DEGREE CURRICULUM

ENVIRONMENTAL ENGINEERING

Coordination: RAMOS MARTIN, MARIA CONCEPCION

Academic year 2022-23

ENVIRONMENTAL ENGINEERING 2022-23

Subject's general information

<table>
<tr><td>Subject name</td><td>ENVIRONMENTAL ENGINEERING</td></tr>
<tr><td>Code</td><td>102594</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
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<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Agricultural and Food Engineering</td><td>4</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
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<tr><th>Activity type</th><th>PRACAMP</th><th>PRAULA</th><th>TEORIA</th></tr>
<tr><th>Number of credits</th><td>0.4</td><td>2.8</td><td>2.8</td></tr>
<tr><th>Number of groups</th><td>1</td><td>1</td><td>1</td></tr>
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<tr><td>Coordination</td><td>RAMOS MARTIN, MARIA CONCEPCION</td></tr>
<tr><td>Department</td><td>ENVIRONMENT AND SOIL SCIENCES</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>40% classes
60% personal work</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan 75%
Spanish: 25%</td></tr>
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Distribution of credits	1. Introduction. Concept of waste and impact. European environmental legislative policy and principles. General strategy for waste management and treatment. Waste sorting. Waste minimization at source. Regulations that regulate them more directly: "IPPC" Directive, "Nitrates" Directive, "Landfill" Directive, "Sludge" Directive, Royal Decree on "Contaminated Soils". Application of organic by-products and sewage sludge in the soil.1.2c 2. Description and characterization of the residues and pollutants that are generated in the agricultural and agri-food activity-0.6c 3. Treatment of gaseous emissions: pollutants and particles 0.8c 4. Physical and physical-chemical processes of wastewater treatment. Pretreatments: roughing; homogenization and regulation of flows; sedimentation and flotation: type of sedimentation and dynamics of the particles in a liquid medium; filtration; floatation. Coagulation and flocculation.1.c 5. Reactor analysis. Biological processes of wastewater treatment. Kinetic and stoichiometric expressions. Environmental and control parameters0.6c 6. Fundamentals of process engineering: Mass conservation, continuity equation, reaction kinetics.1c 6.1. Microbiomass systems suspended. Suspended Biomass Active sludge Equations of matter balance. Sizing parameters. Oxygen requirements in aerobic systems 6.2. Fixed microbiomass systems. Biofilms Definition and characteristics Biofilm Kinetics Reactor kinetics based on biofilm maintenance. Percolating filters, biodisks and submerged filters 6.3. Lagoon and green filters 7. The anaerobic digestion process 0.2c 8. The composting process 0.2c 9. Tertiary wastewater treatments 0.2c 10. Controlled deposits.0.4c

ENVIRONMENTAL ENGINEERING 2022-23

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
COLLADO SANTOLARIA, NOEMI	noemi.collado@udl.cat	,6	
ESTARAN JUSTRIBO, CARLOS	carlos.estaran@udl.cat	3,8	
RAMOS MARTIN, MARIA CONCEPCION	mariaconcepcion.ramos@udl.cat	1,6	

Learning objectives

The objective of the subject is that the student acquires the knowledge that allows him to defend with technical arguments an option of action (management and treatment) at the time of managing and treating waste of the agricultural and agri-food activity.

Competences

Basic skills

CB1. That students have demonstrated and understand knowledge in an area of study that starts from the basis of general secondary education, and is usually found at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study.

CB2. That students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study

CB3. That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include reflection on relevant social, scientific or ethical issues

CB4 Que los estudiantes puedan transmitir información, ideas, problemas y soluciones a un público tanto especializado como no especializado.

CB5. That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

General skills

CG2. Adequate knowledge of physical problems, technologies, machinery and water and energy supply systems, limits imposed by budgetary factors and construction regulations, and the relationships between facilities or buildings and farms, agri-food industries and spaces related to gardening and landscaping with their social and environmental environment,as well as the need to relate those and that environment with human needs and environmental preservation.

CG5 Ability to write and sign studies on rural development, environmental impact and waste management of agri-food industries, agricultural and livestock farms, and spaces related to gardening and landscaping.

CG7 Knowledge in basic, scientific and technological subjects that allow continuous learning, as well as an ability

to adapt to new situations or changing environments.

CG8 Ability to solve problems with creativity, initiative, methodology and critical reasoning.

CG11 Ability to develop their activities, assuming a social, ethical and environmental commitment in tune with the reality of the human and natural environment.

Subject contents

1. Introduction. Concept of waste and impact. European environmental legislative policy and principles. General strategy for waste management and treatment. Waste sorting. Waste minimization at source. Regulations that regulate them more directly: "IPPC" Directive, "Nitrates" Directive, "Landfill" Directive, "Sludge" Directive, Royal Decree on "Contaminated Soils". Application of organic by-products and sewage sludge in the soil.1.0c

2. Description and characterization of the residues and pollutants that are generated in the agricultural and agri-food activity-0.4c

3. Treatment of gaseous emissions: pollutants and particles 0.8c

4. Physical and physical-chemical processes of wastewater treatment. Pretreatments: roughing; homogenization and regulation of flows; sedimentation and flotation: type of sedimentation and dynamics of the particles in a liquid medium; filtration; floatation. Coagulation and flocculation.1.2.c

5. Reactor analysis. Biological processes of wastewater treatment. Kinetic and stoichiometric expressions. Environmental and control parameters 0.6c

6. Fundamentals of process engineering: Mass conservation, continuity equation, reaction kinetics.1.0c

6.1. Microbiomass systems suspended. Suspended Biomass Active sludge Equations of matter balance. Sizing parameters. Oxygen requirements in aerobic systems

6.2. Fixed microbiomass systems. Biofilms Definition and characteristics Biofilm Kinetics Reactor kinetics based on biofilm maintenance. Percolating filters, biodisks and submerged filters

6.3. Lagoon and green filters

7. The anaerobic digestion process 0.2c

8. The composting process 0.2c

9. Tertiary wastewater treatments 0.2c

10. Controlled deposits.0.4c

Practical activities

Classroom practices (problems and cases) .Resolution of cases and problems on various aspects of the calculation of sizing different treatment processes.

Work: Personal work consisting of describing the quantities and characteristics of waste generated in a real agri-food industry and in proposing with calculations and arguments the most appropriate form of management and treatment.

Visit: Visit to a waste treatment plant or station.

Methodology

Methodological axes of the subject

Type of activity	Description	Student face-to-face activity		Student non-face-to-face activity		Assessment	Total time
		Objetives	Time (h)	Student work	Time (h)	Time(h)	Hours/ECTS
Master class	Master class (Classroom. Large group)	Explanation of the main concepts	38	Study: to know, understand and synthesize knowledge	40	0.5	78.5h/3.14
Problems and study cases	Participatory (Classroom. Large group)	Study case and problem resolution	16	Learn to solve problems and casess	20	0.5	36.5h/1.46
Visit	Visit to a plant	On-site knowledge of process lines	4	Report on each visit	2		6h/0.24
Supervised activities	Student work	Drafting the calculation of a treatment facility		Compose a report	28	1	29h/1.16
Total			58		90	2	150/6

Observations 25 hours of total activity per ECTS credit have been considered.

Development plan

Methodological axes of the subject

Type of activity	Description	Student face-to-face activity		Student non-face-to-face activity		Assessment	Total time
		Objetives	Time (h)	Student work	Time (h)	Time(h)	Hours/ECTS
Master class	Master class (Classroom. Large group)	Explanation of the main concepts	38	Study: to know, understand and synthesize knowledge	40	0.5	78.5h/3.14
Problems and study cases	Participatory (Classroom. Large group)	Study case and problem resolution	16	Learn to solve problems and casess	20	0.5	36.5h/1.46
Visit	Visit to a plant	On-site knowledge of process lines	4	Report on each visit	2		6h/0.24
Supervised activities	Student work	Drafting the calculation of a treatment facility		Compose a report	28	1	29h/1.16
Total			58		90	2	150/6

Observations 25 hours of total activity per ECTS credit have been considered. Master classes in classroom and by videoconference.

Evaluation

Activities

Type of activity	Evauation Activity		Weight qualification
	Procedure	Number	(%)
Master classes	Written tests on the theory of the program of the subject	**2**	**35**
Problems and study cases	Delivery of written reports on problems and cases	**Various**	**65**
Total			**100**

Observations

The evaluation tests will be carried out in person. In case of impossibility, the appropriate procedure will be enabled. The work deliveries will be carried out preferably through a virtual campus.

To pass the subject it will be necessary to have obtained a grade equal to or greater than 5 points (out of 10) as an accumulated result of all the evaluable tests and in each of them (written tests and reports).

Bibliography

The bibliography of the technological subjects requires a continuous revision. However, some manuals are cited whose content, despite being written in some cases more than a decade ago, is suitable for a first contact with the subject. At the beginning of the course, and eventually during the development of the subject, teachers will provide a more complete list of bibliographic sources, including portals and internet addresses with sector information.

References

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HENRY, J.G., HEINKE, G.W. (1989). Environmental Science and Engineering. Prentice Hall Ed. Capítulo 6.

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