

**1. General information****Course:** SANITARY ENGINEERING**Type:** CORE COURSE**Degree:** 2343 - MASTERS DEGREE PROGRAMME IN ENGINEERING OF ROADS, CANALS AND PORTS**Center:** 603 - E.T.S. CIVIL ENGINEERS OF CR**Year:** 2**Main language:** English**Use of additional languages:****Web site:****Code:** 310806**ECTS credits:** 4.5**Academic year:** 2023-24**Group(s):** 20**Duration:** First semester**Second language:** Spanish**English Friendly:** N**Bilingual:** Y**Lecturer:** LUIS RODRIGUEZ ROMERO - Group(s): 20

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**2. Pre-Requisites**

Not established

**3. Justification in the curriculum, relation to other subjects and to the profession**

This subject is based on two of the competences included in the order CIN / 309/2009 relative to the degrees that qualify for the exercise of the profession of Ingeniero de Caminos, Canales y Puertos, namely:

- Ability to design and size water and wastewater treatment processes, as well as solid waste treatment ones.
- Ability to design and execute drinking water treatment processes, including desalination, and wastewater treatment. Collection and treatment of solid wastes (urban, industrial or even dangerous).

According to it, this subject focuses on the detailed study of the wastewater treatment processes most used in conventional WWTPs, as well as in the current management of municipal solid wastes and the drinking water treatment.

**4. Degree competences achieved in this course****Course competences**

Code	Description
CB07	Apply the achieved knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to the area of study
CB09	Know how to communicate the conclusions and their supported knowledge and ultimate reasons to specialized and non-specialized audiences in a clear and unambiguous way
G16	Ability to design and execute water purification treatments, including desalination and sewage treatment. Collection and treatment of waste (urban, industrial or even hazardous).
G25	Ability to identify, measure, enunciate, analyse, diagnose and scientifically and technically describe a civil engineering problem
G27	Ability to communicate in a second language.
TE06	Ability to design and dimension water purification and wastewater treatment systems, as well as waste treatment systems.

**5. Objectives or Learning Outcomes****Course learning outcomes****Description**

Students can design the different elements and equipment of a WWTP.

Students are able to propose an optimal alternative for the integral management of MSW in a town or territory.

Students are able to propose an optimal solution for a wastewater treatment plant (WWTP) construction project.

Students know the regulations applicable to the treatment and management of wastewater and urban waste.

Students know the physical-chemical and biological fundamentals of the different wastewater and urban waste treatment processes.

**Additional outcomes**

Students know the technologies and projects of drinking water treatment

**6. Units / Contents****Unit 1: WASTEWATER TREATMENT****Unit 1.1** Introduction to Wastewater Treatment Plants design**Unit 1.2** Preliminary treatment**Unit 1.3** Primary treatment**Unit 1.4** Fundamentals of wastewater biological treatment**Unit 1.5** Suspended growth biological treatment processes**Unit 1.6** Attached growth and hybrid biological treatment processes**Unit 1.7** Processes for nitrogen and phosphorus removal

**Unit 1.8** Wastewater plant residuals management

**Unit 2: WATER SUPPLY TREATMENT**

**Unit 2.1** Conventional drinking water treatment processes

**Unit 2.2** Advanced drinking water treatment processes

**Unit 3: MUNICIPAL SOLID WASTES MANAGEMENT**

**Unit 3.1** Current state of municipal solid waste management

**Unit 3.2** Biological treatment of MSW

**Unit 3.3** Thermal treatment of MSW

**Unit 3.4** Landfill design

7. Activities, Units/Modules and Methodology							
Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	CB07 G25 G27 TE06	0.7	17.5	N	-	Master classes with the use of PowerPoint presentations previously provided to students.
Problem solving and/or case studies [ON-SITE]	Workshops and Seminars	CB07 CB09 G27 TE06	0.24	6	Y	Y	Seminars to solve problems or practical cases provided in advance to the students for their individual or group resolution. Before the start of the seminars, students must submit the solved exercises to the teacher. The problems and case studies are solved on the blackboard by the students. It is a recoverable activity by taking an exam of problems in the final and/or retake exams.
Computer room practice [ON-SITE]	Cooperative / Collaborative Learning	CB07 G27 TE06	0.12	3	Y	Y	Computer practice with simulation software for the sizing of activated sludge treatment plants
Project or Topic Presentations [ON-SITE]	Workshops and Seminars	CB09 G16 G25 G27 TE06	0.16	4	Y	Y	Students, as a group, must prepare and present a previously agreed lesson with the teacher
Mid-term test [ON-SITE]	Assessment tests	CB07 G16 G25 G27 TE06	0.08	2	Y	Y	Mid-term tests (multiple-choice test), which cover several lessons
Study and Exam Preparation [OFF-SITE]	Self-study	CB07 CB09 G16 G25 G27 TE06	2.4	60	N	-	Study and/or preparation of tests and the other assessment activities, to be carried out by the student in an autonomous way.
Writing of reports or projects [OFF-SITE]	Group Work	CB07 CB09 G25 TE06	0.75	18.75	Y	Y	Students, as a group, must complete the sizing of a WWTP from the characteristics indicated by the teacher
Final test [ON-SITE]		CB07 G16 G25 G27 TE06	0.05	1.25	Y	N	Final exam of the formative activities not passed
Total:			4.5	112.5			
Total credits of in-class work: 1.35			Total class time hours: 33.75				
Total credits of out of class work: 3.15			Total hours of out of class work: 78.75				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System			
Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Assessment of active participation	5.00%	0.00%	Both class attendance and active participation (using tools such as TurningPoint, etc.) will be valued. This part of the assessment is non-recoverable.
Practicum and practical activities reports assessment	10.00%	10.00%	The practices will consist in using WWTP sizing software. Its completion will be mandatory and will be evaluated by submitting a results report. The activity is recoverable through the delivery of said report in the final and/or retake exams. The guidelines for the preparation of the report will be included in the Virtual Campus of the subject.
Mid-term tests	20.00%	25.00%	Two mid-term tests (multiple-choice tests carried out in class) will be made throughout the academic year. To pass this type of evaluation, it will be compulsory to take the two exams and to obtain an average score of 4 (out of 10) or more points in the set of all the tests. This part of the assessment is recoverable through the final and/or retake exams.
			It will consist of two different activities: (i) delivery of solved problems proposed by the professor and (ii) making of the preliminary sizing of a WWTP with assumptions proposed by the professor. The first activity will involve 25% of the final mark

Assessment of problem solving and/or case studies	45.00%	45.00%	of the subject, being mandatory to attend 2/3 of the problem seminars and obtain a minimum score of 3 points out of 10 in this section. The WWTP preliminary sizing exercise will account for 20% of the final grade and a minimum grade of 3 points out of 10 will be required. The evaluation of the delivery of solved problems is recoverable through the final and/or retake exams and the WWTP preliminary sizing work is recoverable through the delivery of the corresponding report in the final and/or retake exams. The guidelines for the preparation of the reports (solved problems and WWTP sizing) will be included in the Virtual Campus of the subject.
Oral presentations assessment	20.00%	20.00%	The students, as a group, must prepare and present a lesson previously agreed with the teacher. It will be assessed the following issues: contents of the presentation (40%), structure and quality (40%) and the individual speech (20%). The detailed guidelines for the preparation of the presentations will be included in the Campus Virtual of the subject. It will be also mandatory to attend the presentation sessions. This activity is recoverable through the individual presentation of a topic or a part of it using Microsoft Teams.
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

#### Evaluation criteria for the final exam:

##### Continuous assessment:

The evaluation criteria for each of the training activities and their relative weights in the final grade are those specified in the table above. To pass without the need to take a final exam, it is necessary to obtain at least 5 points in the total evaluation and to carry out all the mandatory evaluation activities along with meeting the corresponding required minimum grades. In case of not meeting any of these requirements, students will have to carry out the evaluation activities with a grade below the minimum one and/or take a final exam of theory and/or problems. The grades obtained in the passed activities will be saved until the following academic year.

Unless stated otherwise, continuous evaluation criteria will be applied to all students.

Anyone choosing non-continuous assessment must notify it to the lecturer within the class period of the subject. The option is only available if the students participation in evaluation activities (from the continuous assessment) has not reached 50% of the total evaluation for the subject.

##### Non-continuous evaluation:

The non-continuous evaluation will include a final exam with a theory part, whose weight in the final grade will be 25%, and a problem part, whose weight will be 25% of the final grade. It is necessary to obtain a minimum of 3 points out of 10 in each of the two parts. The oral presentation of the topic can be done in a non-face-to-face way using Microsoft Teams. The rest of the evaluation activities remain the same, saving the grade obtained in the approved activities until the following academic year.

The subject will be passed through non-continuous evaluation if the minimum required score is reached in the final exam and a minimum of 5 points out of 10 is obtained in the total of the evaluation activities.

#### Specifications for the resit/retake exam:

The retake exam will include the activities not passed in the final exam; they will be assessed in the same way than described above. For the retake exam, the assessment type used for the final exam will remain valid.

#### Specifications for the second resit / retake exam:

The second retake exam will include the activities not passed in the previous academic year; they will be assessed in the same way than described for the final and retake exams.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Computer room practice [PRESENCIAL][Cooperative / Collaborative Learning]	3
Mid-term test [PRESENCIAL][Assessment tests]	2
Writing of reports or projects [AUTÓNOMA][Group Work]	22.75
Final test [PRESENCIAL]	1.25
<b>General comments about the planning:</b> The dates shown here are only approximated; they could be changed depending on the course development.	
Unit 1 (de 3): WASTEWATER TREATMENT	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	17.5
Problem solving and/or case studies [PRESENCIAL][Workshops and Seminars]	6
Study and Exam Preparation [AUTÓNOMA][Self-study]	49
Group 20:	
<b>Initial date:</b> 19-09-2022	<b>End date:</b> 24-11-2022
Unit 2 (de 3): WATER SUPPLY TREATMENT	
Activities	Hours
Project or Topic Presentations [PRESENCIAL][Workshops and Seminars]	1
Writing of reports or projects [AUTÓNOMA][Group Work]	7
Group 20:	
<b>Initial date:</b> 24-11-2022	<b>End date:</b> 28-11-2022
Unit 3 (de 3): MUNICIPAL SOLID WASTES MANAGEMENT	
Activities	Hours
Project or Topic Presentations [PRESENCIAL][Workshops and Seminars]	3
Group 20:	
<b>Initial date:</b> 28-11-2022	<b>End date:</b> 05-12-2022

Global activity	
Activities	hours
Final test [PRESENCIAL][ ]	1.25
Class Attendance (theory) [PRESENCIAL][Lectures]	17.5
Problem solving and/or case studies [PRESENCIAL][Workshops and Seminars]	6
Computer room practice [PRESENCIAL][Cooperative / Collaborative Learning]	3
Project or Topic Presentations [PRESENCIAL][Workshops and Seminars]	4
Writing of reports or projects [AUTÓNOMA][Group Work]	29.75
Mid-term test [PRESENCIAL][Assessment tests]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	49
Total horas: 112.5	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Colomer Mendoza, Francisco José	Tratamiento y gestión de residuos sólidos	Departamento de Ingeniería Rural y Agroalimentari		978-84-8363-071-6	2007	
Lin, Shun Dar	Water and wastewater calculations manual	McGraw-Hill		978-0-07-147624-9	2007	
	Gestión de los residuos sólidos urbanos: los residuos municip	Asociación Mundial de las Grandes Metrópolis. Metr		84-609-5022-0	2005	
	Wastewater engineering: treatment and reuse	McGraw-Hill		007-124140-X	2004	
M.L. Davis	Water and wastewater engineering	McGraw-Hill			2010	
Qasim, Syed R.	Wastewater treatment plants: planning, design, and operation	CRC Press		1-56676-688-5	1999	
Tchobanoglous, George	Gestión integral de residuos sólidos	McGraw-Hill Interamericana de España		84-481-1830-8	1994	
Vaquero Díaz, Iván	Manual de diseño y construcción de vertederos de residuos sól	U.D. Proyectos, E.T.S.I. Minas, U.P.M.		84-96140-05-9	2004	
Varios	XXVI Curso sobre Tratamiento de Aguas Residuales y Explotación de Estaciones Depuradoras : Madrid, del 19 al 30 de noviembre de 2007	CEDEX			2008	