Universitat Autònoma de Barcelona

2020/2021

Balances in Chemical Engineering

Code: 102405
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

Maria Eugenia Suarez Ojeda
Francisca Blanquez Cano

Prerequisites

Minimum knowledge required to take the subject:
Differential and integral calculus (baccalaureate level)
Linear algebra (baccalaureate level)
It is recommended to take the propedeutic courses if you do not have the required level

Objectives and Contextualisation

The objectives of the course are first of all that the student acquires the basic concepts that are related to carry out an industrial process and then familiarize with the mathematical tools that will be the starting point for the analysis of processes
Most of the course is occupied by the calculations of balances of matter and energy that are most frequently performed by a chemical engineer throughout his professional life.

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.
- Apply scientific method to systems in which chemical, physical or biological transformations are produced both on a microscopic and macroscopic scale.
- Develop personal attitude.
- Develop personal work habits.
- Develop thinking habits.

- Understand and apply the basic principles on which chemical engineering is founded, and more precisely: balances of matter, energy and thermodynamic momentum, phase equilibrium and kinetic chemical equilibrium of the physical processes of matter, energy and momentum transfer, and kinetics of chemical reactions
- Work in a team.

Learning Outcomes

1. Apply and identify basic concepts related with chemical engineering.
2. Apply and identify the macroscopic equilibrium of momentum.
3. Apply and identify velocity equations in molecular transport.
4. Apply scientific method to perform macroscopic balances of matter, energy and momentum.
5. Critically evaluate the work done.
6. Develop a capacity for analysis, synthesis and prospection.
7. Develop critical thinking and reasoning
8. Develop curiosity and creativity.
9. Develop independent learning strategies.
10. Develop scientific thinking.
11. Develop systemic thinking.
12. Identify the fields of application of chemical engineering, its relationship with the chemical industry and its energy implications and environmental repercussions.
13. Identify, analyse and resolve balances of energy in simple chemical processes.
14. Identify, analyse and resolve balances of matter in a stationary or non- stationary state, with or without a chemical reaction, in simple chemical processes.
15. Maintain a proactive and dynamic attitude with regard to ones own professional career, personal growth and continuing education. Have the will to overcome difficulties.
16. Manage available time and resources. Work in an organised manner.
17. Obtain and apply the design equations for ideal isothermal reactors.
18. Work autonomously.
19. Work cooperatively.

Content

Teme 1.-Introduction
The chemical process industry. Definitions: process, unit and system. Operation in discontinuous and continuous. Stationary and non-stationary state

Teme 2.- Macroscopic balance of matter in systems without chemical reaction
2.1 Concept of balance. Total material balance
2.2 Material balance of a single component. Balances of matter in steady state
2.3 Processes with recirculation, purge and bypass currents
2.4 Balances of matter in a non-stationary state

Teme 3.- Macroscopic balance of matter in systems with chemical reaction
3.1 Estequimetry. Degree of conversion Other parameters: reactive limitant, performance and selectivity
3.2 Application of material balances to processes with chemical reaction
3.3 Reaction rate. Dependence on concentration and temperature
3.4 Ideal reactors: obtaining the design equations for ideal isothermal reactors

Teme4.- Macroscopic balance of energy
4.1 Total energy balance. Energy associated with the mass and not associated
4.2 Steady-state energy balance
4.3 Energy balance in a non-steady state
4.4 Balance of heat energy

Methodology

The subject is developed through theory classes, problems and seminars.

Theory classes: Classroom classes
Problems classes: Resolution of problems corresponding to the subject. Discussion with the students about the solution strategies and their execution. During the course, homework is proposed to solve the problem.The collection of problems and solutions will be in the Virtual platform available to students.
Seminars: Seminars for the resolution of proposed problems.The problems will be corrected and the qualification will be part of the Problem Note of the subject

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Theoretical lectures	30	1.2	4, 12
problems solving	15	0.6	4
seminars	5	0.2	4
Type: Supervised			
Problem solving and correction	20	0.8	4
Type: Autonomous			
Solving practical exercises	20	0.8	4
study	42	1.68	4, 12
tutories	4	0.16	4

Assessment

1) Continuous evaluation: minimum score of each part to pass the continuous assessment 3/10.
1st partial test: Temes 1 and 2. (40% note).
2nd partial test: Teme 3 and 4. (40% note).

These tests will consist of theory questions and problem solving. For the part of problems you can consult class notes and books, but not solved problems neither of class nor of books of collections of problems.

Work delivered in Seminars: 20% note.

To pass the subject by continuous evaluation, it is necessary that the average of the 2 partial and the note of seminars, according to the percentages indicated is equal to or greater than 5.00 out of 10.

2) Retaking Final test : There will be a final test for those students who have not passed the continuous assessment.

his test will account for 80% of the final grade and 20% of the seminar grade obtained during the course will be maintained.

The student can present himself to the recovery whenever he has submitted to a set of activities that represent at least two thirds of the total grade of the subject and have a minimum score of 3.00 out of 10 in the activities Partial 1, and Partial 2 .

3)to pass the subject a 3/10 note is necessary

4) In no case will exams (evaluation tests) be carried out on daysand times different from those officially published in the Virtual platform by the Responsible Professor or by the Coordination.

5) Important observation: Without prejudice to other disciplinary measures deemed appropriate, and in accordance with current academic regulations, will be scored with a zero the irregularities committed by the student that may lead to a variation of the rating of an evaluation act . Therefore, plagiarizing, copying or allowing an evaluation activity to be copied, or falsifying any evaluation activity will imply suspending with a zero and can not be recovered in the same academic year. If this activity has a minimum associated grade, then the subject will be suspended.

6) qualification review procedure

For each evaluation activity, a place, date and time of revision in which the student can review the activity with the teacher will be indicated. In this context, claims may be made on the activity grade, which will be evaluated by the faculty responsible for the subject. If the student does not appear in this review, this activity will not be reviewed later.

7) Qualifications

Honor plates. Granting a grade of honor registration is the decision of the faculty responsible for the subject. The regulations of the UAB indicate that MH can only be granted to students who have obtained a final grade equal to or greater than 9.00. You can grant up to 5% of MH of the total number of students enrolled.

A student will be considered not evaluable (NA) if he has not been presented in a set of activities the weight of which equals a minimum of two thirds of the total grade of the subject.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
1st partial test	40% note	4	0.16	4, 1, 5, 10, 11, 9, 6, 7, 16, 12, 14, 18
2nd partial test	40% note	4	0.16	4, 1, 2, 3, 5, 10, 11, 9, 6, 8, 7, 16, 13, 14, 17, 18
Retaking Final test	80% note	6	0.24	4, 1, 2, 3, 5, 10, 11, 6, 7, 16, 12, 13, 14, 17, 18
Seminar problems	20% note	0	0	4, 5, 9, 16, 13, 14, 15, 17, 19, 18

Bibliography

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HIMMELBLAU, D. M., (1997), ***Principios Básicos y Cálculos en Ingenieria Química (2a ed.)***, Prentice Hall.

FELDER R.M. I ROUSSEAU R.W., (1991), ***Principios Elementales de los Procesos Químicos, (2a ed.),*** Addison-Wesley Iberoamericana.

FOGLER, H.S., (1998), ***Elements of Chemical Reaction Engineering, (3ª ed.),*** Prentice-Hall.

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