Course guide
280597 - 280597 - Marine Data and Information Processing Using Matlab

Unit in charge: Barcelona School of Nautical Studies
Teaching unit: 707 - ESAII - Department of Automatic Control.

Degree: BACHELOR'S DEGREE IN MARINE TECHNOLOGIES (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN NAUTICAL SCIENCE AND MARITIME TRANSPORT (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2023  ECTS Credits: 6.0  Languages: Catalan

LECTURER

Coordinating lecturer: Fonollosa Magrinya, Jordi
Others: Segon quadrimestre:
JORDI FONOLLOSA MAGRINYA - DT, GESTN, GNTM, GTM

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE3. Basic knowledge on using and programming computers, operating systems, databases and computer programs for engineering applications.
CE4.GESTN. Basic knowledge on using and programming computers, operating systems, databases and software with application in the field of naval engineering technology.

Generical:
CG8.GEN. ABILITY TO IDENTIFY AND SOLVE PROBLEMS IN THE FIELD OF ENGINEERING

Transversal:
06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

TEACHING METHODOLOGY

Lecturing with student participation.
Project based learning. Learning by doing.
Lab work. Programming work.

LEARNING OBJECTIVES OF THE SUBJECT

The main objective is to provide students with the ability to use high-level languages such as Matlab or Python. The goal is being able to solve problems in the field of engineering, in particular, for data and information processing in the field of nautics.
At the end of the course the student should be able to:
- Import and export data to the programming environment.
- Make use of statistical tools and understand the corresponding concepts.
- Process digital signal as time series.
- Perform image processing.
- Make use of machine learning techniques and prediction models.
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>18.0</td>
<td>12.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90.0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>12.0</td>
<td>8.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>30.0</td>
<td>20.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

**Introduction to programming environment**

**Description:**
Object and scope of the course. Programming environment. Matlab. Types of variables, graphical environment, file management, libraries and basic functions.

**Full-or-part-time:** 9h
- Theory classes: 1h
- Practical classes: 3h
- Self study: 5h

**Probability and Statistics**

**Description:**
Make use of the Matlab environment to solve probability and statistical problems. Simulation, basic probability and conditional probability. Discrete and continuous random variables. Visualization of data sets, Measurements of centrality and dispersion. Distributions.

**Full-or-part-time:** 19h
- Theory classes: 1h
- Practical classes: 4h
- Guided activities: 2h
- Self study: 12h

**Fitting and interpolation**

**Description:**

**Full-or-part-time:** 20h
- Theory classes: 2h
- Practical classes: 4h
- Guided activities: 2h
- Self study: 12h
Description:
Building a simple AM model in Simulink. Creation of a subsystem. Visualization of a signal in the domains of time and frequency. Build a complete model using the Communication System Toolbox and become familiar with the different visualization tools within the toolbox. Analyze the BER performance of a complete communications system. Add channel effects and recall blocks to test receiver performance.

Full-or-part-time: 20h
Theory classes: 2h
Practical classes: 4h
Guided activities: 2h
Self study: 12h

Image processing

Description:

Full-or-part-time: 21h
Theory classes: 2h
Practical classes: 5h
Guided activities: 2h
Self study: 12h

Machine Learning techniques

Description:

Full-or-part-time: 23h 30m
Theory classes: 2h
Practical classes: 5h
Guided activities: 2h
Self study: 14h 30m

GRADING SYSTEM

The final grade (Nfinal) is the sum of the following grades:

\[ N_{\text{final}} = 0.45 \, NT + 0.35 \, Nac + 0.2 \, Np \]

Npf: grade of proposed exercises
Nac: continuous assessment.
Np: programming project

The final mark will include the exercises proposed outside class (Npf), exercises proposed in class (Nac), and the development of a programming project (Np).

Re-evaluation: According to the regulations of the FNB, there will be a re-evaluation test that will consist of a global examination of the course. Students with a final grade between 3.0 and 4.9 may take this re-evaluation test. The maximum rating of the re-evaluation is 5.0
BIBLIOGRAPHY

Basic: