

Fundamentals of Engineering

Code: 103818
ECTS Credits: 6

2024/2025

Degree	Type	Year
2501233 Aeronautical Management	OB	1

Contact

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Teachers

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Teaching groups languages

You can view this information at the [end](#) of this document.

Prerequisites

None

Objectives and Contextualisation

The main objective of the subject is to present the general scope of engineering and the fundamental aspects of the profession of engineer, as well as working on the own method of problem solving in engineering. Additionally, a presentation of the Degree in Aeronautical Management will also be carried out, framing it in the previous context and paying special attention on of the professional outputs of these studies. This last aspect will be complemented by conferences given by professionals of the aeronautical sector.

Competences

- Acquire a general vision of engineering as a profession.
- Communication.
- Identify, develop and maintain the necessary resources to meet the tactical and operative needs inherent to air transport activities.
- Participate in human resources management, correctly applying the different concepts involved: psychology applied to organisations, internal and external communication and economic and legal factors.
- Personal work habits.
- Thinking skills.

- 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. Acquire a general vision of engineering as a profession.
3. Communicate knowledge and findings efficiently, both orally and in writing, both in professional situations and with a non-expert audience.
4. Critically assess the work done.
5. Develop critical thought and reasoning.
6. Develop systemic thinking.
7. Identify, manage and resolve conflicts.
8. Make decisions.
9. Make efficient use of ICT in communicating ideas and results.
10. Manage time and available resources. Work in an organised manner.
11. Organise and allocate the human resources necessary to meet the various needs of a project.
12. Organise and allocate the physical resources necessary to meet the various needs of a project.
13. Prevent and solve problems.
14. Work cooperatively.
15. Work independently.

Content

PART I: ENGINEERING AND SOCIETY

Topic 1: Introduction to engineering

1. Introduction
2. Engineering definitions
3. Brief history of engineering
4. Engineering, science and society
5. The engineer as a problem solver

Topic 2: The profession of engineer

1. Introduction
2. Branches of engineering
3. Professional perspectives of the engineer
4. Requirements of engineering
5. The ethics in engineering

PART II: THE PROCESS OF RESOLUTION OF PROBLEMS IN ENGINEERING

Topic 3: Obstacles and tools in solving problems

1. Introduction
2. Problem concept
3. Cognitive psychology and thought
4. Correct habits of problem solving
5. The role of knowledge in solving problems
6. Blocks and creativity
7. Heuristics for problem solving

Topic 4: A formal framework for problem solving in engineering

1. Introduction
2. Step 0: "I can do it"
3. Step 1: Definition
4. Step 2: Exploration
5. Step 3: Planning
6. Step 4: Implementation
7. Step 5: Validation
8. Step 6: Conclusion

PART III: METHODS AND TOOLS IN ENGINEERING

Topic 5: Calculations in engineering

1. Numerical systems
2. Dimensions
3. Units. The international system of units
4. Significant figures
5. Scientific notation
6. Functions parameterization

Topic 6: Brief introduction to project management

1. Introduction and general concepts
2. Development phases of a project
3. Planning tools

Topic 7: Design based on models

1. Introduction
2. Types of models
3. Phases of the modeling process

Topic 8: Communication in engineering

1. Information sources
2. Written communication
3. Oral communication

PART IV: THE DEGREE STUDIES IN AERONAUTICAL MANAGEMENT

Topic 9: Degree in Aeronautical Management

1. Objectives and competencies
2. Structure of the syllabus
3. Career opportunities
4. Postgraduate studies

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Conferences	6	0.24	2

Personal study	18	0.72	2, 5, 10, 11, 12, 15
Problem sessions	10	0.4	2, 3, 4, 5, 6, 8, 11, 12, 13, 15
Sessions for introductions of tools	8	0.32	11, 12
Sessions of project presentation	4	0.16	3, 9
Theory sessions	12	0.48	2, 5, 6, 11, 12
Type: Supervised			
Individual tutorials	4	0.16	4, 5, 15
Project monitoring sessions	18	0.72	1, 4, 5, 6, 7, 10, 11, 12, 13, 14
Type: Autonomous			
Problem solving	22	0.88	2, 5, 6, 8, 10, 11, 12, 13, 15
Project development	46	1.84	1, 4, 5, 6, 7, 10, 11, 12, 13, 14

The general methodological approach of the subject is based on the principle of multivariate strategies, which it is intended to facilitate the active participation and the construction of the learning process by the student. In this sense, lectures will be considered in a whole group, and practical activities and follow-up work of the student, in a small group.

Specifically, the training activities included in this subject are the following:

Theory classes

Exposure and discussion of the fundamental concepts of the subject (whole group).

Problem classes

Resolution and discussion of exercises that allow to reinforce the theoretical concepts of the subject (complete group).

Sessions for introduction of tools

Basically, there will be introductory sessions to:

- Lego Mindstorms programming environment: This environment is needed for the development of the course project.
- Computer tool for project planning, through which the planning of the course project will be carried out.

These activities will be carried out mainly in a small group. The two computer applications that are needed will be provided from the subject.

Conferences

During the course (in class hours of the entire group) some conferences on professional activities of the aeronautical sector will be scheduled to be taught by professionals of the sector.

Practical work (project)

The central work of the subject consists in the development in teams of a small project, for which, you will have to write a report and make an oral presentation. The development of this project it is intended to implement the method of solving problems in engineering and thus work the competencies associated with the objectives of the subject.

For this activity, follow-up sessions will be carried out, in small group. Additionally, 4 sessions of 2 hours have been planned for the project exhibition (each student will attend only two of these sessions).

Based on the formative activities that have just been commented, the expected table of the subject is summarized in the following table.

TYPE OF ACTIVITY	ACTIVITY	HOURS
Directed		
	Classes of Theory / problems	22
	Sessions for introduction of tools	8
	Conferences	6
	Sessions of project presentation	4
	Exam	2
Supervised		
	Sessions of project monitoring	18
	Individual tutorials (*)	4
Autonomous (*)		
	Personal study	18
	Problemsolving	22
	Project development	46

Total hours per student: 150

(*): Estimation.

Reminder: 1 ECTS = 25 hours of work for the student.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Continuous Evaluation	25%	0	0	2, 3, 4, 5, 8, 9, 10, 13, 15
Exam	25%	2	0.08	2, 4, 5, 6, 8, 10, 11, 12, 13, 15
Project	50%	0	0	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14

This subject does not provide for the single assessment system.

$$\text{FINAL GRADE} = \text{CE1} \times 0.25 + \text{CE2} \times 0.25 + \text{CE3} \times 0.5$$

CE1: Continuous assessment grade.

CE2: Grade of the written exam.

CE3: Project note.

If any of the evaluation components (CE_i) has a value lower than 4, the subject will be graded Failed.
The grade of Not Submitted will only be obtained if no evaluable element is submitted.

Details of the Continuous Evaluation:

It will have two components:

- Formative assessment: It consists of a set of tests that the students will take individually. They will basically be conceptual understanding quizzes that will be carried out based on a reading of the notes for each topic, prior to working on the topic in class. These tests will not have a mark, they serve the teacher to plan the theory sessions and reinforce the explanation of those points that require it.
- Summative assessment: It consists of a set of tests that will be carried out, individually, after the class work of each topic, in order to assess the level of achievement of the content of the same. These tests will be graded.

The grade of continuous assessment (AC) will have two components:

- Number of tests (both formative and summative assessment) delivered (25% of the AC grade).
- Overall grade (arithmetic average) of the summative assessment tests (75% of the AC grade).

Detail of the project qualification:

It will have two components:

- Overall evaluation of the work (60% of the mark). This note will be applied equally to each member of the team.
- Individual evaluation of the work (40% of the grade)

Not presented and Honor Roll:

- The grade of Not Submitted will only be obtained if no evaluable element is submitted.
- Honorary registrations. Awarding an honors matriculation qualification is the decision of the teaching staff responsible for the subject. UAB regulations indicate that MH can only be granted to students who have obtained a final grade equal to or higher than 9.00. Up to 5% of MH of the total number of students enrolled in the subject can be awarded.

Recovery of suspended activities:

As a general rule (according to the academic regulations of the UAB), the student can present himself for recovery as long as he has presented himself to a set of activities that represent a minimum of two-thirds of the total qualification of the subject. In particular:

- If during the normal period of completion of the project the qualification was suspended, the team will have the possibility to correct the errors detected, during the recovery period of the subject. In this case, the maximum final mark for the project that can be chosen will be 8. By virtue of the academic regulations of the UAB, mentioned in the introductory paragraph of this section, given that the project has a weight of 50% in the overall mark of the subject, a student who has not been enrolled in any project team, does not have the right to re-evaluation of this element and, in application of the evaluation method, would have the subject suspended.
- With regard to the written exam, there is a re-evaluation exam for students who have failed, or who have not appeared in the exam of the regular call, as long as they comply with the academic regulations of the UAB, mentioned in the introductory part of this section. The maximum mark for which you can opt for the make-up exam will be 8.
- Continuous assessment activities do not have recovery.

Repeating students:

The evaluation method for repeating students will be the same as for the rest of students.

Disciplinary measures:

Without prejudice to other disciplinary measures that are deemed appropriate, and in accordance with the current academic regulations, the irregularities committed by the student that can lead to a variation of the qualification of evaluation activity. Therefore, copying or letting copy a practice or any other evaluation activity will imply suspending it with a zero, and if it is necessary to pass it to pass the subject, the entire subject will be suspended. Qualified evaluation activities will not be recoverable in this way and by this procedure, and therefore the subject will be suspended directly without opportunity to recover it in the same academic year.

Bibliography

Brockman, Jay B. *Introduction to engineering: modeling and problem solving*. John Wiley & Sons, Inc., 2009.

Wright, Paul H. *Introducción a la ingeniería*. Third edition. Limusa Wiley, 2004.

Gómez-Senent, Eliseo y otros. *Introducción a la ingeniería*. UPV Publishers, 2007.

Grech, Pablo. *Introducción a la ingeniería: un enfoque a través del diseño*. Prentice Hall, 2001.

Gómez, Alan G y otros. *Engineering your future: a project-based introduction to engineering*. Great Lakes Press, Inc., 2006.

Software

Lego Mindstorms programming environment.

Microsoft Excel.

Language list

Name	Group	Language	Semester	Turn
(SEM) Seminars	21	Catalan/Spanish	first semester	afternoon
(SEM) Seminars	22	Catalan/Spanish	first semester	afternoon
(SEM) Seminars	23	Spanish	first semester	afternoon
(TE) Theory	11	Catalan/Spanish	first semester	afternoon