

**Fundamentals of Engineering**

Code: 103818  
ECTS Credits: 6

Degree	Type	Year	Semester
2501233 Aeronautical Management	OB	1	1

**Contact**

Name: Romualdo Moreno Ortiz  
Email: Romualdo.Moreno@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

**Teachers**

Ernesto Emmanuel Santana Cruz

**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: Brief introduction to project management

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

#### Topic 6: Design based on models

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

#### Topic 7: 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 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

## **Methodology**

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
<hr/>		
Directed		
	Classes of Theory / problems	22
	Sessions for introduction of tools	8
	Conferences	6
	Sessions of project presentation	4
	Exam	2
<hr/>		
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.

## Activities

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, 4, 3, 6, 5, 11, 12, 8, 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, 6, 5, 11, 12
Type: Supervised			
Individual tutorials	4	0.16	4, 5, 15
Project monitoring sessions	18	0.72	1, 4, 6, 5, 10, 7, 11, 12, 13, 14
Type: Autonomous			
Problem solving	22	0.88	2, 6, 5, 10, 11, 12, 8, 13, 15
Project development	46	1.84	1, 4, 6, 5, 10, 7, 11, 12, 13, 14

## Assessment

$$\text{FINAL GRADE} = \text{CE}_1 \times 0,4 + \text{CE}_2 \times 0,4 + \text{CE}_3 \times 0,2$$

CE1: Grade of the exam.

CE2: Final grade of the project (development).

CE3: Final grade of the project (memory and presentation).

If any component of the evaluation (CE) has a final value less than 4, the qualification will be Suspended and the numerical note will correspond to the weighted average of the components with value less than 4.

Not submitted and With Honors:

- The Not submitted qualification will only be obtained if no evaluable item is delivered.
- With Honors. Granting a With Honors qualification is a decision of the faculty responsible for the subject. The regulations of the UAB indicate that WH can only be awarded to students who have obtained a final grade equal to or greater than 9.00. It can be granted up to 5% of WH of the total number of students enrolled.

Recovery:

In general, (for academic norms of the UAB), the student can submit to the recovery whenever it has been presented to a set of activities that represent a minimum of two thirds of the total.

In particular:

- If during the normal period of completion of the project the qualification was suspended, the team will be able to correct the errors detected, during the recovery period of the subject. In this case, the maximum final grade of the project that can be obtained is 8.
- Regarding the written exam, there is a re-assessment exam for students who have suspended the examination of the regular call. Under the academic regulations of the UAB, mentioned in the introductory paragraph of this section, a student who did not show up for the exam in the regular session is not entitled to the re-assessment examination.

Repeating students:

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

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exam	40%	2	0.08	2, 4, 6, 5, 10, 11, 12, 8, 13, 15
Project: development	40%	0	0	2, 1, 4, 6, 5, 10, 7, 11, 12, 13, 14
Project: memory and presentation	20%	0	0	3, 9, 10

## **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.