept 14:00-16:00, 29 Sept 13:00-14:00 and 15:00-16:00 or [email me](#) to set up an appointment

### **Course Summary:**

This course will provide a hands-on introduction to MATLAB. No prior experience is necessary. The course will cover variables, plotting, scripts, matrices and other ways to store data including NetCDF, loops, and an introduction to more advanced techniques. While the focus is MATLAB, a brief comparison to other programming languages will be included and several of the coding approaches and best practices are applicable to other languages.

### **Requirements:**

You do not need any background with MATLAB or computer programming. Programming is learned best by practice, so in order to follow along and do the homework, you will need to have access to a computer that runs MATLAB. In the past, this course has been held in the Eckart Computer lab, but due to COVID-19 restrictions, this year it will be remote. If you do not have access to a computer, please contact the instructor in advance so that we can discuss with the graduate division. UCSD has a campus-wide MATLAB license, [instructions for students are here](#). Another option is to try the [virtual lab](#). Worst case scenario, a student version is available at the UCSD bookstore (\$100), but that should not be necessary.

### ***Before coming to class on the first day:***

- [download MATLAB](#) and test that it works
- download notes for the first day of class
- download files provided

### **What if I have more or less experience than my classmates?**

It is important to note that because this course is open to all levels, the level of difficulty will vary by student. In order to make the course valuable for a variety of experience levels, two sets of homework aimed for different levels (no prior experience and some-moderate experience) will be available as well as extensive office hours. I strongly encourage students to ask questions during class, slow me down if need be, and repeat some of the coding at home. Finally, a variety of references and tutorials are listed below including some free on-line learning tutorials for a range of experience levels.

### **Note on the short format:**

This class is scheduled for the very start of the fall quarter as some students may need to use MATLAB starting early in their fall quarter classes. Unfortunately, because of other competing time constraints (new student orientation, the Scripps Student Symposium, etc.), the course is packed into just 2 days this year. Prior offerings have been 2-3 days. While 4-5 days would be far preferable, most students find this course provides a good starting point. The goal is NOT to master the MATLAB programming language but rather to introduce students to the wide range

of its capabilities and programming in general. For students with little to no experience, the main goal is to make them comfortable using the tool and knowing where to look for help in the future. For more experienced students, the goal is to learn some tricks and best practices.

### **Credit & homework:**

To enroll in the class, search for the section ID #20946 [here](#). ***\*\*You can only take this class credit/no credit, so please make sure you are appropriately enrolled.\*\**** To get course credit, you must attend (synchronously or asynchronously) both days of class and complete the homework. Homework will not be graded, it will be self-check. Again, you learn programming best by doing!

### **Unusual circumstances for Fall 2020:**

Given our unusual remote-only situation for Fall 2020, and more importantly, the immense stressors on all of us given the COVID-19 enforced shelter-at-home circumstances, it is likely to be an unusual term. While we have already worked through these conditions since Spring quarter 2020, circumstances are changing frequently and the UCSD campus community continues to learn more about effective online instruction and working from home. Therefore, please be aware that your Professors and Administrators are continuing to adapt at the same time that you are. For example, I have moved course content to Canvas for the first time for this course, so please be patient as there are likely to be glitches. Most importantly, let us all pledge to remain respectful, supportive, and adaptable to ensure that educational goals are met. All participants in the course are bound by the UCSD Code of Conduct, found at:

<https://students.ucsd.edu/sponsor/student-conduct/policiesandprocedures.html>. Please reach out to me directly if there are issues prohibiting your full engagement in the course so that we can find a workable solution.

### **Online Classroom Instruction Policies:**

I will be posting all course material in Canvas, and also sending announcements via Canvas, so please make sure you are able to access Canvas and contact me if you are not.

This course will be taught using live, online audio and visual instruction and will take place during the times indicated above. Live lecture attendance is not required, but is highly encouraged so that questions can be asked and answered during the lecture and you can participate in interactive coding practice. Given the occasional disruptions that inevitably occur when using online conferencing tools (due to WiFi drops, service drops, etc.) we will adhere to the following plan of action for each online class meeting:

1. Each course lecture will be initiated using Zoom: (links available through Canvas or contacting instructor)
2. If Zoom fails for a given lecture, we will switch to Explain Everything: (links available through Canvas or contacting instructor)

All lectures will be recorded and posted to Canvas in a timely manner so that they are available asynchronously. Please be aware that you will be recorded if you choose to turn on your video and audio. Lecture notes will always be available in the event that lecture recording fails.

### **Netiquette:**

Hopefully with our small class, this will not be a major issue, however, methods to minimize background noise and to promote clear communications during live online lectures, please keep

your microphone on MUTE when you are not talking and consider using headphones. If you have a question, you can either “raise your hand,” put a note in the chat, or best, please do unmute yourself and just chime in!

## References:

### *Textbooks:*

There are many textbooks covering MATLAB, so you might check out the selection at the UCSD bookstore. Here are a couple of suggestions:

- [MATLAB, Third Edition: A Practical Introduction to Programming and Problem Solving](#) by Stormy Attaway ([bookstore link](#)) ([Amazon link](#)). This one is well reviewed and recent.
- [Physical Oceanography: A Mathematical Introduction with MATLAB](#) by Reza Malek-Madani ([Amazon link](#)). This book seems useful for those interested in using MATLAB to solve numerical problems in physical oceanography. For those of you in different fields, look on-line, there are great books for applications to engineering, numerical methods, biology, etc.
- [Introduction to Programming with MATLAB for Scientists and Engineers](#), second edition, by William W. Broenkow

### *Online tutorials:*

- Mathworks (the company who developed MATLAB) has [online tutorials](#) as well as a detailed [users manual](#) is available.
- Regular Google searches work pretty well too as there is a very large user community and on-line responses to questions as well as application specific code sharing. Some code you will find through individual websites (e.g., [TEOS-10](#)) others you can find on the MATLAB code [file exchange](#).

### *MATLAB help files (online and offline)*

MATLAB help files are available within the program and [online help](#). For functions, (e.g. the “plot” function), you can use the help command: `>> help plot` OR `>> doc plot`.

## APPROXIMATE SCHEDULE

### **Monday September 28th (08:30-13:00)**

Workspace, startup, basic math, matrices & arrays, element-by-element vs. matrix math, symbolic algebra, characters & strings, scripts, best practices, basic plotting, saving figures, saving & loading data, loading and saving .txt or ascii files, basic statistics, basic fitting, MATLAB dates, figure properties, 2D plotting of 3D data, mapping, scatterplots

### **Tuesday September 29th (08:30-13:00)**

Indexing & logical, functions, if statements, for & while loops, vectorizing code for efficiency, structures, cell arrays, Native MATLAB NetCDF, SNCtools NetCDF