

Advanced Computing

Code: 101765
ECTS Credits: 9

| Degree | Type | Year | Semester |
|---------------------------------|------|------|----------|
| 2501233 Aeronautical Management | OB | 2 | 1 |

Contact

Name: Aura Hernández Sabaté
Email: Aura.Hernandez@uab.cat

Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Prerequisites

1st grade course:

1. Calculus
2. Fundamentals of Computer Science

Statistics from previous years show that, in order to follow the subject correctly, it is extremely important to have passed the Fundamentals of Computer Science. Therefore, in case of suspending Fundamentals of Computer Science, we strongly recommend not enrolling in this subject.

Objectives and Contextualisation

The main objective of this course is to help students in the process of abstraction necessary to address problems of large dimensions related to aeronautical management and provide the basic concepts for this effect. For this reason, the course deals with the treatment of data from two different points of view that converge at the same point: how information is stored and how it is manipulated.

Thus, the subject is separated into two modules. On the one hand, the introduction to databases in order to store information efficiently, and on the other hand the programming part as a natural continuation of the subject Fundamentals of Computer Science, carried out in the 1st year.

In this way, the general objectives that are proposed are the following:

1. Deepen into data structures and their abstraction through databases
2. Extract information from a database of a certain complexity
3. Provide advanced programming skills through dynamic data structures
4. Introduce the principles of object-oriented programming
5. To help students obtain the abstraction needed to separate the representation of data and its use.

This course is intended for students to be able to:

1. Achieve a good level of advanced programming
2. Design and implement an algorithm based on dynamic data structures and the concept of data abstraction.
3. Familiarisation with the principles of object-oriented programming

4. To know in depth a BD, from the Model E-R from some specifications of the real world that one wants to model the BD.
5. Perform simple and complex queries to a DB using SQL

Competences

- Communication.
- Develop software of low or medium complexity.
- Personal work habits.
- Thinking skills.
- Use knowledge of the fundamental principles of mathematics, economics, information technologies and psychology of organisations and work to understand, develop and evaluate the management processes of the different systems in the aeronautical sector.
- Use new technologies in airline management.
- Work in teams.

Learning Outcomes

1. Accept and respect the role of the various team members and the different levels of dependence within the team.
2. Analyze the software and hardware necessary resources related to the use of data base.
3. Apply imperative programming efficiently.
4. Apply object-oriented programming.
5. Communicate knowledge and findings efficiently, both orally and in writing, both in professional situations and with a non-expert audience.
6. Create applications to exploit the information stored in databases.
7. Design and implement databases of low complexity to meet the information needs of companies in the sector.
8. Develop independent learning strategies.
9. Develop scientific thinking skills.
10. Develop systemic thinking.
11. Develop the ability to analyse, synthesise and plan ahead.
12. Make efficient use of ICT in communicating ideas and results.
13. Manage time and available resources. Work in an organised manner.
14. Understand the functioning of database systems.
15. Work cooperatively.
16. Work independently.
17. Write programmes to solve problems of medium complexity in the aeronautical sector using imperative and object-oriented programming.

Content

Module 1. Database systems

Topic 1. Introduction to databases

- Definitions. Components of a Database system.
- Advantages and disadvantages of a database system.

Topic 2. Relational data model

- Introduction
- Data Structure.
- Integrity rules. Data manipulation.
- Relational algebra.

Module 2. Programming

Topic 3. Review of Fundamentals of Computer Science

Topic 4. Introduction to object-oriented programming

- Class concept. Methods and attributes. Builders and destroyers. Data Encapsulation

Topic 5. Dynamic data structures

- Lists. Basic concepts, manipulation and advanced programming
- Dictionaries.

Methodology

Since the background of the subject is the accompaniment in the process of abstraction, the work of the students is the central axis of their learning, accompanied and guided by the teaching staff. For this reason, the face-to-face classes will be highly practical and will focus on the students consolidating the knowledge that is the objective of learning this subject.

The general methodology of the subject can be divided into three phases:

Preparation of the class: the aim of this phase is for the students to be able to prepare the contents that will be worked on in the following session by means of various activities offered by the teaching staff, such as watching videos, reading texts, etc.

Face-to-face class: the aim of face-to-face classes is to consolidate the concepts seen and put them into value within the context of the subject. The teaching staff will ensure that students delve deeper into these concepts through exercises (more or less) guided during the face-to-face sessions. These face-to-face sessions will be divided into large, medium and small group sessions, according to the number of students and the activities will be adapted to the size of the group.

Self-employment: in order for students to consolidate the knowledge acquired in the two previous phases, they will have to do part of the work on their own.

The management of the teaching of the subject will be done through the documentary manager Caronte (<https://caronte.uab.cat/>), which will be used to view the materials, manage groups, make the corresponding deliveries, see the notes, communicate with the teaching staff, etc. In order to use it, the following steps are necessary:

1. Register as a user / to giving the name, NIU, and a passport photo in JPG format. If you have already registered for any other subject, it is not necessary to do it again, you can go to the next step.
2. Enroll in the type of teaching "Teaching Advanced Computer Science", giving as subject code "InfoAvan" (without quotes). Even if you are repeaters, you have to register again.

Activities

| Title | Hours | ECTS | Learning Outcomes |
|--------------------------|-------|------|---|
| Type: Directed | | | |
| Practice lectures | 18 | 0.72 | 2, 3, 4, 1, 5, 6, 9, 10, 7, 17, 12 |
| Problem solving lectures | 18 | 0.72 | 2, 3, 4, 1, 14, 6, 9, 10, 11, 7, 17, 15 |
| Theoretical lectures | 39 | 1.56 | 3, 4, 14, 6, 9, 10, 11, 7, 17 |
| Type: Supervised | | | |

| | | | |
|---|----|------|---|
| Follow-up in the assimilation of theoretical concepts | 10 | 0.4 | 1, 5, 9, 10, 8, 11, 12, 13 |
| Reinforcement and follow-up in problem solving | 16 | 0.64 | 3, 14, 5, 6, 9, 10, 11, 17, 12, 13 |
| Type: Autonomous | | | |
| Database project | 21 | 0.84 | 2, 14, 5, 8, 11, 7, 13, 16 |
| Exams preparation | 10 | 0.4 | 14, 9, 10, 8, 11, 12, 13, 16 |
| Individual and group problem solving | 38 | 1.52 | 2, 3, 4, 1, 14, 6, 8, 7, 17, 12, 13, 15, 16 |
| Preparation prior to face-to-face classes | 22 | 0.88 | 9, 10, 8, 11, 13, 16 |
| Programming Project | 21 | 0.84 | 3, 4, 5, 6, 8, 11, 17, 13, 16 |

Assessment

The course is divided into two modules:

1. the first half of the course will be devoted to the study of database systems (module 1)
2. the second half of the course will be devoted to the deepening of object-oriented programming and data structures (module 2)

The two parts will be evaluated independently, and each module will count 50%. To obtain the final grade it will be necessary to pass each of the two parts separately (Note module >= 5).

Each of the parts of the course will be evaluated independently three types of activities and the weighted sum of them will give the final grade. These three activities are:

1. Individual Exams (EI)
2. Assessable exercises (EA)
3. Practical project (P)

1. The first part (EI) consists of two partial exams in which the students will be evaluated individually. The minimum grade to pass each partial exam is 5.
2. The second part (EA) will be carried out continuously throughout the course. The final grade will come from the weighted sum of the deliveries that are requested.
3. The third part (P) will be evaluated in a group (with the delivery of a project) and individual (with the evaluation of a written test). The final grade will be obtained from the weighted sum of the two previous grades. The minimum grade to pass the project is 5, while the individual exam must be passed with a minimum grade of 3.5. The final grade of this part must be a minimum of 5.

To pass the course it is necessary that the evaluation of each of the parts exceeds the minimum required and that the total evaluation exceeds 5 points.

RECOVERY

According to the Academic Regulations of the UAB in order to participate in the student's recovery must have been previously evaluated in a set of activities the weight of which is equivalent to a minimum of two thirds of the total grade of the subject. In addition, it is necessary to have obtained a minimum grade of 3 in the average of the subject to be able to present to the recovery.

If the above criteria are met, individual written tests that have not been passed may be made up on the day assigned to the official examination week.

HONORARY REGISTRATION

In case of a grade equal to or higher than 9, the student will be eligible for honorary matriculation. The maximum number of enrolments allowed by the regulations will be given among the applicants.

CONVALIDATION

From one course to the next, only the final module grades are saved, as long as they are higher than 5.

PLAGIARISM AND VARIANTS

Without prejudice to other disciplinary measures that may be deemed appropriate, and in accordance with current academic regulations, irregularities committed by the student that may lead to a variation in the grade of an act of evaluation will be graded with a zero. Therefore, copying or letting copy a practice or any other evaluation activity will involve suspending - with a zero, and if it is necessary to pass - the to pass, the whole subject will be suspended. The evaluation activities qualified in this way and by this procedure will not be recoverable, and therefore the subject will be suspended directly without the opportunity to recover - in the same academic year.

COMMUNICATION

The dates of evaluations and delivery of problems will be published to the document manager Caronte and may be subject to possible changes in programming for reasons of adaptation to possible incidents. The Caronte will always be informed about these changes as it is understood that this is the usual platform for exchanging information between teachers and students.

Assessment Activities

| Title | Weighting | Hours | ECTS | Learning Outcomes |
|--------------------------------|-----------|-------|------|---------------------------------|
| Final Exam (recuperation) | 50% | 4 | 0.16 | 2, 3, 14, 5, 13 |
| Individual Exam module 1 | 25% | 2 | 0.08 | 3, 5, 13 |
| Individual Exam module 2 | 25% | 2 | 0.08 | 2, 14, 5, 13 |
| Practical evaluations module 1 | 20% | 1 | 0.04 | 3, 4, 1, 5, 17, 13, 15, 16 |
| Practical evaluations module 2 | 20% | 1 | 0.04 | 1, 14, 5, 6, 7, 13, 15, 16 |
| Troubleshooting Module 1 | 5% | 1 | 0.04 | 5, 9, 10, 8, 11, 12, 13, 15, 16 |
| Troubleshooting Module 2 | 5% | 1 | 0.04 | 5, 9, 10, 8, 11, 12, 13, 15, 16 |

Bibliography

A. Silberschatz, H.F. Korth, S. Sudarshan, Fundamentos de Bases de Datos , 4a edició, McGraw-Hill, 2002.

R. Elmasri, S. B. Navathe, Fundamentos de Sistemas de Bases de Datos, Addison-Wesley, 1997.

L. Joyanes Aguilar, Fundamentos De Programación, 4ª Ed. , McGraw-Hill, 2008.

Mark Lutz and David Ascher, Learning PYTHON, 2nd Edition. Safari Tech Books Online.

Python interactive electronic books:

- <http://interactivepython.org/runestone/static/thinkcspy/toc.html#t-o-c>
- <http://python101.pythonlibrary.org/#>

- <http://www.pythontutor.com/>