Course guide
280635 - 280635 - Informatics

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). (Compulsory subject).
BACHELOR’S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2023 ECTS Credits: 6.0 Languages: Catalán, Spanish, English

LECTURER

Coordinating lecturer: JORDI FONOLLOSA MAGRINYA - ROSA M. FERNANDEZ CANTI
Primer quadrimestre:
ROSA M. FERNANDEZ CANTI - Grup: GEST1, Grup: GEST2, Grup: GTM

Segon quadrimestre:
JORDI FONOLLOSA MAGRINYA - Grup: GESTN, Grup: GTM

Others:
Primer quadrimestre:
FRANCISCO JAVIER AYMERICH MARTINEZ
ROSA M. FERNANDEZ CANTI
JORDI FONOLLOSA MAGRINYA - MARIÀ ÂNGELES FUENTES EXPÓSITO
DANIEL MARÍN LÓPEZ - FLAVIO PALMIERI -

Segon quadrimestre:
JORDI FONOLLOSA MAGRINYA
MARIÀ ÂNGELES FUENTES EXPÓSITO
FLAVIO PALMIERI

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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

GTM.CE3. Basic knowledge on using and programming computers, operating systems, databases and computer programs for engineering applications.

Transversal:
TEQ N1. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

STCW:
ETO.1. A-III/6-1. Function: Electrical, electronic and control engineering at the operational level
ETO.2. A-III/6-1.5 Operate computers and computer networks on ships
ETO.3. A-III/6-KUP 1.5.1.1 Understanding of: .1 main features of data processing
ETO.4. A-III/6-KUP 1.5.1.2 Understanding of: .2 construction and use of computer networks on ships
ETO.5. A-III/6-KUP 1.5.1.3 Understanding of: .3 bridge-based, engine-room based and commercial computer use
TEACHING METHODOLOGY

- Receive, understand and synthesize knowledge.
- Pose and solve problems.
- Develop the reasoning and critical thinking and defend it in an oral or written way.
- Work individually and in a team.

One group (problems + laboratory) will be in English. Check the schedule for further details.

LEARNING OBJECTIVES OF THE SUBJECT

Once completed the computer course, the student must be able to:
1. Describe a computer from the point of view of their functional and physical model.
2. Explain the functions of a computer operating system.
3. Perform computer programs using high-level languages.
4. Describe the components and functions of a local area network.
5. Configurar y testar una red NMEA

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

Unit 1: Introduction

Description:
- computers
- Architecture and structure of the computer systems
- Introduction to the operating systems
- Computer applications in the bridge, in the engine-room and in the naval architecture

Related competencies:
- A36-1.5.1c. A-III/6-KUP 1.5.1.3 Understanding of: .3 bridge-based, engine-room based and commercial computer use

Full-or-part-time: 12h
- Theory classes: 4h
- Self study: 8h
## Unit 2.1: Introduction to digital systems

**Description:**
- Systems and signals
- Computer structures
- Numerical systems and binary arithmetic
- Coding information

**Related competencies:**
- A36-1.5.1a. A-III/6-KUP 1.5.1.1 Understanding of: .1 main features of data processing

**Full-or-part-time:** 10h
- Theory classes: 2h
- Practical classes: 2h
- Self study: 6h

## Unit 2.2: Logic functions and combinational systems

**Description:**
- The logic and the Boole algebra
- Logic functions
- Functions simplification
- Implementation and synthesis of logic functions
- Combinational blocs

**Related competencies:**
- A36-1.5.1a. A-III/6-KUP 1.5.1.1 Understanding of: .1 main features of data processing

**Full-or-part-time:** 18h
- Theory classes: 4h
- Practical classes: 2h
- Laboratory classes: 2h
- Guided activities: 2h
- Self study: 8h

## Unit 2.3: Sequential systems

**Description:**
- Concepts and definitions
- Flip-flops
- Implementation of sequential systems
- Registers, counters, memories.

**Related competencies:**
- A36-1.5.1a. A-III/6-KUP 1.5.1.1 Understanding of: .1 main features of data processing

**Full-or-part-time:** 16h
- Theory classes: 3h
- Practical classes: 2h
- Laboratory classes: 2h
- Guided activities: 1h
- Self study: 8h
Unit 2.4: Basic structure of the computers

Description:
Basic computer design:
- instruction set,
- format of the instructions,
- process sub-system,
- control sub-system.

Related competencies:
A36-1.5.1a. A-III/6-KUP 1.5.1.1 Understanding of: .1 main features of data processing

Full-or-part-time: 8h
- Theory classes: 2h
- Guided activities: 2h
- Self study: 4h

Unit 2.5 Programmable Logic Controller (PLC)

Description:
- PLC. Concept and types
- Internal structure
- Scan time

Related competencies:
A36-1.5.1a. A-III/6-KUP 1.5.1.1 Understanding of: .1 main features of data processing

Full-or-part-time: 1h
- Theory classes: 1h

Unit 3.1: Introduction to algorithmic

Description:
- Concepts and definitions
- Downstream analysis: program design cycle
- Introduction to C language, functions and procedures
- Arduino

Related competencies:
A36-1.5.1c. A-III/6-KUP 1.5.1.3 Understanding of: .3 bridge-based, engine-room-based and commercial computer use

Full-or-part-time: 14h
- Theory classes: 4h
- Practical classes: 2h
- Guided activities: 2h
- Self study: 6h
Unit 3.2: Basic algorithmic structures

Description:
Instructions organization: Sequential structures, conditional structures, iterative structures
Program execution: the program trace.

Related competencies:
A36-1.5.1c. A-III/6-KUP 1.5.1.3 Understanding of: .3 bridge-based, engine-room-based and commercial computer use

Full-or-part-time: 20h
Theory classes: 2h
Practical classes: 4h
Laboratory classes: 2h
Guided activities: 4h
Self study: 8h

Unit 3.3: Algorithmic structures

Description:
The list:
Creating a list,
move-through structures and search structures.

Related competencies:
A36-1.5.1c. A-III/6-KUP 1.5.1.3 Understanding of: .3 bridge-based, engine-room-based and commercial computer use

Full-or-part-time: 18h
Theory classes: 2h
Practical classes: 2h
Laboratory classes: 4h
Guided activities: 2h
Self study: 8h

Unit 4.1: Introduction to local area networks

Description:
Network types. Local area networks
Network components (network interface, interconnection and concentration devices, communication media)
Network services (ficheros, bases de datos, FTP,...)
Architecture. OSI/ISO model
Devices for the systems interconnection from the OSI layers viewpoint
Protocols. Media Access Control. TCP/IP. CSMA/CD
Public/private IPs. A, B and C classes. Network mask

Related competencies:
A36-1.5.1b. A-III/6-KUP 1.5.1.2 Understanding of: .2 construction and use of computer networks on ships

Full-or-part-time: 16h
Theory classes: 4h
Practical classes: 2h
Laboratory classes: 2h
Self study: 8h
Unit 4.2: NMEA

Description:
Marine networks. Standards and trademarks
NMEA 2000 electric features. CAN protocol.
Connectors and wire types in NMEA 2000. Compatibility. Network configuration and testing (components, distances,...)
NMEA 2000 frames format
Protocol CSMA/CA

Related competencies:
A36-1.5.1b. A-III/6-KUP 1.5.1.2 Understanding of .2 construction and use of computer networks on ships

Full-or-part-time: 7h
Theory classes: 1h
Guided activities: 2h
Self study: 4h

GRADING SYSTEM

The final qualification is the sum of the following partial marks:

\[ N_{\text{final}} = 0.4N_{\text{pf}} + 0.3N_{\text{ac}} + 0.2N_{\text{eL}} + 0.1N_{\text{ad}} \]

where

\[ N_{\text{final}}: \text{final qualification of the subject} \]
\[ N_{\text{pf}}: \text{final test grade, is the grade obtained in the final exam} \]
\[ N_{\text{ac}}: \text{Continuous assessment grade} \]
\[ N_{\text{eL}}: \text{qualification of laboratory teaching (internships in the computer room)} \]
\[ N_{\text{ad}}: \text{qualification of the directed activities} \]

Continuous assessment (Nac) consists of conducting partial assessment tests throughout the course, one of digital systems (topics 1 and 2), one of algorithms (topic 3) and one of communications networks (topic 4), with the following weights:

\[ N_{\text{ac}} = 0.4 \times T1-2 + 0.35 \times T3 + 0.25 \times T4 \]

The final exam grade (Npf) is calculated according to the weights:

\[ N_{\text{pf}} = 0.4 \times T1-2 + 0.35 \times T3 + 0.25 \times T4 \]

If a grade of 3 or higher is not achieved in all parts (T1-2, T3 and T4) of the final exam, the formula will be applied but \( N_{\text{final}} \) cannot be higher than 3.0.

It will be considered as Not Presented to all students who do not submit the final exam.

The evaluation of the teachings in the laboratory (NeL) takes into account the activity carried out in the computer room, the reports delivered and the mark of two tests on the lab work of topics 2 and 3 respectively, with the following weighting:

\[ N_{\text{eL}} = 0.3 \times \text{IP}2 + 0.2 \times \text{TP}2 + 0.3 \times \text{IP}3 + 0.2 \times \text{TP}2 \]

on
\[ \text{IP}2, \text{IP}3: \text{Qualification of the reports of lab work of the subject 2 and of the subject 3} \]
\[ \text{TP}2, \text{TP}3: \text{Qualification of the tests of lab work of the subject 2 and of the subject 3} \]

The evaluation of the directed activities (Nad) consists of doing outside the classroom and delivering different activities (directed works), of an additive and formative nature.

All laboratory activities, examinations or supervised activities, which are not carried out will be evaluated with a zero, as long as there has not been a justified reason.

Re-evaluation
All the students who obtain a grade equal to or higher than 3 and lower than 5 will be entitled to a re-assessment test consisting of a written exam that will include the entire content of the course.

The method of demonstrating STCW competence is to pass the training
The evaluation criterion is the verification and correct management of the computers
EXAMINATION RULES.

All of lab activities, tests or guided activities that are not carried out will be evaluated as zero, if there has not been a justified reason. The students who do not attend to the final exam will be graded as Not presented. Calculators and other electronic devices are not allowed in the written tests.

BIBLIOGRAPHY

Basic:

Complementary:

RESOURCES

Other resources:
- NI Multisim software for combinational and sequential system practices
- N2KBuilder software for configuring and testing NMEA networks