

Course guide

270204 - AP1 - Algorithmics and Programming I

Last modified: 19/07/2023

Unit in charge: Barcelona School of Informatics
Teaching unit: 723 - CS - Department of Computer Science.

Degree: BACHELOR'S DEGREE IN DATA SCIENCE AND ENGINEERING (Syllabus 2017). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 7.5 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: JORDI PETIT SILVESTRE

Others: Primer quadrimestre:
JORDI PETIT SILVESTRE - 11, 12
EMMA ROLLÓN RICO - 11, 12

PRIOR SKILLS

The student must have the knowledge of mathematics and computational reasoning acquired at the Baccalaureate level.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CE2. To be able to program solutions to engineering problems: Design efficient algorithmic solutions to a given computational problem, implement them in the form of a robust, structured and maintainable program, and check the validity of the solution.

Generical:

CG1. To design computer systems that integrate data of provenances and very diverse forms, create with them mathematical models, reason on these models and act accordingly, learning from experience.

CG2. Choose and apply the most appropriate methods and techniques to a problem defined by data that represents a challenge for its volume, speed, variety or heterogeneity, including computer, mathematical, statistical and signal processing methods.

CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.

Transversal:

CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.

CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

CT7. Third language. Know a third language, preferably English, with an adequate oral and written level and in line with the needs of graduates.

Basic:

CB5. That the students have developed those learning skills necessary to undertake later studies with a high degree of autonomy

TEACHING METHODOLOGY

The theoretical contents of the subject are taught in theory classes. These classes are complemented by practical examples and problems that students must solve in the hours of Autonomous Learning.

The laboratory sessions consolidate the knowledge acquired in the theory classes by solving programming problems related to the theoretical contents. During the laboratory classes, the teacher will introduce new techniques and leave an important part of the class for the students to work on the proposed exercises.

LEARNING OBJECTIVES OF THE SUBJECT

1.Be able to solve small and medium complexity calculation problems using algorithmic and programming techniques.

STUDY LOAD

Type	Hours	Percentage
Hours small group	30,0	16.00
Self study	112,5	60.00
Hours large group	45,0	24.00

Total learning time: 187.5 h

CONTENTS

consultar la versió en català

Description:

consultar la versió en català

consultar la versió en català

Description:

consultar la versió en català

consultar la versió en català

Description:

consultar la versió en català

consultar la versió en català

Description:

consultar la versió en català

consultar la versió en català

Description:

consultar la versió en català

consultar la versió en català

Description:

consultar la versió en català



[consultar la versió en català](#)

Description:

consultar la versió en català

[consultar la versió en català](#)

Description:

consultar la versió en català

ACTIVITIES

[consultar la versió en català](#)

Description:

consultar la versió en català

Specific objectives:

1

Related competencies :

CG1. To design computer systems that integrate data of provenances and very diverse forms, create with them mathematical models, reason on these models and act accordingly, learning from experience.

CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.

CG2. Choose and apply the most appropriate methods and techniques to a problem defined by data that represents a challenge for its volume, speed, variety or heterogeneity, including computer, mathematical, statistical and signal processing methods.

CE2. To be able to program solutions to engineering problems: Design efficient algorithmic solutions to a given computational problem, implement them in the form of a robust, structured and maintainable program, and check the validity of the solution.

CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.

CT7. Third language. Know a third language, preferably English, with an adequate oral and written level and in line with the needs of graduates.

CB5. That the students have developed those learning skills necessary to undertake later studies with a high degree of autonomy

Full-or-part-time: 22h

Theory classes: 6h

Laboratory classes: 4h

Self study: 12h

consultar la versió en català**Description:**

consultar la versió en català

Specific objectives:

1

Related competencies :

CG1. To design computer systems that integrate data of provenances and very diverse forms, create with them mathematical models, reason on these models and act accordingly, learning from experience.

CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.

CG2. Choose and apply the most appropriate methods and techniques to a problem defined by data that represents a challenge for its volume, speed, variety or heterogeneity, including computer, mathematical, statistical and signal processing methods.

CE2. To be able to program solutions to engineering problems: Design efficient algorithmic solutions to a given computational problem, implement them in the form of a robust, structured and maintainable program, and check the validity of the solution.

CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.

CT7. Third language. Know a third language, preferably English, with an adequate oral and written level and in line with the needs of graduates.

CB5. That the students have developed those learning skills necessary to undertake later studies with a high degree of autonomy

Full-or-part-time: 22h

Theory classes: 6h

Laboratory classes: 4h

Self study: 12h

consultar la versió en català**Description:**

consultar la versió en català

Specific objectives:

1

Related competencies :

CG1. To design computer systems that integrate data of provenances and very diverse forms, create with them mathematical models, reason on these models and act accordingly, learning from experience.

CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.

CG2. Choose and apply the most appropriate methods and techniques to a problem defined by data that represents a challenge for its volume, speed, variety or heterogeneity, including computer, mathematical, statistical and signal processing methods.

CE2. To be able to program solutions to engineering problems: Design efficient algorithmic solutions to a given computational problem, implement them in the form of a robust, structured and maintainable program, and check the validity of the solution.

CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.

CT7. Third language. Know a third language, preferably English, with an adequate oral and written level and in line with the needs of graduates.

CB5. That the students have developed those learning skills necessary to undertake later studies with a high degree of autonomy

Full-or-part-time: 22h

Theory classes: 6h

Laboratory classes: 4h

Self study: 12h

consultar la versió en català**Description:**

consultar la versió en català

Specific objectives:

1

Related competencies :

CG1. To design computer systems that integrate data of provenances and very diverse forms, create with them mathematical models, reason on these models and act accordingly, learning from experience.

CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.

CG2. Choose and apply the most appropriate methods and techniques to a problem defined by data that represents a challenge for its volume, speed, variety or heterogeneity, including computer, mathematical, statistical and signal processing methods.

CE2. To be able to program solutions to engineering problems: Design efficient algorithmic solutions to a given computational problem, implement them in the form of a robust, structured and maintainable program, and check the validity of the solution.

CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.

CT7. Third language. Know a third language, preferably English, with an adequate oral and written level and in line with the needs of graduates.

CB5. That the students have developed those learning skills necessary to undertake later studies with a high degree of autonomy

Full-or-part-time: 11h

Theory classes: 3h

Laboratory classes: 2h

Self study: 6h

consultar la versió en català**Description:**

consultar la versió en català

Specific objectives:

1

Related competencies :

CG1. To design computer systems that integrate data of provenances and very diverse forms, create with them mathematical models, reason on these models and act accordingly, learning from experience.

CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.

CG2. Choose and apply the most appropriate methods and techniques to a problem defined by data that represents a challenge for its volume, speed, variety or heterogeneity, including computer, mathematical, statistical and signal processing methods.

CE2. To be able to program solutions to engineering problems: Design efficient algorithmic solutions to a given computational problem, implement them in the form of a robust, structured and maintainable program, and check the validity of the solution.

CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.

CT7. Third language. Know a third language, preferably English, with an adequate oral and written level and in line with the needs of graduates.

CB5. That the students have developed those learning skills necessary to undertake later studies with a high degree of autonomy

Full-or-part-time: 22h

Theory classes: 6h

Laboratory classes: 4h

Self study: 12h

consultar la versió en català

Description:

consultar la versió en català

Specific objectives:

1

Related competencies :

CG1. To design computer systems that integrate data of provenances and very diverse forms, create with them mathematical models, reason on these models and act accordingly, learning from experience.

CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.

CG2. Choose and apply the most appropriate methods and techniques to a problem defined by data that represents a challenge for its volume, speed, variety or heterogeneity, including computer, mathematical, statistical and signal processing methods.

CE2. To be able to program solutions to engineering problems: Design efficient algorithmic solutions to a given computational problem, implement them in the form of a robust, structured and maintainable program, and check the validity of the solution.

CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.

CT7. Third language. Know a third language, preferably English, with an adequate oral and written level and in line with the needs of graduates.

CB5. That the students have developed those learning skills necessary to undertake later studies with a high degree of autonomy

Full-or-part-time: 22h

Theory classes: 6h

Laboratory classes: 4h

Self study: 12h

consultar la versió en català

Description:

consultar la versió en català

Specific objectives:

1

Related competencies :

CG1. To design computer systems that integrate data of provenances and very diverse forms, create with them mathematical models, reason on these models and act accordingly, learning from experience.

CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.

CG2. Choose and apply the most appropriate methods and techniques to a problem defined by data that represents a challenge for its volume, speed, variety or heterogeneity, including computer, mathematical, statistical and signal processing methods.

CE2. To be able to program solutions to engineering problems: Design efficient algorithmic solutions to a given computational problem, implement them in the form of a robust, structured and maintainable program, and check the validity of the solution.

CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.

CT7. Third language. Know a third language, preferably English, with an adequate oral and written level and in line with the needs of graduates.

CB5. That the students have developed those learning skills necessary to undertake later studies with a high degree of autonomy

Full-or-part-time: 22h

Theory classes: 6h

Laboratory classes: 4h

Self study: 12h

consultar la versió en català

Description:

consultar la versió en català

Specific objectives:

1

Related competencies :

CG1. To design computer systems that integrate data of provenances and very diverse forms, create with them mathematical models, reason on these models and act accordingly, learning from experience.

CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.

CG2. Choose and apply the most appropriate methods and techniques to a problem defined by data that represents a challenge for its volume, speed, variety or heterogeneity, including computer, mathematical, statistical and signal processing methods.

CE2. To be able to program solutions to engineering problems: Design efficient algorithmic solutions to a given computational problem, implement them in the form of a robust, structured and maintainable program, and check the validity of the solution.

CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.

CT7. Third language. Know a third language, preferably English, with an adequate oral and written level and in line with the needs of graduates.

CB5. That the students have developed those learning skills necessary to undertake later studies with a high degree of autonomy

Full-or-part-time: 22h

Theory classes: 6h

Laboratory classes: 4h

Self study: 12h

Lab test

Full-or-part-time: 5h 30m

Guided activities: 2h 30m

Self study: 3h

Lab test

Full-or-part-time: 4h 30m

Guided activities: 2h 30m

Self study: 2h

Theory test

Full-or-part-time: 12h 30m

Guided activities: 2h 30m

Self study: 10h



GRADING SYSTEM

There are two tests that are done in the lab: a partial (PL) and a final (FL). There is also a final written exam (FT).

The FINAL grade is calculated according to the formula:

$$0.6 \max \{0.3 \text{ PL} + 0.7 \text{ FL}, \text{ FL}\} + 0.4 \text{ FT}.$$

The REVALUATION grade is calculated according to the formula:

$$0.6 \text{ RL} + 0.4 \text{ RT}$$

where RL is the grade for the laboratory exam in the re-assessment and RT is the grade for the theory exam in the re-assessment.

BIBLIOGRAPHY

Basic:

- Savitch, W. J. Problem solving with C++. 10th ed. New York, NY: Pearson, 2018. ISBN 9780134448282.
- Cohen, Edward. Programming in the 1990s : an introduction to the calculation of programs. Study ed. New York, NY: Springer-Verlag, 1990. ISBN 0387973826.
- Cortadella, Jordi. Introduction to programming. UPC. Dep of Computer Science, 2016.

RESOURCES

Hyperlink:

- <https://jutge.org>- <https://lliçons.jutge.org>