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: 2022 ECTS Credits: 6.0 Languages: Catalan, 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 - Grup: GEST1, Grup: GEST2, Grup: GTM
FIDEL BONET VILELA - Grup: GEST1, Grup: GEST2, Grup: GTM
ROSA M. FERNANDEZ CANTI - Grup: GEST1, Grup: GEST2, Grup: GTM
JORDI FONOLLOSA MAGRINYA - Grup: GEST1, Grup: GEST2, Grup: GTM
MARIA ÁNGELES FUENTES EXPÓSITO - Grup: GEST1, Grup: GEST2, Grup: GTM

Segon quadrimestre:
FRANCISCO JAVIER AYMERICH MARTINEZ - Grup: GESTN, Grup: GTM
FIDEL BONET VILELA - Grup: GESTN, Grup: GTM
JORDI FONOLLOSA MAGRINYA - Grup: GESTN, Grup: GTM

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-roombased 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 testear una red NMEA

STUDY LOAD

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

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**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

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**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
Networks 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 gtesting (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_{final} = 0.4 N_{pf} + 0.3 N_{ac} + 0.2 N_{el} + 0.1 N_{ad}

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

Continuous assessment (N_{ac}) 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_{ac} = 0.4 x T_{1-2} + 0.35 x T_{3} + 0.25 x T_{4}

The final exam grade (N_{pf}) is calculated according to the weights:
N_{pf} = 0.4 x T_{1-2} + 0.35 x T_{3} + 0.25 x T_{4}

If a grade of 3 or higher is not achieved in all parts (T_{1-2}, T_{3} and T_{4}) of the final exam, the formula will be applied but N_{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 (N_{el}) 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_{el} = 0.3 x IP_{2} + 0.2 x TP_{2} + 0.3 x IP_{3} + 0.2 x TP_{2}
on
IP_{2}, IP_{3}: Qualification of the reports of lab work of the subject 2 and of the subject 3
TP_{2}, TP_{3}: Qualification of the tests of lab work of the subject 2 and of the subject 3

The evaluation of the directed activities (N_{ad}) 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