Universitat Autònoma de Barcelona

2020/2021

Environmental Engineering

Code: 102415
ECTS Credits: 6

Degree	Type	Year	Semester
2500897 Chemical Engineering	OB	3	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

Name: Francisca Blanquez Cano
Email: Paqui.Blanquez@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

Prerequisites

There are no prerequisites for studying Environmental Engineering

Objectives and Contextualisation

The general objective of this subject is to introduce students to the environmental problems, their management and the technical and methodological solutions to minimize them. With this objective, different methodologies to prevent and reduce the generation of the environmental impacts caused by the human activities and the main technologies of treatment of waters, emissions and waste will be studied.

At the end of the course the student must be able to:

Explain the concept of environmental pollution and its impact on the environment,
Explain and use basic methodologies of environmental prevention,
Recognize and describe the main pollutants and the analytical parameters used to measure them, as well as their effects on the environment,
Interpret a residual water analysis and propose a logical combination of treatment operations to purify and / or reuse it,
Interpret an analytic of an emission into the atmosphere and propose a logical combination of treatment operations to debug it,
Describe the operation, characteristics and scientific bases of treatment operations and facilities for water treatment, water purification, waste treatment and emissons treatment.

Competences

- Analyze different types of waste and identify possible ways of transformation Demonstrate knowledge about recovery and processing of raw materials and energy resources have
- Apply ones knowledge when performing measurements, calculations, estimations, evaluations, assessments, studies, reports and other similar tasks.
- Communication
- Develop personal work habits.
- Develop thinking habits.

- Show an understanding of the role of chemical engineering in the prevention and resolution of environmental and energy problems, in accordance with the principles of sustainable development.

Learning Outcomes

1. Analyse and evaluate processes in observance of sustainability criteria.
2. Analyse the meaning of environmental parameters.
3. Analyze different types of waste and identify possible ways of transformation and recovery.
4. Apply environmental and technological risk the evaluation procedures.
5. Apply environmental management systems and tools.
6. Communicate efficiently, orally and in writing, knowledge, results and skills, both professionally and to non-expert audiences.
7. Describe the technologies, tools and techniques used in the field of environmental engineering.
8. Develop a capacity for analysis, synthesis and prospection.
9. Develop critical thinking and reasoning
10. Develop scientific thinking.
11. Develop systemic thinking.
12. Enumerate and describe the social factors involved in environmental solutions.
13. Explain the scientific bases applied to environmental engineering.
14. Identify and enunciate environmental problems.
15. Identify the applicable environmental legislation on a local, regional and global scale.
16. List and describe the different energy resources offered by a given system.
17. Prevent and solve problems.
18. Produce environmental evaluation reports on processes and activities while applying tools such as environmental impact and lifecycle assessments.
19. Propose a logical sequence of technologies applicable to the resolution of an environmental problem.
20. Work autonomously.

Content

THEME1.- Introduction

Concept of contamination and contaminant
Cycles of matter and pollution
The role of the Chemical Engineer in sustainable development
The hierarchy in waste management
The social control of pollution
The environmental legal framework

THEME 2.- Tools for minimization

Introduction
Green Engineering
Methodologies to measure and improve the sustainability of processes (LCA, Green Chemistry, ...)

THEME 3.- Quality parameters and legislation

Water
Emissions into the atmosphere
Waste

THEME 4.- Treatment and water purification

Generation, quality and management
Physical treatments
Sedimentation processes
Filtration processes

Adsorption
Reverse osmosis
Chemical treatments
Coagulation and flocculation
Metal removal
Disinfection
Biological treatments
Aerobic processes
Anaerobic processes

THEME 5.- Waste Treatment

Industrial waste and urban waste. Quality parameters and legislation
Anaerobic digestion
Composting
Pre and Post-treatments in the treatment of urban waste

THEME 6.- Treatment of emissions into the atmosphere

Particle removal operations
Sedimentation chamber
Cyclones
Filter of hoses
Gas washers
Electrofiltre
Operations for the elimination of gaseous pollutants
Absorption
Adsorption
Biofiltration

Methodology

Theoretical lectures and cases resolution: The student acquires their own knowledge of the subject attending theoretical lectures and cases resolution, complementing them with the individual study of the topics explained. Apart from theory classes, there will also be sessions of case studies resolution.

Technical visits (if the budget allows): They will be an additional tool for reviewing and consolidating the work done in theoretical classes.

Autonomous and collaborative study and resolution of cases: These are autonomous activities that will serve the student to consolidate the knowledge acquired in the theoretical activities and develop the corresponding competences. the contents of this material will be evaluated to the examinations of the subject.

Group homework: Students will carry out a group homework on topics that the teacher will propose. The works will be part of the subject.

Schedule of attention to the students

The attention will be held after class or during a scheduled time between the student and the teacher.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Technical visits	6	0.24	2, 8, 13, 14, 19
Theoretical lectures and cases resolution	42	1.68	2, 1, 4, 5, 6, 7, 10, 11, 8, 9, 18, 12, 13, 14, 15, 17, 19, 20
Type: Autonomous			
Homework	10	0.4	6, 10, 11, 8, 9, 17, 20
Resolution of practical exercises and study	84	3.36	2, 1, 4, 5, 6, 7, 10, 11, 8, 9, 18, 12, 13, 14, 15, 17, 19, 20

Assessment

A) Continuous evaluation

The evaluation of the subject will be based on three evaluation activities. These activities will consist of two partial exams, and a group work.

- The first partial exam will include the themes opics 1, 2 and 3, will be done in class period. This partial will contribute 40% in the final mark of the subject.
- The second partial exam will include the themes 4, 5, and 6 and the date will be fixed in the calendar of exams of the degree. In this partial exam may include content already evaluated in the previous partial. This partial exam will contribute 45% in the final mark of the subject.
- Group work: A group work will be carried out, with a weight of 15% on the final mark of the subject. The topics of the works will be proposed by the professor and will form part of the agenda to be evaluated in the partial ones.

The content that will be evaluated in the 1st and 2nd partial exams will correspond both to the content explained in class and in the material corresponding to the work done by all the groups, which will be posted in the Moodle Classroom.

B) Recovery test:

The student can apply for recovery whenever he has submitted to a set of activities that represent at least two thirds of the total mark of the subject. Of these, students who have an average of all the activities of the subject with a score higher than 3.5 out of 10 may be presented to the recovery.

The recovery test will be divided into two parts. One corresponding to themes 1,2, and 3 and the otherto themes 4, 5 and 6. In both cases the material prepared in group works will be included. The date of this test will be fixed in the calendar of exams of the degree.

The final mark of the subject will be calculated in the same way as in the continuous evaluation.

C) Procedure for the revision of the qualifications:

For each assessment activity, a place, date and time of revision will be indicated in which the student will be able to review the activity with the teacher. In this context, claims can be made about the activity note, which will be evaluated by the teachers responsible for the subject. If the student does not submit to this review, this activity will not be reviewed later.

D) Qualifications:

The MH qualification is a decision of the lecturers responsible for the subject. The regulations of the UAB indicate that MH can only be awarded to students who have obtained a final grade of 9.00 or more. It can be granted up to 5% of MH of the total students enrolled.

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

E) Irregularities by the student, copy and plagiarism:

without prejudice to other disciplinary measures considered appropriate, the irregularities committed by the student that can lead to a variation in the rating of an evaluation act will be qualified with a zero. Therefore,copying, plagiarizing, cheating, copying, etc. in any of the assessment activities it will imply suspending it with a zero. Assessment activities qualified in this way and by this procedure will not be recoverable. If it is necessary to pass any of these assessment activities to pass the subject, this subject will be suspended directly, without opportunity to retake it in the samecourse.

F) Group work

The topic of the work can be chosen from a list proposed by the teacher.
There will be two work delivery dates. Depending on the subject of the work, one of the delivery dates will be one week before the first partial and the second date will be one week before the end of the classes.

The works will be posted in the Moodle Classroom and will be part of the evaluation of the subject both in the 1st and 2nd partials as well as the recovery test.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
First partial exam	40%	2	0.08	3, 2, 4, 5, 6, 10, 11, 8, 9, 18, 16, 12, 14, 15, 17, 20
Group work	15%	0	0	6, 10, 11, 8, 9, 17
Recovery test	85%	4	0.16	3, 2, 1, 4, 5, 6, 7, 10, 11, 8, 9, 18, 16, 12, 13, 14, 15, 17, 19, 20
second partial exam	45%	2	0.08	3, 2, 1, 6, 7, 10, 11, 8, 9, 16, 13, 14, 15, 17, 19, 20

Bibliography

- Metcalf & Eddy. Ingenieria de aguas residuales. Tratamiento vertido i reutilización. McGraw Hill Inc. 1998
- Peavy, H.S., Rowe, D.R., Tchobanoglous, G. Environmental Engineering. McGraw Hill Inc. 1985.
- Ramalho, R.S. Tratamiento de aguas residuales. Reverté, 1993
- Standard Methods for the examination of water and waste water. APAA-AWWA-WPCF Washington 1998 20ª Edició.
- Hernández Muñoz, A. Manual de depuración Uralita. Editorial Paraninfo. 1996
- Dullien, F.A.L. Introduction to industrial gas cleaning. Academic Press, Inc. 1989.
- Wark, K., Warner, C.F. Contaminación del aire. Origen y control. Ed. Limisa. 1998.
- Theodore, L., Buonicore, A. Air pollution control equipment. Selection, design, operation and maintenance. Springer-Verlag. 1994.
- Seinfeld, J.H., Atmospheric Chemistry and Physics of Air Pollution. Ed. Jhon Wiley and Sons. 1986.
- Tchobanoglous, G., Theisen, H., Vigial, S.A. Gestión integral de residus sólidos. McGraw Hill Inc. 1996

- Nemerow, N.L., Dasgupta, A. Tratamiento de vertidos Industriales y peligrosos. Ediciones Díaz de Santos. 1998.
- Alfayate Blanco, J.M., Orozco Barrenetxea, C. Contaminación ambiental. Una visión desde la química. Ed. Paraninfo. 2002. ISBN 9788497321785