

Module Announcement

PhD in Information Technology and Electrical Engineering Università degli Studi di Napoli Federico II

Module Title: Matlab Fundamentals

Lecturer: Prof. Agostino De Marco, Ing. Stefano Marrone, Ing. Francesco Orefice

Università degli Studi di Napoli Federico II, DIETI

Email: agostino.demarco@unina.it

Bio: Agostino De Marco graduated in Aerospace and Astronautical Engineering from the University of Naples Federico II in 1996 and obtained a PhD in Naval Engineering in 2001. He has taught Flight Mechanics and associated courses since 2003, including Flight Dynamics, Aerodynamics, Applied Aerodynamics, Computational Aerodynamics and Numerical Methods for Engineering. He has taught for expert users at various Italian institutions and aeronautical industries (such as Accademia Aeronautica, Alenia/Selex, Piaggio, OAN, Protom). He is currently a member of the DAF Group and holder of the chairs of Flight Mechanics and Flight Dynamics and Simulation at the Polytechnic School of the University of Naples Federico II. He was a member of the design group of the STOL ultralight aircraft called "Easy-Fly". From 2002 to 2005 he was coordinator of the design and development group of an advanced flight simulation laboratory at the University of Naples. Among other skills, Prof. De Marco is a deep expert in computer programming. He is expert in (C, C++, Python, Java, Matlab), software engineering and object oriented programming, grid generation, CAD, website developer (HTML, CSS, Javascript, PHP, Drupal, Joomla). He is official developer of the open-source flight dynamics model called JSBSim (www.jsbsim.org), which is the standard model used for flight simulation software called FlightGear (www.flightgear.org).

Dates and location:

Date	Time	Lesson	Location
20 Feb. 2020	15.30 – 17.30	1	Room C2A, building 3A, Via Claudio 21
26 Feb. 2020	15.30 – 17.30	2	Room II1, building 1, Via Claudio 21
2 Mar. 2020	10.30 – 12.30	3	Room II2, building 1, Via Claudio 21
16 Mar. 2020	10.30 – 12.30	4	ONLINE
17 Mar. 2020	10.30 – 12.30	5	ONLINE
18 Mar. 2020	10.30 – 12.30	6	ONLINE
19 Mar. 2020	10.30 – 12.30	7	ONLINE
20 Mar. 2020	10.30 – 12.30	8	ONLINE
24 Mar. 2020	10.30 – 12.30	9	ONLINE
25 Mar. 2020	10.30 – 12.30	10	ONLINE
14 May 2020	TBD	EXAM (for certification)	TDB

NB: Dates and locations might change due to logistic reasons or due to unforeseen events.



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NOTICE: due to the COVID-19, lessons 4 to 10 will be delivered online through Microsoft team. The link to join the group is:

<https://teams.microsoft.com/j/team/19%3acfec668b18524ebd9dec721ebaf98c1b%40thread.tacv2/conversations?groupId=19062c53-4c19-4c3e-bb61-89821311bb52&tenantId=2fcfe26a-bb62-46b0-b1e3-28f9da0c45fd>

Team ID: nndlca1

Summary

The course is intended to prepare student for the [“MATLAB Certificate Associate”](#). To this aim, students will be guided on the concepts and aspects of the MATLAB language and environment. Each lesson is 2H long and will both feature theoretical and practical aspects. Since the core of the course will be [MATLAB Fundamentals](#), students are required to create the [Unina – MATLAB account](#) and to bring a laptop. It is mandatory to register by using the following [link](#).

Contents

Lesson 1: Become familiar with the main features of the MATLAB language and of the MATLAB integrated design environment and of its user interfaces. Get an overview of course themes, the exam modalities, the teaching materials. Introduction to MATLAB Campus license at University of Naples Federico II and of MATLAB Student Ambassadors.

Lesson 2: The student will learn how to enter MATLAB commands, with an emphasis on creating variables, accessing and manipulating data in variables and creating basic visualizations. They will also learn how to manipulate variables in the MATLAB workspace and how to collect MATLAB commands into scripts for ease of reproduction and experimentation.

Lesson 3: The student will learn how to perform basic mathematical and statistical calculations with vectors (arrays). They will also learn how to use the MATLAB syntax to perform calculations on whole data sets with a single command. Finally, the student will learn how to organize scripts into logical sections for development, maintenance, and publishing.

Lesson 4: The student will learn how to use matrices as mathematical objects or as collections of (vector) data. In particular, the lesson will describe how and why the MATLAB core are matrices and how this impact the why MATLAB code is developed. Finally, the student will understand the appropriate use of MATLAB syntax to distinguish between these applications.

Lesson 5: Introduction to the concept of Table, and to the related MATLAB variable type. The student will learn how to import data (from workspace as well as from external files) as a MATLAB table and how to visualize the acquired data. Finally, the student will learn how to manipulate (work with) data stored as a MATLAB table.

Lesson 6: The student will learn how to extract and analyze subsets of data (such as sub-arrays, sub-matrices, portions of tables, etc.) that satisfy one or more given criteria (such as logic operator, value comparison, indexing, etc.) from variables in the workspace.





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Lesson 7: The student will learn how to organize table data (for example as result of data loading as seen in lesson 5) for analysis in MATLAB. To this aim, the lesson will show the different ways in which representing tabular data using the most appropriate native MATLAB data types.

Lesson 8: The student will learn how to perform typical data analysis tasks in MATLAB, including how to import data from external files, how to preprocess data, how to fit a model to given data, and how to create a customized visualization of the obtained model.

Lesson 9: The lesson focuses on how to create flexible code that can interact with the user, make decisions, and adapt to different situations. To this aim, the logic construct and input/output command will be shown, discussed and used in some illustrative examples.

Lesson 10: The student will learn how to increase automation by encapsulating modular tasks as user-defined functions. As a result, the student will understand how MATLAB resolves references to files and variables and how to use MATLAB development tools to find and correct problems with code.

ECTS Credits: 2

Info: **Prof. Agostino De Marco** - tel. 081 7683323 – agostino.demarco@unina.it

