Course guide
340020 - INFO-N1O23 - Informatics

Last modified: 18/06/2024

Unit in charge: Vilanova i la Geltrú School of Engineering
Teaching unit: 723 - CS - Department of Computer Science.

Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Roman Jiménez, José Antonio

Others: Román Jiménez, José Antonio
López Calderón, David
Valls Mancha, Hugo
Ruiz Villar, Víctor
Da Silva Saavedra, Alfonso

PRIOR SKILLS

Basic knowledge of mathematics for the required level at the university entrance exam.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
2. CE3. Fundamental knowledge of use and programming of computer, operating systems, data base and informatic programs with application in engineering.

Transversal:
1. 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.
3. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
4. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
5. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

TEACHING METHODOLOGY

The course consists of:
- 2 hours per week of theory class (large group) where the teacher presents content.
- 2 hours per week of laboratory class (small group) where evaluable individual or group activities are proposed and performed.

LEARNING OBJECTIVES OF THE SUBJECT

The fundamental objective of the Information Technology course is learn to program in a high-level language, and implement programs to solve problems in science and technical areas.

To pass the course, students should be able to:
· Understand the basic concepts associated with computer hardware and software: the structure of computers and operating systems.
· Understand the fundamental concepts of computer programming.
· Develop skills in using basic tools and techniques of programming: algorithms and programs.
· Develop the capacity of abstraction in the use of programming schemes to solve real problems.
· Design well-structured and readable programs.
· Conduct a programming project of average complexity.

STUDY LOAD

Type	Hours	Percentage
Hours small group	30,0	20.00
Self study	90,0	60.00
Hours large group	30,0	20.00

Total learning time: 150 h

CONTENTS

1. Introduction to Programming

Description:
1.1. Fundamental definitions
1.2. Problem Solving Cycle with the Computer
1.3. Functional Structure of the Computer
1.4. Primitive Instructions

Related activities:
Activity 1: Problems about primitive statement, variables, and expressions (Activity-1a)
Activity 4: Questionnaires
Activity 5: Control 1

Full-or-part-time: 10h 30m
Theory classes: 1h 30m
Laboratory classes: 2h
Self study : 7h

2. Variables, data types and expressions

Description:
2.1. Variables
2.2. Data Types
2.3. Expressions

Related activities:
Activity 1: Problems about primitive statement, variables, and expressions (Activity-1a)
Activity 4: Questionnaires
Activity 5: Control 1

Full-or-part-time: 12h 30m
Theory classes: 2h 30m
Laboratory classes: 2h
Self study : 8h

3. Control Statements and functions

Description:
3.1. Sequential Construction
3.2. Conditional Construction
3.3. Iterative Construction
3.4. Functions

Related activities:
Activity 2: Problems of cotrol structures and functions (Activity-1b)
Activity 4: Questionnaires
Activity 5: Control 1
Activity 7: Control 2

Full-or-part-time: 28h
Theory classes: 4h
Laboratory classes: 5h
Guided activities: 1h
Self study : 18h

4. Sequences and Iterative Schemes

Description:
4.1. Sequence Schemes
4.1.1. Linear Scheme
4.1.2. Search Scheme

Related activities:
Activity 4: Control 1
Activity 6: Making a stage of the activity 6 corresponding to practices
Activity 7: Control 2

Full-or-part-time: 10h
Theory classes: 2h
Laboratory classes: 1h
Guided activities: 1h
Self study : 6h

5. Generic sequencies

Description:
5.1. Generic Sequences
5.2. Data Flows

Related activities:
Activity 4: Control 1
Activity 6: Making a stage of the activity 6 corresponding to practices
Activity 7: Control 2

Full-or-part-time: 13h
Theory classes: 2h
Laboratory classes: 2h
Guided activities: 1h
Self study : 8h

6. Lists

Description:
6.1. Sequences, Lists and Strings
6.1.1. Lists
6.1.2. Strings
6.2. Schemes on lists
6.2.1. Linear scheme
6.2.2. Search scheme
6.3. Lists and functions
6.3.1. Pass parameters with lists
6.3.2. Multiple return of functions

Related activities:
Activity 3: Problems about list or rrays with iterative schemes (Activity-2)
Activity 4: Questionnaires
Activity 6: Finishing the activity 6 corresponding to practices
Activity 7: Control 2

Full-or-part-time: 25h
Theory classes: 4h
Laboratory classes: 4h
Guided activities: 1h
Self study : 16h

7. Arrays

Description:
7.1. Arrays
7.2. Schematics on arrays
7.2.1. Route scheme
7.2.2. Search scheme

Related activities:
Activity 3: Lists or Arrays problems with iterative schemes (Activity-2)
Activity 4: Questionnaires
Activity 6: Assignment of activity 6 that corresponds to the practices
Activity 7. Control 2

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

8. Modular design and problem solving

Description:
8.1. Design and use of modules
8.2. Identifier visibility

Related activities:
Activity 6: Completion of activity 6 that corresponds to the practices

Full-or-part-time: 24h
Theory classes: 6h
Laboratory classes: 2h
Self study : 16h

ACTIVITIES

1. PROBLEMS ABOUT PRIMITIVE INSTRUCTIONS, VARIABLES AND EXPRESSIONS (Activity-1a)

Description:
Solve a control problem of the topics 1 or 2 in course, in the classroom. The problem will be chosen at random from a list proposed by teachers. Individual activity.

Specific objectives:
At the end of the activity, the student should be able to:
- Know primitive instructions of the programming language studied.
- Run a simple program manually and show how input/output channels and
memory have changed.
- Know the data types of the studied programming language and the basic operations they have defined.
- Know how to build correct expressions combining different types and operations.
- Know how to evaluate expressions combining different types and operations.

Material:
List of problems available at Atenea.

Delivery:
Solution of the problem given by the student.
The sum of activities representa the 15% of the final grade.

Related competencies :
. CE3. Fundamental knowledge of use and programming of computer, operating systems, data base and informatic programs with application in engineering.
07 AAT N1. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
06 URI N1. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

Full-or-part-time: 0h 05m
Laboratory classes: 0h 05m

2. PROBLEMS OF CONTROL STRUCTURES AND FUNCTIONS (Activity-1b)

Description:
Solve a control problem of the topic 3 in course, in the classroom. The problem will be chosen at random from a list proposed by teachers. Individual activity.

Specific objectives:
At the end of the activity, the student should be able to:
- Know control statements in the programming language studied.
- Trace a program that contains control statements and understand what it does.
- Know when to use a control statement.
- Know how to define and specify functions
- Build correct programs with variables, expressions, functions and control structures.

Material:
List of problems available at Atenea.

Delivery:
Solution of the problem given by the student.
The sum of activities represent the 15% of the final grade.

Related competencies :
. CE3. Fundamental knowledge of use and programming of computer, operating systems, data base and informatic programs with application in engineering.
07 AAT N1. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
06 URI N1. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

Full-or-part-time: 0h 10m
Laboratory classes: 0h 10m

3. PROBLEMS ABOUT LISTS AND ARRAYS WITH ITERATIVE SCHEMES (Activity-2)

Description:
Solve a problem of the topic 6 (lists) or 7 (arrays) in course, in the classroom. The problem will be chosen at random from a list proposed by teachers. Individual activity.

Specific objectives:
At the end of the activity, the student should be able to:
- Knowing the implementation of the sequences in the programming language studied.
- Create, access and modify a sequence implemented as a list, string, or array
- Apply iterative travel and search schemes on sequences in lists, strings or arrays
- Write correct programs that use iterative schemes on any sequence.

Material:
List of problems available at Atenea.

Delivery:
Solution of the problem given by the student.
The sum of activities represent 15% of the final grade.

Related competencies :
. CE3. Fundamental knowledge of use and programming of computer, operating systems, data base and informatic programs with application in engineering.
07 AAT N1. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
06 URI N1. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

Full-or-part-time: 0h 15m
Laboratory classes: 0h 15m

4. QÜESTIONARIS

Description:
Completion of self-assessed questionnaires (Atenea) to check up the subject comprehension.

Material:
Self-assessed questionnaires available at Atenea.
Collection of problem statements.
Laboratory manual available at Atenea.

Delivery:
Students may complete each questionnaire along a deadline. All questionnaries are online.
The whole set of questionnaires contributes 5% in the final grade.

Full-or-part-time: 1h 15m
Laboratory classes: 1h 15m

5. CONTROL 1

Description:
Individual test which includes the first three issues of the course, consisting of solving a number of problems by hand.

Specific objectives:
At the end of the activity, the student must have achieved the specific objectives of topics covered by the exam.

Material:
Exam questions.

Delivery:
Solutions of the exam questions given by the student.
Control 1 represents 20% of the final grade.

Related competencies :
. CE3. Fundamental knowledge of use and programming of computer, operating systems, data base and informatic programs with application in engineering.
07 AAT N1. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
04 COE N1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
06 URI N1. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

Full-or-part-time: 1h 30m
Guided activities: 1h 30m

6. PRACTICES

Description:
Activity in group (or individual if it is done in a non-presential way). If it is done in presential way, couples will be formed and these couples will be rotating, ie, for each practice couples should be different.

Presentation of a series of programs that solve problems of medium complexity in the mathematics area. The solving process will be in the classroom lab.

Specific objectives:
At the end of the activity, the student should be able to:
- Prove that he/she has achieved all of the course objectives.
- Show his/her capacity for teamwork.
- Knowing how to explain in a written or oral, the criteria applied when designing and implementing his/her project.

Material:
Collection of problem statements.
Laboratory manual available at Atenea.

Delivery:
For each problem there will be an online delivery which will be evaluated both in person as online, from the documentation submitted. Completion is mandatory.
The whole set of problems contribute 30% in the final grade.

Related competencies :
. CE3. Fundamental knowledge of use and programming of computer, operating systems, data base and informatic programs with application in engineering.
07 AAT N1. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
04 COE N1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
05 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.
06 URI N1. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

Full-or-part-time: 36h
Laboratory classes: 6h
Self study: 30h

7. CONTROL 2

Description:
Individual test which includes all of the course topics, consisting of solving a number of problems by hand.

Specific objectives:
At the end of the activity, the student must have achieved the specific objectives of topics covered by the exam.

Material:
Exam questions.

Delivery:
Solutions of the exam questions given by the student.
Control 2 represents 30% of the final grade.

Related competencies :
. CE3. Fundamental knowledge of use and programming of computer, operating systems, data base and informatic programs with application in engineering.
07 AAT N1. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
04 COE N1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
06 URI N1. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

Full-or-part-time: 2h 15m
Guided activities: 2h 15m

GRADING SYSTEM

AC = Grade from Activity 1 (Unit 1, 2 i 3) and Activity 2 (Units 6 and 7)
QU = Grade from activity 4.
PR = Grade from activity 6.
C1 = Grade from activity 5.
C2 = Grade from activity 7.
Final Grade = max(50% C2, 20% C1 + 30% C2) + 5% QU + 15% AC + 30% PR
The re-evaluation contains the C2 test.
137/5000
- The C2 control is a global final test, weighted in the manner described.
- The re-evaluation test is equivalent to the C2 test.

EXAMINATION RULES.

Activities 1 and 2 are individual activities.

Activity 4 (Questionnaires) is a series of self-assessed questionnaires that the student solves online and individually.

Activity 6 (Practices) consists of several programs that solve problems of increasing difficulty must be delivered. These problems are solved individually or in pairs. For each problem there is scheduled an online delivery. The teacher can ask students for an explanation of the work presented, and take into account their response to qualify the work.

BIBLIOGRAPHY

Basic:
- Franch Gutiérrez, Xavier [et al.]. Introducció a la programació : problemes resolts [on line]. Barcelona: Edicions UPC, 2006 [Consultation: 25/03/2022]. Available on: https://upcommons.upc.edu/handle/2099.3/36697. ISBN 9788483018811.
- Lutz, Mark. Learning Python [on line]. 5th ed. (Beijing ; Sebastopol, California: O'Reilly Media, 2013 [Consultation: 13/02/2024]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=1224732. ISBN 9781449355715.

RESOURCES

Hyperlink:
- http://atenea.upc.edu/moodle/ />. Notes, collection of problem statements and lab manual for the Informatics course.
- http://repositori.uji.es/xmlui/bitstream/handle/10234/102653/s93_impressora.pdf. Electronic book that introduces the world of programming with Python 3
- http://www.pythontutor.com. Resource
- http://jutge.org/. Virtual Learning Environment for Computer Programming