UAB
Universitat Autònoma de Barcelona

Separation Processes

Code: 106041
ECTS Credits: 6

2024/2025

Degree	Type	Year
2500897 Chemical Engineering	FB	2

Contact

Name: Laura Prat Baiget

Email: laura.prat@uab.cat

Teaching groups languages

You can view this information at the end of this document.

Prerequisites

The subject does not officially require any prerequisites, but it is assumed that the student has completed and passed the Mathematis of the first year. It is required to have practice in differentiating and integrating one-variable functions.

Objectives and Contextualisation

It is a basic subject that introduces one of the most important mathematical tools for modeling and solving real problems that appear in engineering: vector analysis. At the end of the course, the student:

- will get familiar dealing with functions of several variables and vector fields.

- will be able to deal with curves and surfaces in space and the equations that describe them.

- will understand the meaning of the basic concepts of vector analysis.

- will learn to use the vectorial analysis tools to identify and calculate physical magnitudes.

- will understand the theorems of vectorial analysis and their use in the formulation of some physical theories.

Competences

- Apply relevant knowledge of the basic sciences, such as mathematics, chemistry, physics and biology, and the principles of economics, biochemistry, statistics and material science, to comprehend, describe and resolve typical chemical engineering problems.
- Develop personal work habits.
- Work in a team.

Learning Outcomes

1. Apply the methods and basic concepts of differential and integral calculus of a variable to the description and calculation of magnitudes.
2. Apply the methods for solving differential equations to the analysis of deterministic phenomena.
3. Make one's own decisions.
4. Work cooperatively.

Content

Vector analysis.

1. Vector functions. Curves in space. Tangent and normal vectors.
2. Functions of several variables. Curves and level surfaces. Partial derivatives Gradients and directional derivatives. Chain rule. Tangent planes. Maximum and minimum values.
3. Multiple integration. Double integrals on elementary domains. Iterated integrals. Triple integrals Applications of the double and triple integrals. Change of variables.
4. Line and surface integrals. Vector fields. Rotational and divergence. Integral lines. Theorem of Green. Theorems of Stokes and the Divergence.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problem sessions	15	0.6	1, 2
Theory classes	30	1.2	1, 2
Type: Supervised			
Seminars	5	0.2	1, 2, 3, 4
Type: Autonomous			
Personal study	30	1.2	1, 2, 3
Problem solving	64.5	2.58	1, 2, 3

In the learning process it is fundamental the own work of the student, with the help of the professor.

The hours of class are distributed in:

Theory classes: The teacher introduces the basic concepts corresponding to the subject, showing examples of their application. The student will have to complement the explanations of the professors with the personal study.

Problem sessions: By completing sets of exercises, the comprehension and application of the concepts and tools introduced in the theory class is attained . The student will have lists of problems, a part of which will be solved in the problem classes. Students should work on the remaining ones as part of their autonomous work.

Seminars: to reach a deeper understanding of the subject the students work in group on more practical problems.

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

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Mid-term Exam combining theory and problems	40%	2	0.08	1, 2, 3
Mid-term Exam combining theory and problems	40%	2	0.08	1, 2, 3
Seminar exams	20%	1.5	0.06	1, 2, 3, 4

A continuous assessment is performed based on three controls:

a) Two written tests combining theory and problems, one P1 related to part A, another P2 related to part B.

b) A grade from the seminars.

Submissions in b) are manadatory, with no resit assesment.

If both P1, P2 have been attended, a grade Q1 is generated according to Q1=0,2·S+0,4·(P1+P2). If Q1 is at least 5, the final grade is Q1.

Students with Q1<5 and having submitted b), may attend a resit exam, with grade R.

The final grade Q2 after the resit exam is Q2=0,20·S+màx{0,4·(P1+P2),0,8·R}.

Bibliography

Main:

S. L. Salas, E. Hille. Cálculo de una y varias variables. Ed. Reverté, 1994.

Cálculo Vectorial.J.E. Marsden y A.J.Tromba, Addison Wesley Longman

Software

None is needed.

Language list

Name	Group	Language	Semester	Turn

(PAUL) Classroom practices	211	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	212	Catalan	first semester	morning-mixed
(SEM) Seminars	211	Catalan	first semester	morning-mixed
(SEM) Seminars	212	Catalan	first semester	morning-mixed
(TE) Theory	21	Catalan	first semester	morning-mixed