VNIVERSITAT DE VALÈNCIA

Course Guide
33116 Treatment of emissions and residues

COURSE DATA

Data Subject	
Code	33116
Name	Treatment of emissions and residues
Cycle	Grade
ECTS Credits	6.0
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
1104 - Degree in Environmental Sciences	Faculty of Biological Sciences	4	First term

Subject-matter

Degree	Subject-matter	Character
1104 - Degree in Environmental Sciences	184 - Emissions and waste treatment	Optional

Coordination

Name	Department
GIMENEZ GARCIA, JUAN BAUTISTA	245 - Chemical Engineering

SUMMARY

The subject Emissions and Waste Treatment is a subject that is taught on an optional basis in the first quarter of the fourth
year of the Degree in Environmental Science from the University of Valencia. This course consists of 6 ECTS credits and is integrated into the module Elective Courses within the thematic block "Environmental Management and Technology."

The subject is presented as a complement of the subject Pollution Control Technologies and aims to deepen knowledge for pre-design and operation of key technologies to provide solutions to environmental problems. The course addresses in a comprehensive and integrated way the various control systems related to wastewater treatment, waste management and treatment, treatment of contaminated soils and treatment of air emissions.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Have taken the subject Pollution Control Technologies.

OUTCOMES

1104 - Degree in Environmental Sciences

- Capacidad de utilizar instrumentos de prevención y control contaminación: autorización ambiental integrada y comercio de derechos de emisión.
- Capacidad de aplicar los procedimientos de análisis y diagnóstico medioambiental en los procesos de producción y evaluar las estrategias de minimización y producción limpia.
- Conocer y saber aplicar los criterios de diseño y operación de los diferentes tratamientos aplicables a emisiones al aire, vertidos y residuos.

LEARNING OUTCOMES

- To know the engineering principles associated with technologies for pollution control.
- To know how to apply the technical constraints of the legal regulations associated with pollution control in the face of management and treatment of emissions and waste.
- To assess potential applicable wastewater treatments according to their characteristics and their subsequent use.
- To select alternative configurations to establish wastewater treatment plants and know the principles for design.
- To understand the principles of waste management and treatment.
- To evaluate, select and design waste treatment alternatives based on waste characteristics.
- To know the techniques for contaminated soil treatment and to know how to select the most appropriate technique depending on the origin and type of contamination.
- To set the appropriate process configurations for air pollution control.
- To understandthe design principles of the key technologies for the treatment of air emissions.
- To become familiar with specialized reference sources for finding, selecting and understanding the information.
- To analyze critically the results obtained in the practical applications raised.

DESCRIPTION OF CONTENTS

1. Wastewater treatment

Unit 1. Wastewater characterization: Flow, composition of the pollutants of interest for the WWTP.
Unit 2. Pretreatment and primary treatment: Design and operation of screening, grit and grease removal, equaslisation, physical-chemical and primary sedimentation treatments.
Unit 3. Secondary treatment: Design and operation of activated sludge systems.
Unit 4. Tertiary treatment: Design and operation of precipitation/physical-chemical, filtration and disinfection by UV radiation treatments.
Unit 5. Sludge treatment: Design and operation of the thickened sludge, aerobic and anaerobic digestion and dewatering treatments.
Unit 6. Sustainable management of wastewater treatment plants: Energy consumption and sludge production minimising.

2. Urban waste management

Unit 7. Collection, transfer and transport of municipal solid waste.
Unit 8. Recovery of the organic fraction of waste: Composting. Design and operating criteria.
Unit 9. Valuation of the combustible fraction of waste: Incineration. Design and operating criteria.
Unit 10. Landfills: Methods and operating criteria. Recovery and subsequent use of landfills.

3. Air pollution control

Unit 11. Particle control: Design and operation criteria of cyclones, fabric filters and electrostatic precipitators.
Unit 12. Acid gas control: Design and operation criteria to minimize and treat sulfur and nitrogen oxides emissions.
Unit 13. Control of other pollutants: Design and operation criteria to minimize and treat carbon monoxide, hydrocarbons, dioxins and furans, and VOCs emissions.

4. Management and treatment of contaminated soils

Unit 14. Exploration of potentially contaminated soils: Sampling and site characterization. Intervention, control and monitoring.
Unit 15. Systems for treatment and recovery of contaminated soils: Classification. Principles of operation.
Unit 16. Evaluation and selection of treatment alternatives: Technical and economic considerations.

5. Laboratory of emissions and waste treatment

Practice 1. Determination of kinetic and stoichiometric parameters of a wastewater treatment biological process. Off-line calibration using respirometric techniques, determination of the kinetics of the process.
Practice 2. Study of the contamination / decontamination of a soil.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	36,00	100
Classroom practices	10,00	100
Computer classroom practice	6,00	100
Laboratory practices	5,00	100
Tutorials	3,00	100
Development of group work	15,00	0
Study and independent work	30,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	15,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The methodology used in the course will consider the following aspects:

Theory sessions: We offer students an overview of the subject matter and will affect the key concepts to be developed, as well as
resources to be used for further preparation of the subject in depth. Being a subject eminently applied in these sessions will raise practical applications to enhance the assimilation of the concepts introduced.

Practical class sessions: These sessions, first the teacher will conduct a series of problems, each type of content they develop. In addition, students will work similar problems supervised by the teacher. Also propose practical applications for independent study students.

Laboratory practical sessions and computer classroom: The student will perform two laboratory practical sessions of 3.5 hours. The labs are facing pilot unit scale. Students will practice in pairs, integrated teams of 4-8 students depending on the practice to be performed. Each pair in one of the teams will handle a specific aspect related to the operation of the process.

After completing the experimental part will be scheduled two sessions of 2 hours in the computer room to develop the calculations associated with the results obtained in the laboratory. Each session will be an individual questionnaire for each of the practices. Finally, each team shall submit a report that integrates and encompasses all aspects covered in each session.

Attendance at laboratory sessions and classroom computer is a compulsory activity to pass the subject.

Tutorials: Students will be divided into small groups and participate in a mandatory 3 sessions of 60 minutes spread over the semester.
In them, the teacher will clarify concepts and resolve any doubts that may have arisen during the implementation of the proposed problems or work to evaluate.

EVALUATION

The evaluation of the course is based on the following aspects:

1. Continuous assessment.

- Student participation in the teaching-learning process, given regular attendance and classroom activities provided for the resolution
of questions raised in class, individually and / or in small groups. Be valued at 15% of the final grade.

- The resolution of a number of problems or activities that students must solve, individually or in small groups, and deliver on the date indicated. Exercises or activities provided by students will be assessed with 15% of the final grade.

2. Laboratory practice (20% of grade). Be evaluated from the memory of laboratory practice (15%) and individual questionnaires (5%).

3. Test objective: The student must perform at the end of the semester a single objective test consisting of a test that will be valued at 50% of the final grade. This examination includes theoretical and practical issues and is intended to confirm that they have assimilated the
basic concepts of the subject.

The subject is considered exceeded when the weighted average grade is equal to or greater than 5 (out of 10), provided that in the objective test to obtain a grade equal to or greater than 4 (out of 10).

To apply for advance examination of this subject, students should be aware that they are required to fulfil all the mandatory activities outlined in this guide.

REFERENCES

Basic

- Mackenzie, L.D. (2010) Water and Wastewater Engineering. McGraw-Hill, New York.
- Metcalf & Eddy (2003) Wastewater Engineering. Treatment and Reuse, 4ª Ed., McGraw-Hill, New York.
- Tchobanoglous, G., Theisen, H., Vigil, S.A. (1996) Gestión Integral de Residuos Sólidos. McGraw-Hill Interamericana de España, Madrid.
- Castells, X.E. (2005) Tratamiento y valorización energética de residuos. Díaz de Santos, Madrid.
- Mirsal, I.A. (2008) Soil Pollution. Origin, Monitoring & Remediation. 2ª ed., Springer-Verlag Berlin, Heidelberg.
- de Nevers, N. (1998) Ingeniería de Control de la Contaminación del Aire. McGraw-Hill Interamericana, México.
- Bouzas, A., Penya-roja, J.M., Seco, A. Depuración de Aguas. Servei de Publicacions de la Universitat de València, Valencia, 2009.

Additional

- Kiely, G. (1999) Ingeniería Ambiental, Fundamentos, entornos, tecnologías y sistemas de gestión. McGraw-Hill Interamericana de España, Madrid.
- Process Science and Engineering for Water and Wastewater Treatment (2002) IWA (IWA Publishing), London
- Leslie Grady Jr. C.P.,. Daigger G.T., Lim, H.C.. (1999) Biological Wastewater Treatment. Marcel Dekker, Inc. New York.
- Crittenden, J.C. (2005) Water treatment: Principles and design. Wiley, New Jersey.
- Castells, X. E. (2009) Reciclaje de residuos industriales: residuos sólidos urbanos y fangos de depuradora. Díaz de Santos, Madrid
- Lagrega, M.D., Buckingham, P.L. y Evans, J.C. Gestión de Residuos Tóxicos. (1996) Tratamiento, eliminación y recuperación de suelos. (McGraw-Hill)
- Wang, L.K., Pereira, N.C., Hung, Y. (2004) Air pollution control engineering. Humana Press, Totowa

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

English version is not available

1. Contenidos

Se mantienen los contenidos previstos en la guía docente.

2. Volumen de trabajo y planificación temporal de la docencia

No se modifica el volumen de trabajo previsto. Las sesiones teóricas y de problemas se mantendrán según lo previsto realizándose de manera presencial/semipresencial o totalmente por teleconferencia síncrona o asíncrona, según las necesidades del momento lo determinen.

Las prácticas de laboratorio también se mantienen según lo previsto garantizando las medidas higiénico-sanitarias.

3. Metodología docente

La docencia no presencial de las clases se realizará por Videoconferencia síncrona (a través de la herramienta Teams de Microsoft 365 o Blackboard Collaborate):

- En las sesiones de TEORÍA los estudiantes dispondrán de las transparencias de Powerpoint y apuntes previamente colgados en Aula Virtual. Los estudiantes trabajarán los contenidos de cada sesión de teoría de forma individual y en las sesiones el profesor revisará los conceptos más importantes y las dudas que los estudiantes planteen.

- En las clases PRÁCTICAS, se resolverán los problemas planteados mediante el uso de One Note o de la pizarra virtual de Blackboard Collaborate y posteriormente se dejará el problema resuelto disponible para el alumno bien en One Note o en Aula Virtual.

4. Evaluación

La evaluación del aprendizaje por parte del estudiante se llevará a cabo mediante una evaluación continuada y una evaluación final según lo previsto en la guía docente.

5. Bibliografía

La bibliografía prevista en la guía docente se complementará con las transparencias y clases grabadas que se suban al Aula Virtual o a Microsoft Stream de la UV.