

## Introduction to MATLAB

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2 ECTS

### Summary

This course is an introduction to the basics of computer programming via MATLAB, mathematical computing environment. No previous programming experience is required (students already familiar with the topics described hereafter are discouraged to take the course). Our aims are to show how programming can be used for developing tools in support to our daily research and to incentivize scientific reflection.

### Goals

At the end of the course students:

- should be able to develop simple codes for their own projects and
- should have the basics to improve their programming skills by taking further courses and by training and exercising on their own.

The course is organized in 3 one-day workshops (each of them alternates between theory and hands-on exercises), and 3 half-day sessions, one (optional) for project development and 2 for the exam. The topics are organized as follows:

### Before the course

To introduce basics concept of Matlab it is mandatory to perform (prior to the starting of the course) the “Matlab Onramp” tutorial on <https://matlabacademy.mathworks.com/>. This tutorial is free and you don't need to have Matlab on your computer. We estimate you will need 2 hours to perform this tutorial and they are included in the course.

### Group Session 1: November 05, 2019 (Tuesday) - (9-12h and 13h30-16h30) @ UNIL-Sorge

#### *Morning*

- Course description
- Vectors & Matrices
- Arithmetic operators and basic functions with matrices.
- Control flow statements (if-else-end, for-end, while-end)
- User interaction (disp, input)

#### *Afternoon*

- Structures & Cells
- Importing / exporting data (reading / writing text files, csv & xls files)
- **Define and analyze the needs of your own project (with a form that will be distributed on-site).**

### Individual private presentations: November, 19, 2019 (Tuesday) - Centre de Recherche en Radiologie du CHUV (see location below)

- Students present the project they would like to implement in the context of their research interests and needs (with slides as support, 5 min presentation). The filled form of Session 1 aims at helping students in defining their project and prepare this presentation. After approval of the project by the teachers, students should start writing a function to import their data in Matlab (within vector, matrices, cells or any relevant structure), to be delivered at the end of Session 2.

**Group Session 2: November 26, 2019 (Tuesday) - (9-12h and 13h30-16h30) @ UNIL-Sorge**

*Morning*

- Function & Scripts
- Plotting
- Share of code and scripts in Mathworks
- Check on input data import in MATLAB structures.

*Afternoon*

- Hands on on your project: importing the data for the student project
- Function on importing data must be completed before the end of the session.

**Group Session 3: December 03, 2019 (Tuesday) - (9-12h and 13h30-16h30) @ UNIL-Sorge**

*All Day*

- Develop your own project. This is a hands-on-session where students develop their Matlab project with the help of the organizers.

**Session 4: December 17, 2019 (Tuesday) - (9h-12h and 13h30-16h30) @ UNIL-Sorge**

Exam session.

**Location**

- **Sessions 1, 2, 3 & 4** will take place in [room 1929](#) in the basement of the **BIOPHORE building at UNIL- Sorge**. **Individual private presentations** will take place at the [Centre de Recherche en Radiologie](#), Rue Centrale 7, 4<sup>th</sup> floor (you must take the stairs), CH-1003 Lausanne. In case of mobility problems, please let the course organizers know in advance.

**Evaluation**

Evaluation is based on both a short written exam (20% of the mark) and the development of their own project (80%). Participants will develop a short project using MATLAB, related to their own research activity. The project must contain (at least) the following:

1. Lecture/creation of data
2. Processing
3. Visualization of the results
4. At least one 'own' function
5. Proper comment of the code

The use of external functions or libraries is allowed but should remain minority. It has to be clearly identified what it is written by you (your own code) from external sources, for instance by comments.

Evaluation criteria: all the following point will be graded and weighted for the evaluation.

- Clear and precise definition of the research context and project's goals (Filled form by Session 1 – Afternoon and Presentation 1 during private session, **20%** of total grade).
- Function to import their data in Matlab (within vector, matrices, cells or any relevant structure), to be delivered at the end of session 2, **10%**.
- Students must send their script and data **by December 12, 2019, to the course organizers**. The course organizers should be able to run and understand the scripts based on students' written instructions (weight of **30 %**)
- Session 4: written exam (**20%**)
- Session 4: students will explain their code and results in a presentation format (Presentation 2, weight of **20%**).
- **Participation to Sessions 1, 2, 3, 4 and private presentation is mandatory.**

### **Reading materials**

Course materials are stored on the UNIL e-learning platform Moodle. You can access by doing the following:

- go to "<https://moodle2.unil.ch>"
- log in with your institutional/university address
- click on "Faculté de Biologie et de Médecine" > "Ecole doctorale / doctoral school" >

"Lemanic Neuroscience Doctoral School"

The materials are stored under "**Introduction to MATLAB**". Please use the self-enrollment method to access them.

### **Registration**

The course is limited to 12 participants. **Register before September 20** by writing a mail to [Indscourses@gmail.com](mailto:Indscourses@gmail.com) (with your supervisor in copy) and stating "Introduction to MATLAB" as subject.