UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: WORKS TECHNOLOGY OF STRUCTURES
Code: 38332
Type: CORE COURSE
ECTS credits: 6
Degree: 345 - UNDERGRADUATE DEGREE PROGRAMME IN CIVIL ENGINEERING
Academic year: 2023-24
Center: 603 - E.T.S. CIVIL ENGINEERS OF CR
Group(s): 20
Year: 4
Duration: C2
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **JOSE ANTONIO LOZANO GALANT** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
Edificio Politécnica/A-41	INGENIERÍA CIVIL Y DE LA EDIFICACIÓN	+34 926 05 23 33	joseantonio.lozano@uclm.es	Tentative. Tuesdays and Thursdays from 15:00 to 18:00 h.

Lecturer: **RAMON ALFONSO SANCHEZ DE LEON** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
Edificio Politécnica/A-59	INGENIERÍA CIVIL Y DE LA EDIFICACIÓN		rsanchezdeleon@estudioaia.com	Tentative. Tuesday from 12:00 to 18:00 h.

2. Pre-Requisites

Construction materials

Strenght of materials

Analysis of structures

Technology of structures

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

The course aims to provide the future Engineer with the minimum knowledge to face the project and construction of steel and concrete structures. To this end, previous knowledge in technology of steel and concrete structures is expanded and developed with a practical approach. The student must acquire skills that allow him/her to choose between the different materials available; understand the behavior of the different structural typologies; identify its resistant mechanisms against external actions and imposed deformations; use specific analysis methods and understand the structural response to address the project of a structure.

4. Degree competences achieved in this course

Course competences

Code	Description
CE01	Students can apply their knowledge in the practical solution of civil engineering problems, with capacity for the analysis and definition of the problem, the proposal of alternatives and their critical evaluation, choosing the optimal solution with technical arguments and with capacity of defense against third parties.
CE13	Students gain the ability to analyze and understand how the characteristics of structures influence their behavior. Ability to apply knowledge of the structural behaviour to design structures according to existing standards and using analytical and numerical calculation methods
CE15	Students have knowledge of the fundamentals of the behaviour of reinforced concrete and metal structures and the ability to conceptualize, design, build and maintain such structures.
CG01	Students achieve general knowledge of Information and Communication Technologies (ICT).
CG02	Students can use proper oral and written communication

5. Objectives or Learning Outcomes

Course learning outcomes

Description

6. Units / Contents

Unit 1: Introduction and actions

- **Unit 1.1** Basic concepts
- **Unit 1.2** Actions in buildings
- **Unit 1.3** Actions in bridges

Unit 2: Concrete structures

- **Unit 2.1** Introduction

Unit 2.2 Reinforced concrete
Unit 2.3 Prestressed concrete
Unit 2.4 Strut and tie model
Unit 2.5 Design and verification ULS
Unit 2.6 Inestability, punching and torsion

Unit 3: Steel structures
Unit 3.1 Introduction
Unit 3.2 Verification and design
Unit 3.3 Joint design and verification
Unit 3.4 Torsion and buckling

Unit 4: Typology and technology of buildings
Unit 4.1 Joints in buildings
Unit 4.2 Workshop of steel structures and foundations (pads and piles)

Unit 5: Typology and technology of bridges
Unit 5.1 Workshop of concrete structures
Unit 5.2 Steel rebars layout

Unit 6: Project of a structure
Unit 6.1 Recommendations
Unit 6.2 Building Information Modelling (BIM)

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	CE01 CE13 CE15 CG01	1	25	N	-	
Class Attendance (practical) [ON-SITE]	Lectures	CE01 CE13 CG01	0.4	10	Y	N	
Workshops or seminars [ON-SITE]	Group Work	CE01 CE13 CG01 CG02	0.8	20	Y	N	
Practicum and practical activities report writing or preparation [OFF-SITE]	Project/Problem Based Learning (PBL)	CE01 CE13 CG01 CG02	2.8	70	Y	Y	Workshops in group or individually. Minimum grade 4.0
Final test [ON-SITE]	Assessment tests	CE01 CE13 CG02	0.14	3.5	Y	Y	Written exam. Minimum grade 4.0
Study and Exam Preparation [OFF-SITE]	Self-study	CE01 CE13 CG01 CG02	0.8	20	N	-	
Mid-term test [ON-SITE]	Assessment tests	CE01 CE13 CE15 CG01 CG02	0.06	1.5	Y	N	Partial exam Recoverable in the final exam. Minimal grade 4.0
		Total:	**6**	**150**			
		Total credits of in-class work: 2.4					**Total class time hours: 60**
		Total credits of out of class work: 3.6					**Total hours of out of class work: 90**

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%	Individual participation in class and workshops. Unrecoverable
Final test	65.00%	100.00%	Written exam unless conditions do not allow it, in which case it would be carried out virtually. Mandatory and recoverable. Minimum grade 4.0.
Assessment of problem solving and/or case studies	20.00%	0.00%	Report. Minimum grade 4.0. Unrecoverable
Progress Tests	10.00%	0.00%	Written exam unless conditions do not allow it, in which case it would be carried out virtually. Mandatory and recoverable. Minimal grade 4.0.
Total:	**100.00%**	**100.00%**	

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 final grade of each student in this subject will be obtained from:
- Grade (Nrm) obtained in the exam of basic concepts of strength of materials (from 0 to 10). This grade will be obtained by the progress test and students can be evaluated again of it in the final test.
- Grade (NE) obtained in the examination of concrete and steel structures (from 0 to 10)
- Average grade of the building and bridge workshops (NT) obtained by each student (from 0 to 10). The details on content, extension and requirements of the workshops to be delivered will be indicated on the virtual campus at the beginning of the semester.
- Increased in grade based on each student's performance during the subject (dNe) (up to 0.5).

The course grade (Nc) will be calculated according to the following equation:
Nc = 0.7 NE + 0.1 Nrm + 0.15 NT + dNe
In order to pass the course, it is compulsory that the grades NT, NE, and Nrm are greater than 4.0 and Nc greater than 5.0.
Written activities will be replaced by virtual ones if necessary.

Only the grade from the workshops would be saved from one course to another.

Non-continuous evaluation:

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 student's participation in evaluation activities (from the continuous assessment) has not reached 50% of the total evaluation for the subject.
For the retake exam, the assessment type used for the final exam will remain valid.
The final grade of each student in this subject will be obtained from:
- Grade (Nrm) obtained in the exam of basic concepts of strenght of materials (from 0 to 10) (minimum grade 4.0)
- Grade (NE) obtained in the examination of concrete and steel structures (from 0 to 10) (minimum grade 4.0)
The course grade (Nc) will be calculated according to the following equation:
Nc = 0.9 NE + 0.1 Nrm
Written activities will be replaced by virtual ones if necessary.

Specifications for the resit/retake exam:

The final grade of each student in this subject will be obtained from:
- Grade (Nrm) obtained in the exam of basic concepts of strenght of materials (from 0 to 10)
- Grade (NE) obtained in the examination of concrete and steel structures (from 0 to 10)
- Average grade of the building and bridge workshops (NT) obtained by each student (from 0 to 10). The details on content, extension and requirements of the workshops to be delivered will be indicated on the virtual campus at the beginning of the semester.
- Increased in grade based on each student's performance during the subject (dNe) (up to 0.5).

The course grade (Nc) will be calculated according to the following equation:
Nc = 0.7 NE + 0.1 Nrm + 0.15 NT + dNe
In order to pass the course, it is compulsory that the grades NT, NE, and Nrm are greater than 4.0 and Nc greater than 5.0.
Written activities will be replaced by virtual ones if necessary.

Only the grade from the workshops would be saved from one course to another.

Specifications for the second resit / retake exam:

The same criteria of the non-continuous evaluation is applied.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**
Final test [PRESENCIAL][Assessment tests]	5
Unit 1 (de 6): Introduction and actions	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	6
Class Attendance (practical) [PRESENCIAL][Lectures]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	2
Unit 2 (de 6): Concrete structures	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	15
Class Attendance (practical) [PRESENCIAL][Lectures]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	13
Unit 3 (de 6): Steel structures	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Class Attendance (practical) [PRESENCIAL][Lectures]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Unit 4 (de 6): Typology and technology of buildings	
Activities	**Hours**
Workshops or seminars [PRESENCIAL][Group Work]	9
Practicum and practical activities report writing or preparation [AUTÓNOMA][Project/Problem Based Learning (PBL)]	33
Unit 5 (de 6): Typology and technology of bridges	
Activities	**Hours**
Workshops or seminars [PRESENCIAL][Group Work]	9
Practicum and practical activities report writing or preparation [AUTÓNOMA][Project/Problem Based Learning (PBL)]	33
Unit 6 (de 6): Project of a structure	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Workshops or seminars [PRESENCIAL][Group Work]	2
Practicum and practical activities report writing or preparation [AUTÓNOMA][Project/Problem Based Learning (PBL)]	4
Global activity	
Activities	**hours**
Practicum and practical activities report writing or preparation [AUTÓNOMA][Project/Problem Based Learning (PBL)]	70
Final test [PRESENCIAL][Assessment tests]	5
Workshops or seminars [PRESENCIAL][Group Work]	20
Class Attendance (theory) [PRESENCIAL][Lectures]	25
Class Attendance (practical) [PRESENCIAL][Lectures]	10
Study and Exam Preparation [AUTÓNOMA][Self-study]	20
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
José Luís Bonet, M Carmen Castro, Miguel A Fernández, Jose R Martí, Pedro F Miguel, Juan Navarro y Luís Pallarés	Cálculo de secciones y elementos estructurales de hormigón, casos prácticos adaptados a la EHE08 TOMO 1	Universitat Politécnica de Valencia	Valencia	978848363502	2011	
Tony Threlfall	Worked Examples for the Design of Concrete Structures to Eurocode 2	CRC Press		9780429164477	2013	
	Steel Building Design: worked examples	Steel Construction Institute		978859421833	2009	
AENOR, D.L.	Eurocódigo 2 : proyecto de estructuras de hormigón	Asociación Española de Normalización y Certificación			1998	
AENOR, D.L.	Eurocódigo 1 : bases de proyecto y acciones en estructuras	Asociación Española de Normalización y Certificación			1998	
AENOR, D.L.	Eurocódigo 3 : proyecto de estructuras de acero.	Asociación Española de Normalización y Certificación			1998	
España. Ministerio de Fomento	EHE-08 : Instrucción de hormigón estructural : con comentari	Ministerio de Fomento, Secretaría General Técni		978-84-498-0825-8	2008	
Sánchez Amillategui, Fernando	Curso de hormigón pretensado	ETS Ingenieros Caminos		84-607-4164-8	2002	
	Código técnico de edificación (CTE)	Paraninfo		978-84-283-3030-5	2008	
	Ejemplos de aplicación de la IAPF-07	ACHE, Asociación Científico-Técnica del Hormigó		978-84-89670-65-5	2009	
	IAP-11 Instrucción sobre las acciones a considerar en el proyecto de puentes de carretera	Ministerio de Fomento			2011	
	Instrucción de Acciones a considerar en Puentes de Ferrocarril IAPF-07	Ministerio de Fomento			2007	
	Instrucción de Acero Estructural (EAE)	Ministerio de Fomento			2011	
Comisión permanente del Hormigón Ministerio de Fomento	Guia de aplicación de la instrucción de hormigón estructural: Edificación			8449806267	2003	
Eduardo Medina	Construcción de estructuras de hormigón armado edificación	Delta publicaciones		8496477967	2008	
José Luís Bonet, M Carmen Castro, Miguel A Fernández, Jose R Martí, Pedro F Miguel, Juan Navarro y Luís Pallarés	Cálculo de secciones y elementos estructurales de hormigón, casos prácticos adaptados a la EHE08 TOMO 2	Universitat Politécnica de Valencia	Valencia	9788483636619	2011	
Strasky, J.	DESIGNING AND CONSTRUCTING PRESTRESSED BRIDGES			9780727763853	2021	