UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

Course guide
280635 - 280635 - Informatics

Last modified: 17/10/2024

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: 2024   **ECTS Credits:** 6.0   **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer:	ROSA M. FERNANDEZ CANTI

Others:	Primer quadrimestre: FRANCISCO JAVIER AYMERICH MARTINEZ - GEST1, GEST2, GTM ROSA M. FERNANDEZ CANTI - GEST1, GEST2, GTM MARIA ÁNGELES FUENTES EXPÓSITO - GEST1, GEST2, GTM MARC JOVÉ BUENO - GEST1, GEST2, GTM GINES YAÑEZ SAURA - GEST1, GEST2, GTM Segon quadrimestre: ROSA M. FERNANDEZ CANTI - GESTN, GTM MARIA ÁNGELES FUENTES EXPÓSITO - GESTN, GTM GINES YAÑEZ SAURA - GESTN, GTM MARC JOVÉ BUENO - GESTN, 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

Type	Hours	Percentage
Self study	84,0	56.00
Guided activities	6,0	4.00
Hours large group	30,0	20.00
Hours medium group	15,0	10.00
Hours small group	15,0	10.00

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 arquitecture

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

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-roombased 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-roombased 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-roombased 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 183 electric features. Connectors. Types of sentences. Sentences format. Multiplexer.
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 grade Nfinal of the subject takes into account the following partial grades:

Npf: final test grade (final exam)
Nac: grade of continuous assessment (partial exams)
NeL: qualification of laboratory activities (practices in the computer room)
Nad: grading of supervised activities (supervised works)

If a student does not deliver in the Npf final exam, the final grade for the subject is NOT PRESENTED: Nfinal = NP.

If the grade of the Npf final exam is equal to or higher than 3.5, the final grade of the subject is obtained by applying the following weightings:
Nfinal = 0.5 x Npf + 0.2 x Nac + 0.2 x NeL + 0.1 x Nad

If the grade of the Npf final exam is lower than 3.5, then the final grade of the subject is Nfinal = 3.

Here is how partial grades are calculated:

Final test grade (Npf):
The final written exam has three parts: digital systems (units 1 and 2), algorithms (unit 3) and networks (unit 4) and these are weighted as follows,
Npf = 0.4 x T1-2 + 0.35 x T3 + 0.25 x T4

Continuous assessment grade (Nac):
The continuous assessment has three parts: digital systems (units 1 and 2), algorithmic (unit 3) and networks (unit 4) and these are weighted as follows,
Nac = 0.4 x T1-2 + 0.35 x T3 + 0.25 x T4
where
T1-2: Note of the written partial exam on units 1 and 2
T3: Partial grade of subject 3. It is calculated as
T3=0.5 x PP + 0.5 x EP
where
PP: Note of the programming project
EP: Note of the written partial exam on unit 3
T4: Grade of the written partial exam of unit 4 (this exam is held on the same day as the final exam)

A grade equal to or higher than 5 in T1-2 or in T3 frees the corresponding subject for the final exam and will be used in both the Nac and Npf calculations. If a student wants to try to raise the grade of one of these subjects, he can present himself or herself again on

the day of the final exam (and then Npf will be calculated with the grade obtained on the day of the final exam).

On the other hand, the grade obtained in T4 serves both to calculate Nac and Npf.

Qualification of the laboratory activities (NeL):
This qualification corresponds to the practices carried out in the computer room and takes into account the reports delivered and the grade of the two test-type tests on the practices of units 2 and 3 respectively, with the following weighting:
NeL = 0.3 x IP2 + 0.2 x TP2 + 0.3 x IP3 + 0.2 x TP3
where
IP2, IP3: Qualification of the Practice Reports of unit 2 and unit 3
TP2, TP3: Qualification of the Practice Tests of unit 2 and unit 3

Supervised work grade (Nad):
It is obtained based on the supervised works grade and specific activities done in the classroom.

All laboratory activities, exams or directed activities that are not turned in will count as zero.

Re-evaluation:
Those students who obtain a final course grade equal to or higher than 3 and lower than 5 will have the right to a re-evaluation test consisting of a written exam in which the entirety of the subject's syllabus will be included.

The method of demonstrating STCW competence is to pass the training
The evaluation criterion is the checking 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.

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- Schildt, Herbert. Turbo C/C++ 3.1 : manual de referencia. Madrid: Osborne/McGraw-Hill, 1994. ISBN 8448118561.
- Trill i Mollà, Albert. Informàtica bàsica 1. Vol. 1 Introducció a la informàtica. Barcelona: ETSEIB. CPDA, 1990.
- Abad Domingo, Alfredo. Redes de área local. Madrid: McGraw-Hill, 2005. ISBN 844819974X.
- Castro Rabal, Jorge. Curso de programación. Madrid: McGraw-Hill, 1993. ISBN 8448119592.
- Banzi, Massimo. Getting started with Arduino. 2nd ed. Sebastopol: O'Reilly, 2011. ISBN 9781449309879.
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- Stroustrup, Bjarne; Aranda González, Virginia. Un recorrido por C++. Tercera actualització. Madrid: Anaya Multimedia, [2023]. ISBN 9788441548213.

Complementary:
- Rubio Sanchez, Manuel. Introduction to Recursive Programming. Boca Raton: CRC Press, 2017. ISBN 9781498735285.
- Liu, Christine; Johnson, Tera. The Computer science activity book : 24 Pen-and-Paper projects to explore the wonderful world of coding. San Francisco: No Starch Press, 2019. ISBN 9781593279103.
- Anthropy, Anna. Make your own Twine games!. San Francisco: No Starch Press, 2019. ISBN 9781593279387.
- Margolis, Michael; Jepson, Brian; Weldin, Nicholas Robert. Arduino cookbook : recipes to begin, expand, and enhance your projects [on line]. 3rd ed. Sebastopo: O'Reilly Media, [April 2020] [Consultation: 11/10/2023]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=6177122. ISBN 9781491903506.
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- Culkin, Jody ; Hagan, Eric. Aprende electrónica con Arduino : una guía ilustrada para principiantes sobre la informática física / Jody Culkin y Eric Hagan [on line]. Barcelona: Marcombo, [2019] [Consultation: 28/07/2023]. Available on: https://search-ebscohost-com.recursos.biblioteca.upc.edu/login.aspx?direct=true&AuthType=ip,uid&db=nlebk&AN=2749567&site=ehost-live&ebv=EK&ppid=Page-   -1.

RESOURCES

Other resources:

NI Multisim software for combinational and sequential system practices
N2KBuilder software for configuring and testing NMEA networks