Universitat Autònoma de Barcelona

2020/2021

Engineering Fundamentals

Code: 103812
ECTS Credits: 6

Degree	Type	Year	Semester
2500897 Chemical Engineering	OB	1	2

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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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

Francesc Serra Graells
Vanessa Moreno Font

Prerequisites

No official requirements are defined for this course.

Objectives and Contextualisation

This course is scheduled for the first year and the second semester of the degree.

The general aim of this course is to show the student what it means to be an engineer, beyond the technical know-how of each engineering field. In particular, the course will focus on the way of rational thinking, facing new problems, organizing work and projects so the student can apply it successfully to face their studies.

The course is fundamentally practical. Taking as a basis the team work, it is sought that the student confronts and solves for the first time with the help and supervision of the teachers a series of topics to deal in their professional life: reading articles in English and scientific journals, consulting the state of the art on a topic, writing of patents, selecting sources of information, applying heuristic methods to solve problems, organizing human teams, definition of objectives, scheduling of projects and proposals, risk assessment, contingency plans, executive reports, etc.

Competences

- Analyse, evaluate, design and operate the systems or processes, equipment and installations used in chemical engineering in accordance with certain requirements, standards and specifications following the principles of sustainable development.
- Assume the values of professional responsibility and ethics required in chemical engineering.
- Communication

- Develop personal work habits.
- Develop thinking habits.
- Objectively compare and select different technical options for chemical processes.
- Observe ethics and professionalism.
- Work in a team.

Learning Outcomes

1. Assume social, ethical, professional and legal responsibility, if applicable, derived from professional exercise.
2. Communicate efficiently, orally and in writing, knowledge, results and skills, both professionally and to non-expert audiences.
3. Critically evaluate the work done.
4. Detect and respond to ethical conflicts in the management of ones own chemical engineering activities.
5. Develop a capacity for analysis, synthesis and prospection.
6. Develop critical thinking and reasoning
7. Develop independent learning strategies.
8. Develop scientific thinking.
9. Develop systemic thinking.
10. Efficiently use ICT for the communication and transmission of ideas and results.
11. Identify the different phases of a project.
12. Identify the structure and contents of project reports.
13. Identify, manage and resolve conflicts.
14. Make ones own decisions.
15. Manage available time and resources. Work in an organised manner.
16. Organise and determine the necessary human resources to perform different tasks and cater for different needs in a project.
17. Prevent and solve problems.
18. Resolve ethical conflicts arising in cooperative work environments.
19. Respect diversity in ideas, people and situations.
20. Select the adequate methodology to resolve common problems in project development.
21. Show a clear vision of engineering as a profession, performing its inherent tasks and observing social responsibility.
22. Work autonomously.
23. Work cooperatively.

Content

1. Engineering. Science, technology, engineering and society. Skills of an engineer.
2. Historical introduction of Engineering. Fields of specialization and academic environment.
3. Problem solving in Engineering.
4. Concept of system. Modeling of systems.
5. Sources of information sources. Databases. Reliability.
6. Communication in Engineering.
7. Basics of project management.
8. Intellectual property and patents.
9. Engineering associations and legal responsabilities.

Methodology

The teaching methodology followed in this course is based on a series of training activities that require the presence of the student in the classroom or in the laboratory (oriented activities), plus a series of activities to be carried out in groups of 4-5 people under the supervision of the teacher (supervised activities) that must be completed necessarily with a personal work by the student (autonomous activities); all with an eminently practical orientation.

The "Training activities" table specifies the teaching / learning activities. Lectures are given in large groups, while subjects exposed in seminars are discussed within smaller groups. Finally, practical cases are presented to students, who must solve them and return solutions to the teacher.

Along the course, students groups are assigned different practical cases in which they have to face the identification-resolution of problems and the approach of solutions proposals with increasing difficulty. Supported by the teaching team, groups of students must analyze the cases, propose solutions, prepare a report and defend in front of their peers the analysis made and the decisions taken. Both the delivery of exercises in the seminars as well as the reports and the defense of the works has a weight in the final evaluation of the student.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Conferences	4	0.16	7, 5, 6
Lectures	18	0.72	2, 8, 5
Workshops	13	0.52	2, 8, 9, 13, 14, 22
Type: Supervised			
Team working	50	2	1, 2, 9, 5, 4, 10, 15, 12, 11, 13, 16, 17, 18, 20, 23, 22
Tutorial sessions	16	0.64	3, 8, 5, 6, 12, 17
Type: Autonomous			
Individual exercises	6	0.24	3, 7, 5, 6, 15, 22
Self study	37	1.48	15, 13, 14, 17

Assessment

The evaluation of the acquired skills will be done on the basis of the activity developed in lectures (resolution of exercises), and of the reports and presentations of the works perofrmed in teams. Since all these activities are carried out in groups, a individual exam has been included, with a weight in the final mark of 40%, which allows the student's personal assessment. The individual exam consists of a test and a second writing part where students must answer synthetically and accurately some questions about both theoretical and practical topics developed in the course.

The evaluation activities and their weights in the final qualification are specified in the following table. To pass the course it is necessary:

1. Obtain a qualification of more than 3 in activities 1, 2, 3 and 4

2. That the weighted average of the global qualification obtained is 5.

Not gradable: The student will be non-gradable if he/she has not submitted any of the assessment activities 1, 2 and 4.

Review of exams and claims: Together with the publication of the final notes, the students will be able to review the tests on the virtual campus of the course, comment on the note with the teacher and review the final grades. Qualifications of the different evaluation activities. In this context, claims can be made about the final grade that will be evaluated by the responsible professor.

Recovery mechanism for the evaluation of the subject. The evaluation recovery mechanism is linked to evaluation activities 1,2 and 4. Given that activity 3 is a collection of different exercises each with a weight less than 15%, the recovery is not considered of this part as a whole.

- Individual exams will be compensated through a new exam common to all students who have not achieved the minimum grade of 3. The final grade of this activity will be the last exam done.
- With regard to activities 1 and 4, the compensation will consist ofrepeating the exercise presenting a new report taking into account the recommendations made by the professors in the oral presentation. In this case, there will be no oral defense and therefore the score relative to the oral defense is not recoverable.

Second (and later) enrollments: Students who are not enrolled for the first time of the subject and who have submitted for evaluation in previous editions without having passed the course have the option of presenting themselves only to the final exam if and only if in the last assessment they obtained a qualification of activities 1 and 2 equal to or greater than 5. In this case, the final grade of the course will be the qualification obtained in the writing exam, without taking into account any of the qualifications obtained in previous editions. The student will have to apply for this option by communicating it to the responsible professor.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exercise solving.	15%	0	0	8, 9, 7
Problem solving. Report.	20%	2	0.08	3, 9, 7, 10, 12, 17, 22
Project planning. Report and oral presentation.	25%	2	0.08	1, 2, 4, 10, 15, 12, 11, 13, 16, 18, 19, 20, 23
Writing exam.	40%	2	0.08	2, 21, 8, 9, 7, 5, 6, 15, 14

Bibliography

- Brockman, Jay B. *Introduction to engineering: modeling and problem solving*. John Wiley & Sons, Inc., 2009.
- Wright, Paul H. *Introducción a la ingeniería*. Tercera edición. Limusa Wiley, 2004.
- Gómez-Senent, Eliseo y otros. *Introducción a la ingeniería*. Editorial UPV, 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.