

## Course guide

### 230696 - MLAB - Matlab: Fundamentals And/Or Applications

Last modified: 25/05/2023

**Unit in charge:** Barcelona School of Telecommunications Engineering  
**Teaching unit:** 739 - TSC - Department of Signal Theory and Communications.

**Degree:** MASTER'S DEGREE IN ELECTRONIC ENGINEERING (Syllabus 2013). (Optional subject).  
MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Optional subject).  
MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Optional subject).  
MASTER'S DEGREE IN ELECTRONIC ENGINEERING (Syllabus 2022). (Optional subject).

**Academic year:** 2023    **ECTS Credits:** 5.0    **Languages:** English

#### LECTURER

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**Coordinating lecturer:** Consultar aquí / See here:  
<https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura>

**Others:** Consultar aquí / See here:  
<https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma>

#### PRIOR SKILLS

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Linear Algebra, Signal Processing

#### REQUIREMENTS

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No requisit

#### TEACHING METHODOLOGY

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Lecture notes and collection of exercises are available in pdf in the virtual campus. We use a forum for questions and answers in the virtual campus. Solutions of the proposed exercises are also available. In the first part of the course the student solves a set of proposed exercises for training. In the second part of the course the student develops and presents a final work.

#### LEARNING OBJECTIVES OF THE SUBJECT

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Part I. Fundamentals.

The objectives are:

1. Present MATLAB and SIMULINK.
2. To get the basic knowledge necessary to work with both packages with complete autonomy.

Part II. Applications.

The objectives are:

1. To get more insight into MATLAB and SIMULINK, while presenting and developing more advanced applications,...
2. Each student will work in a subject of their own interest.

## STUDY LOAD

Type	Hours	Percentage
Self study	86,0	68.80
Hours large group	26,0	20.80
Hours small group	13,0	10.40

**Total learning time:** 125 h

## CONTENTS

### (ENG) Unit 1. Matlab Fundamentals

**Description:**

Matlab fundamentals

**Specific objectives:**

Introduction to the software

**Related activities:**

Exercises 1

**Full-or-part-time:** 11h 40m

Guided activities: 3h 20m

Self study : 8h 20m

### (ENG) Unit 2. Matlab Graphics

**Description:**

Using Matlab Graphics

**Related activities:**

Exercises 2

**Full-or-part-time:** 11h 40m

Guided activities: 3h 20m

Self study : 8h 20m

### (ENG) Unit 3. M-file Programming

**Description:**

M-file programming

**Specific objectives:**

Learn how to produce scripts and functions

**Related activities:**

Exercises 3

**Full-or-part-time:** 11h 40m

Guided activities: 3h 20m

Self study : 8h 20m



#### (ENG) Unit 4. Graphics User Interface

**Description:**

Using GUIs

**Specific objectives:**

Generate GUIs with Matlab

**Related activities:**

Exercises 4

**Full-or-part-time:** 11h 40m

Guided activities: 3h 20m

Self study : 8h 20m

#### (ENG) Unit 5. Simulink

**Description:**

Introducing Simulink and Stateflow

**Specific objectives:**

To simulate systems with Simulink

**Related activities:**

Exercises 5

**Full-or-part-time:** 11h 40m

Guided activities: 3h 20m

Self study : 8h 20m

#### (ENG) Unit 6. Hand-on projects with ARDUINO, RASPBERRY PI, FPGAs

**Description:**

Laboratory projects based on SIMULINK and/or MATLAB with ARDUINO, RASPBERRY and FPGAs

**Specific objectives:**

Learn the basics of programming with SIMULINK / MATLAB and Hardware-in-the-loop

**Related activities:**

Practices in the Laboratory of the Subject using ARDUINO, RASPBERRY and/or FPGAs

**Full-or-part-time:** 10h

Practical classes: 4h

Laboratory classes: 6h

#### (ENG) Unit 7. Advanced projects with ARDUINO, RASPBERRY PI, FPGAs

**Description:**

Development of your own laboratory projects based on SIMULINK and/or MATLAB with ARDUINO, RASPBERRY and FPGAs

**Full-or-part-time:** 14h

Laboratory classes: 6h

Self study : 8h



## ACTIVITIES

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### Guided Laboratory Practices on examples of projects based on SIMULINK and/or MATLAB with ARDUINO, RASPBERRY and FPGAs

**Description:**

Laboratory projects based on SIMULINK and/or MATLAB with ARDUINO, RASPBERRY and FPGAs

**Specific objectives:**

Learn the basics of Hardware programming with SIMULINK and / or MATLAB

**Material:**

ARDUINO, RASPBERRY and FPGAs

**Delivery:**

Practice Report

**Full-or-part-time:** 10h

Practical classes: 4h

Laboratory classes: 6h

### Develop of a Final Work

**Description:**

Development of your own laboratory projects based on SIMULINK and/or MATLAB with ARDUINO, RASPBERRY and FPGAs

**Delivery:**

Final Work Report

Video of performance

**Full-or-part-time:** 14h

Laboratory classes: 6h

Self study: 8h

## GRADING SYSTEM

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Exercises: 30%

Final work: 70%

## EXAMINATION RULES.

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Final work consists of

(1) A document containing:

(1.1) A brief theoretical introduction about the chosen subject (this can be any related to your thesis, your job, or other interests), and

(1.2) two solved exercises about the chosen subject as well as their solution steps and MATLAB code.

(2) The set of MATLAB files (\*.m, \*.mdl,...) that solve the two proposed exercises.

(Several final works from previous courses will be available in the virtual campus in order to show the required extension and difficulty)

## BIBLIOGRAPHY

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**Basic:**

- Dormido, S. I, II, III Congreso de usuarios de MATLAB. Madrid: UNED, 1995.

- Mathworks. Matlab toolboxes. Mathworks,