Universitat Autònoma de Barcelona

2023/2024

Basic Environmental Engineering

Code: 102819
ECTS Credits: 6

Degree	Type	Year	Semester
2501915 Environmental Sciences	OB	3	2

Contact

Name: Adriana Artola Casacuberta

Email: adriana.artola@uab.cat

Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject.
Please note that this information is provisional until 30 November 2023.

Teachers

Adriana Artola Casacuberta

Xavier Font Segura

Raquel Barrena Gomez

Prerequisites

Students must be able to work in solving equations, chemical formulation, stoichiometry, to find out molecular weight of elements, calculate number of moles, and conversion from one system of units to another.

Objectives and Contextualisation

To understand some relevant environmental engineering processes analyzing unit operations involved.
To perform mass and energy balances in environmental systems.

To understand the usefulness of matter and energy balances in the field of Environmental Sciences.

To apply the concept of "ideal reactor" in environmental engineering.
To understand the basic principles that underlie the most relevant biological treatments in environmental engineering.

Competences

- Adequately convey information verbally, written and graphic, including the use of new communication and information technologies.
- Analyze and use information critically.
- Demonstrate adequate knowledge and use the most relevant environmental tools and concepts of biology, geology, chemistry, physics and chemical engineering.
- Demonstrate concern for quality and praxis.
- Demonstrate initiative and adapt to new situations and problems.
- Information from texts written in foreign languages.
- Learn and apply in practice the knowledge acquired and to solve problems.
- Teaming developing personal values regarding social skills and teamwork.
- Work autonomously

Learning Outcomes

1. Adequately convey information verbally, written and graphic, including the use of new communication and information technologies.
2. Analyze and use information critically.
3. Apply relevant knowledge of basic sciences to enable compression, the description and the solution of typical problems of environmental engineering.
4. Apply the basic principles on which is based environmental engineering and, more specifically, mass and energy balances.
5. Demonstrate concern for quality and praxis.
6. Demonstrate initiative and adapt to new situations and problems.
7. Distinguish different operations of reaction, separation, processing and transportation of materials and circulation of fluids in industrial processes involved in environmental engineering.
8. Information from texts written in foreign languages.
9. Learn and apply in practice the knowledge acquired and to solve problems.
10. Teaming developing personal values regarding social skills and teamwork.
11. Work autonomously

Content

1. INTRODUCTION TO ENVIRONMENTAL ENGINEERING
Principles. Unit operations. Continuous and discontinuous operations. Steady and unsteady state. Type of reactors.

2. MASS BALANCES APPLIED IN SYSTEMS WITHOUT REACTION
Concept of balance. Applicability of balances. Mass balances in systems without reaction under steady state operation. Balances in multiple units systems. Systems with recycle, purge, and bypass flows. Mass balances in systems without reaction operating under unsteady state.

3. MASS BALANCES APPLIED IN SYSTEMS WITH REACTION
Stoichiometry. Measurement of changes in composition. The rate of reaction. Ideal reactors' design equations. Comparison among ideal reactors.

4. ENERGY BALANCES
Forms of energy. The general energy balance. Simplified forms. Energy balance at steady state. Heat energy balance. Mechanical energy balance.

5. BIOLOGICAL PROCESSES IN ENVIRONMENTAL ENGINEERING
Classification of biological processes. Wastewater treatment: activated sludge. Anaerobic digestion. Composting.

Methodology

Theory lessons: presentation of the different topics of the syllabus. Examples of application for these topics are also presented.
Problem classes: resolution of exercises related to the subject. Discussion with the students about the solving strategies and their execution. Some exercices or part of them will be delivered for evaluation.
Seminars: practical application of the basis of environmental engineering on environmental sciences. Some exercices will be proposed to be solved in "exam mode" to be evaluated.

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problems classes: Resolution of problems corresponding to the subject. Discussion with the students about the solution strategies and their execution.	14	0.56	3, 4, 9, 6, 5, 7, 8, 10
Seminars	4	0.16	3, 4, 9, 6, 5, 7, 10
Theory classes	28	1.12	2, 3, 4, 6, 5, 7, 8, 1, 11
Type: Autonomous			
Autonomous learning	60	2.4	2, 3, 4, 9, 6, 7, 8, 1, 11
Collaborative learning	38	1.52	2, 3, 4, 9, 6, 7, 8, 10

Assessment

The subject consists of the following evaluation activities:

- Two partial exams including theory and exercices (40% each exam)

- Delivery exercices to be solved during the problems' classes and seminars or out of the classes (20%).

Non-participation in any of the specific tests will be assessed with a zero.

For a student to pass the subject through continuous assessment it is necessary to obtain a minimum weighted grade of 5 in the global of the subject. To be able to make a weighted average between the delivery of problems and the grade of the partial tests, a minimum average grade of 4 out of 10 of the partial tests will be required with a minimum mark of 2 for each of the partial tests.

If grade 5 is not achevieved globally, the student may undergo a resit exam only if he/she has been previously evaluated in a set of activities that represent a minimum of two thirds of the total qualification of the subject. In this case, exercices delivering mark remains unchanged.

For each evaluation activity, a place, date and time of revision will be set. There will not be further revision opportunities for students not attending the revision.

Following UAB regulations, students with a grade of 9.0 or higher in a subject may be qualified by an Honors degree. The number of Honors degrees awarded to students cannot be higher than 5% of the total number of students enrolled in a subject.

A student will be considered non-evaluable (NA) if he/she has not undertaken some of the partial exams or the recovery exam.

Without prejudice to other disciplinary measures, and in accordance with current academic regulations, any irregularities committed by the student that could lead to a variation of the score of an evaluation act will be marked with a zero. Therefore, copying or allowing to copy in an evaluation activity will imply a zero (0).

Students coursing the subject for a second or third year must undergo the above listed evaluationactivities.

Unique assessment

Students who have accepted the single assessment modality must take a final synthesis test on the date marked in the exam calendar as the second exam. This test will consist of a theory part (30% of the mark) and a problem part (70% of the mark). If the final grade does not reach 5, the student has another chance to pass the subject by means of the resit exam (on the date marked for the make-up exam of the subject).

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Delivery of solved problems	20%	0	0	2, 3, 4, 9, 6, 11, 10
First exam	40 %	3	0.12	4, 9, 6, 5, 7, 8, 10
Second exam	40%	3	0.12	2, 3, 4, 6, 5, 7, 8, 1, 11

Bibliography

- Aucejo, A. i col. (1999) "Introducció a l'Enginyeria Química" Pòrtic. Biblioteca Universitària. Ed. Enciclopèdia Catalana.
- Bouzas i col. (2007). Bases d'Enginyeria Ambiental. Editorial Universitat de València. Versió en línia, Biblioteques UAB.
- Izquierdo J.F. i col. (2011). Introducción a la Ingeniería Química. Problemas resueltos de Balances de Materia y Energía. Editorial Reverté.
- Davis M.L., Cornwell D.A. (1991) "Introduction to Environmental Engineering". McGraw-Hill,
- Reklaitis G.V. (1986) "Balances de materia y energía". Ed. Interamericana
- Himmelblau D. (1997) "Principios básicos y cálculos en Ingeniería Química". Prentice-Hall Hispanoaméricana
- Peavy H.S., Rowe D.R., Tchobanoglous G. (1985) "Environmental Engineering". McGraw-Hill,
- Costa, J. i col. (1991) "Química Técnica : Introducción a los Procesos, las Operaciones Unitarias y los Fenómenos de Transporte en Ingenieria Química". Ed. Reverté.(versió electrònica biblioteca UAB)
- Stephenson, T. (2002) "Process Science and Engineering for Water and Wastewater Treatment" IWA Publishing
- Mihelcic J.R. (2001) "Fundamentos de ingeniería ambiental". Limusa Wiley.

- Masters, G.M., Elia, W.P. (2007) "Introducción a la Ingeniería Medioambiental". Prentice-Hall International, Inc.

Software

No specific software is recommended.