29429 - MATLAB - Matlab: Fundamentals and Applications

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications
Academic year: 2015
Degree: DOCTORAL DEGREE IN ELECTRONIC ENGINEERING (Syllabus 2007). (Teaching unit Optional)
MASTER’S DEGREE IN RESEARCH ON INFORMATION AND COMMUNICATION TECHNOLOGIES (Syllabus 2009). (Teaching unit Optional)
ERASMUS MUNDUS MASTER’S DEGREE IN RESEARCH ON INFORMATION AND COMMUNICATION TECHNOLOGIES (Syllabus 2009). (Teaching unit Optional)
DOCTORAL DEGREE IN SIGNAL THEORY AND COMMUNICATIONS (Syllabus 1998). (Teaching unit Optional)
DOCTORAL DEGREE IN SIGNAL THEORY AND COMMUNICATIONS (Syllabus 2007). (Teaching unit Optional)
ECTS credits: 3
Teaching languages: English

Teaching staff
Coordinator: Lazaro Villa, Jose Antonio

Opening hours
Timetable: Tuesday 18h-19h, Friday 11h-13h

Prior skills
Linear Algebra, Signal Processing

Requirements
No requisit

Teaching methodology
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.

Optionally, students that would like to test the results of their final works on specific software can do it on:
- ARDUINO
- RASBERRY PI
- FPGA
Hardware available in the Laboratory of the Subject
(This Laboratory Practices are not compulsory)

Learning objectives of the subject
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.
## Content

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<tr>
<th>(ENG) Unit 1. Matlab Fundamentals</th>
<th>Learning time: 11h 40m</th>
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<tr>
<td><strong>Description:</strong> Matlab fundamentals</td>
<td>Guided activities: 3h 20m</td>
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<td><strong>Related activities:</strong> Exercises 1</td>
<td>Self study : 8h 20m</td>
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<td><strong>Specific objectives:</strong> To introduce the software</td>
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<th>(ENG) Unit 2. Matlab Graphics</th>
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<td><strong>Description:</strong> Using Matlab Graphics</td>
<td>Guided activities: 3h 20m</td>
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<td><strong>Related activities:</strong> Exercises 2</td>
<td>Self study : 8h 20m</td>
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<th>(ENG) Unit 3. M-file Programming</th>
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<tr>
<td><strong>Description:</strong> M-file programming</td>
<td>Guided activities: 3h 20m</td>
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<td><strong>Related activities:</strong> Exercises 3</td>
<td>Self study : 8h 20m</td>
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<td><strong>Specific objectives:</strong> Learn how to produce scripts and functions</td>
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### (ENG) Unit 4. Graphics User Interface

**Description:**
Using GUIs

**Related activities:**
Exercises 4

**Specific objectives:**
Generate GUIs with MATLAB

**Learning time:** 11h 40m
- Guided activities: 3h 20m
- Self study: 8h 20m

### (ENG) Unit 5. Simulink

**Description:**
Introducing Simulink and Stateflow

**Related activities:**
Exercises 5

**Specific objectives:**
To simulate systems with Simulink

**Learning time:** 11h 40m
- Guided activities: 3h 20m
- Self study: 8h 20m

### (ENG) Unit 6. Examples of Projects with ARDUINO, RASPBERRY PI, FPGA

**Description:**
Examples of projects based on SIMULINK for real time software in ARDUINO, RASPBERRY and FPGAs

**Related activities:**
Optional Practices in the Laboratory of the Subject using ARDUINO, RASPBERRY and FPGAs (Not compulsory)

**Specific objectives:**
Learning Software & Hardware interaction with ARDUINO, RASPBERRY i FPGAs

**Learning time:** 11h 40m
- Theory classes: 1h
- Practical classes: 1h
- Laboratory classes: 1h 20m
- Self study: 8h 20m
Planning of activities

**Laboratory Practices (not compulsory) with ARDUINO, RASBERRY PI, FPGA**

**Hours:** 3h
- Laboratory classes: 1h
- Practical classes: 1h
- Theory classes: 1h

**Description:**
Optionally, students that would like to test the results of their final works on specific software can do it on:
- ARDUINO
- RASBERRY PI
- FPGA
Hardware available in the Laboratory of the Subject
(This Laboratory Practice are not compulsory)

**Support materials:**
Hardware available in the Laboratory of the Subject

**Descriptions of the assignments due and their relation to the assessment:**
- Video of performance

Qualification system

Exercises: 30%
Final work: 70%

Regulations for carrying out activities

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

**Basic:**
- Mathworks. Matlab toolboxes. Mathworks,