



1. General information

Course: HYDRAULIC STRUCTURES AND HYDROPOWER PLANTS
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: 1
Main language: English
Use of additional languages:
Web site:

Code: 310807
ECTS credits: 4.5
Academic year: 2019-20
Group(s): 20
Duration: C2
Second language: English
English Friendly: N
Bilingual: N

Lecturer: SARAI DIAZ GARCIA - Group(s): 20				
Building/Office	Department	Phone number	Email	Office hours
A37	INGENIERIA CIVIL Y DE LA EDIFICACIÓN	926052824	Sarai.Diaz@uclm.es	Se fijará al inicio del cuatrimestre/To be set at the beginning of the semester
Lecturer: JAVIER GONZALEZ PEREZ - Group(s): 20				
Building/Office	Department	Phone number	Email	Office hours
A38	INGENIERIA CIVIL Y DE LA EDIFICACIÓN	926295422	javier.gonzalez@uclm.es	Se fijará al inicio del cuatrimestre/To be set at the beginning of the semester

2. Pre-Requisites

Numerical Analysis
Hydraulic Engineering
Geotechnics

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

This course allows the student to acquire knowledge and skills associated with the operation of Hydraulic Structures and Systems, linking the theoretical aspects of fluid mechanics and hydraulic engineering, with the techniques of engineering problem solving using

4. Degree competences achieved in this course

Course competences	
Code	Description
AFC1	Ability to address and solve advanced mathematical engineering problems, from problem solving to formulation development and implementation in a computer program. In particular, the ability to formulate, program and apply advanced analytical and numerical models for calculation, design, planning and management, as well as the ability to interpret the results obtained, in the context of civil engineering.
CB10	Have the learning skills which allow to continue studying in a self-directed or autonomous way
G01	Scientific-technical and methodological capacity for the continuous recycling of knowledge and the exercise of the professional functions of consultancy, analysis, design, calculation, project, planning, leadership, management, construction, maintenance, conservation and exploitation in the fields of civil engineering.
G13	Ability to plan, carry out studies and design surface or groundwater intake structures (dams, pipelines, pumping).
G27	Ability to communicate in a second language.
TE04	Ability to design, dimension, build and maintain waterworks.

5. Objectives or Learning Outcomes

Course learning outcomes
Description
Students are familiar with the usual orders of magnitude in hydraulic works in Civil Engineering.
Students numerically analyze the behavior of a hydraulic work design.
Students are aware of the environmental implications of interventions in hydraulic works.
Students understand the principles of operation, design and maintenance of the different types of hydraulic works common in Civil Engineering.

6. Units / Contents

Unit 1: Open Channel and Drainage
Unit 1.1 Unsteady Open Channel and Channel Flow Management
Unit 1.2 Open Channel Design
Unit 2: Pressure flow and pumping systems
Unit 2.1 Unsteady pressure flow. Protection elements.
Unit 3: Flood defense structures and river management
Unit 3.1 Sediment traps. Erosion protection.
Unit 3.2 Flood control structures.
Unit 4: Dams' Engineering
Unit 4.1 Tensional state computation in concrete dams.
Unit 4.2 Stability analysis in earth filled dams.
Unit 5: Dams' outlets
Unit 5.1 Spillway design and outlets elements
Unit 6: Turbines and hydroelectric power
Unit 6.1 Turbines desing

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	R	Description
Class Attendance (theory) [ON-SITE]	Combination of methods	AFC1 CB10 G01 G13 G27 TE04	0.48	12	N	-	-	
Workshops or seminars [ON-SITE]	Combination of methods	AFC1 CB10 G01 G13 G27 TE04	0.48	12	N	-	-	
Project or Topic Presentations [ON-SITE]	Project/Problem Based Learning (PBL)	AFC1 CB10 G01 G13 G27 TE04	0.39	9.75	Y	Y	N	
Study and Exam Preparation [OFF-SITE]	Self-study	AFC1 CB10 G01 G13 G27 TE04	1.12	28	Y	Y	Y	
Writing of reports or projects [OFF-SITE]	Project/Problem Based Learning (PBL)	AFC1 CB10 G01 G13 G27 TE04	2.03	50.75	Y	Y	Y	
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
R: Rescheduling training activity

8. Evaluation criteria and Grading System

Evaluation System	Grading System		Description
	Face-to-Face	Self-Study Student	
Final test	40.00%	0.00%	>=5 points of a total of 10
Other methods of assessment	20.00%	0.00%	Class presentations and discussions
Assessment of problem solving and/or case studies	40.00%	0.00%	
Total:	100.00%	0.00%	

Evaluation criteria for the final exam:

The presentation of the works of the proposed cases of study is mandatory, and they must have a global grade >= 5 points over 10 points to pass.
The final exam must be approved in order to pass.

Specifications for the resit/retake exam:

The score of the submitted home works are valid along the full year. The exam note in the ordinary call is not valid for extraordinary call. The student must repeat the exam in case not pass ordinary call.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	hours
Unit 1 (de 6): Open Channel and Drainage	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	1.8
Workshops or seminars [PRESENCIAL][Combination of methods]	1.8
Project or Topic Presentations [PRESENCIAL][Project/Problem Based Learning (PBL)]	1.46

Study and Exam Preparation [AUTÓNOMA][Self-study]	4
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	7.61
Unit 2 (de 6): Pressure flow and pumping systems	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	1.8
Workshops or seminars [PRESENCIAL][Combination of methods]	1.8
Project or Topic Presentations [PRESENCIAL][Project/Problem Based Learning (PBL)]	1.46
Study and Exam Preparation [AUTÓNOMA][Self-study]	4
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	7.61
Unit 3 (de 6): Flood defense structures and river management	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	1.8
Workshops or seminars [PRESENCIAL][Combination of methods]	1.8
Project or Topic Presentations [PRESENCIAL][Project/Problem Based Learning (PBL)]	1.46
Study and Exam Preparation [AUTÓNOMA][Self-study]	4
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	7.61
Unit 4 (de 6): Dams' Engineering	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	3
Workshops or seminars [PRESENCIAL][Combination of methods]	3
Project or Topic Presentations [PRESENCIAL][Project/Problem Based Learning (PBL)]	2.44
Study and Exam Preparation [AUTÓNOMA][Self-study]	8
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	12.69
Unit 5 (de 6): Dams' outles	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	1.8
Workshops or seminars [PRESENCIAL][Combination of methods]	1.8
Project or Topic Presentations [PRESENCIAL][Project/Problem Based Learning (PBL)]	1.46
Study and Exam Preparation [AUTÓNOMA][Self-study]	4
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	7.61
Unit 6 (de 6): Turbines and hydroelectric power	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	1.8
Workshops or seminars [PRESENCIAL][Combination of methods]	1.8
Project or Topic Presentations [PRESENCIAL][Project/Problem Based Learning (PBL)]	1.47
Study and Exam Preparation [AUTÓNOMA][Self-study]	4
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	7.62
Global activity	
Activities	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	12
Workshops or seminars [PRESENCIAL][Combination of methods]	12
Project or Topic Presentations [PRESENCIAL][Project/Problem Based Learning (PBL)]	9.75
Study and Exam Preparation [AUTÓNOMA][Self-study]	28
Writing of reports or projects [AUTÓNOMA][Project/Problem Based Learning (PBL)]	50.75
Total horas: 112.5	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Cítv	ISBN	Year	Description
Brater, Ernest F.Ernest Frederick1912-	Handbook of hydraulics: for the solution of hydraulic engine	Mc-Graw-Hill		0-07-007247-7	1996	
Chow, Ven Te	Hidráulica de canales abiertos / Ven Te Chow	Diana		968-13-1327-5	1993	
Díez-Cascón Sagrado, Joaquín	Ingeniería de presas: presas de fábrica	Servicio de Publicaciones de la Universidad de Can		84-8102-292-6	2001	
	Journal of hydraulic engineering	American Society of Civil Engineers		0733-9429	1983	