



## 1. General information

**Course:** BUILDING AND PREFABRICATION**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:** 310802**ECTS credits:** 4.5**Academic year:** 2023-24**Group(s):** 20**Duration:** First semester**Second language:** Spanish**English Friendly:** N**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.

## 2. Pre-Requisites

A basic knowlegde of the following topics is advised: (1) Concrete and Steel structures, (2) Geotechnical Engineering, (3) Materials strength, (4) Calculation of structures.

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

In this holistic and skills focused course students will gain the skills to work in an architectural practice or building design company. Students will learn how to design and calculate the main structural typologies in buildings (such as beams, trusses, frames, cables or arches). To do so, firstly they will draw sketches and perform hand calculations to address the structural behavior of the main building elements (columns, slabs, beams, pads, piles...). This information will be used to check the calculations obtained by Building Information Modelling (BIM) simulation software.

## 4. Degree competences achieved in this course

## Course competences

Code	Description
CB06	Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
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
CB08	Be able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of knowledge and judgments
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
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.
G02	Understanding of the multiple technical, legal and property constraints that arise in the design of a public work, and the capacity to establish different valid alternatives, to choose the optimum one and to express it adequately, anticipating the problems of its construction, and using the most suitable methods and technologies, both traditional and innovative, with the aim of achieving the greatest efficiency and promoting the progress and development of a sustainable and respectful society with the environment.
G03	Knowledge, understanding and ability to apply the necessary legislation in the exercise of the profession of Civil Engineer.
G04	Knowledge of the history of civil engineering and ability to analyse and assess public works in particular and the construction industry in general.
G05	Knowledge of the Civil Engineering profession and the activities that can be carried out in the field of civil engineering.
G11	Capacity for the design, execution and inspection of structures (bridges, buildings, etc.), foundation works and underground civil works (tunnels, car parks), and the assessment of their integrity.
G19	Knowledge of the latest developments and applications of technology to civil engineering in all its fields, as well as its new challenges.
G20	Ability to choose between construction alternatives and public works management, anticipating the effects derived from the option assumed.
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.
G28	Ability to work in an international context.
TE02	Knowledge and capacity for structural analysis through the application of methods and programmes for the design and advanced calculation of structures, based on the knowledge and understanding of loads and their application to structural typologies in civil engineering. Ability to perform structural integrity assessments.
TE03	Knowledge of all types of structures and their materials, and ability to design, project, execute and maintain civil engineering structures and buildings.

## 5. Objectives or Learning Outcomes

### Course learning outcomes

Description

Students can define the construction procedures for each of the types of bridges and building structures according to their design and materials.

Students determine the actions to be considered in the design of railroad bridges and highways, as well as in the design of building structures.

Students apply the most suitable calculation and structural analysis methods to obtain the integral response of the structure, as well as the different elements that compose it, for both static and dynamic actions applied.

## 6. Units / Contents

### Unit 1: Actions in buildings

### Unit 2: Structural typologies in buildings

**Unit 2.1** Structural systems for vertical loads

**Unit 2.2** Structural systems for horizontal loads

### Unit 3: Design of building elements

**Unit 3.1** Foundations

**Unit 3.2** Frames

**Unit 3.3** Slabs

**Unit 3.4** Retaining walls

**Unit 3.5** Roofs and façades

### Unit 4: Building Information Modelling

### Unit 5: Construction of buildings

## 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]	Cooperative / Collaborative Learning	CB06 CB08 CB10 G01 G02 G03 G04 G05 G11 G19 G20 G27 G28 TE02 TE03	1	25	N	-	
Class Attendance (practical) [ON-SITE]	Project/Problem Based Learning (PBL)	CB07 CB08 CB09 CB10 G01 G03 G11 G25 G27 G28 TE02 TE03	0.23	5.75	N	-	
Writing of reports or projects [OFF-SITE]	Problem solving and exercises	CB07 CB08 CB09 CB10 G01 G02 G03 G04 G05 G11 G25 G27 G28 TE02 TE03	1.5	37.5	Y	Y	Non recoverable.
Mid-term test [ON-SITE]		CB06 CB07 CB08 CB09 CB10 G01 G02 G03 G04 G05 G11 G19 G20 G25 G27 G28 TE02 TE03	0.06	1.5	Y	N	Partial 1. Recoverable in the final exam.
Study and Exam Preparation [OFF-SITE]	Self-study	CB06 CB07 CB08 CB09 CB10 G01 G02 G03 G04 G05 G11 G19 G20 G25 G27 G28 TE02 TE03	1.65	41.25	N	-	
Final test [ON-SITE]	Assessment tests	CB06 CB07 CB08 CB09 CB10 G01 G02 G03 G04 G05 G11 G19 G20 G25 G27 G28 TE02 TE03	0.06	1.5	Y	Y	Recoverable.
<b>Total:</b>			<b>4.5</b>	<b>112.5</b>			
<b>Total credits of in-class work: 1.35</b>			<b>Total class time hours: 33.75</b>				
<b>Total credits of out of class work: 3.15</b>			<b>Total hours of out of class work: 78.75</b>				

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
Progress Tests	30.00%	0.00%	Recoverable in the final test. Minimal Grade 4.0.
Practicum and practical activities reports assessment	40.00%	0.00%	Assignments. Non recoverable.
Test	30.00%	100.00%	Exams: The exams will preferably be done in person but if necessary virtual exams are also possible. Minimal grade 4.0. Recoverable in the extraordinary exam.
<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:

Grade: 60% Partial exams (minimal grade 4.0) + 40% Assignments (the details on content, extension and requirements of the works or practices that have to

be delivered in writing will be indicated on the virtual campus at the beginning of the semester).  
The activities will preferably be done in person but if necessary virtual performance is also possible.

#### 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.

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

Grade: 60% Partial o final exams + 40% Assignments (the details on content, extension and requirements of the works or practices that have to be delivered in writing will be indicated on the virtual campus at the beginning of the semester)

The passed partial exams and assignments during the continuous evaluation will be considered.

Only the passed assignments will be considered for the next academic course.

#### 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]	3
Unit 1 (de 5): Actions in buildings	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Cooperative / Collaborative Learning]	2
Writing of reports or projects [AUTÓNOMA][Problem solving and exercises]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Unit 2 (de 5): Structural typologies in buildings	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Cooperative / Collaborative Learning]	8
Class Attendance (practical) [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Writing of reports or projects [AUTÓNOMA][Problem solving and exercises]	15
Study and Exam Preparation [AUTÓNOMA][Self-study]	15
Unit 3 (de 5): Design of building elements	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Cooperative / Collaborative Learning]	12
Class Attendance (practical) [PRESENCIAL][Project/Problem Based Learning (PBL)]	3.75
Writing of reports or projects [AUTÓNOMA][Problem solving and exercises]	17.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	15.25
Unit 4 (de 5): Building Information Modelling	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Cooperative / Collaborative Learning]	1.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Unit 5 (de 5): Construction of buildings	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Cooperative / Collaborative Learning]	1.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Global activity	
Activities	hours
Final test [PRESENCIAL][Assessment tests]	3
Writing of reports or projects [AUTÓNOMA][Problem solving and exercises]	37.5
Class Attendance (practical) [PRESENCIAL][Project/Problem Based Learning (PBL)]	5.75
Class Attendance (theory) [PRESENCIAL][Cooperative / Collaborative Learning]	25
Study and Exam Preparation [AUTÓNOMA][Self-study]	41.25
<b>Total horas: 112.5</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Raymond Ian Gilbert, Neil Colin Mickleborough, Gianluca Ranzi	DESIGN OF PRESTRESSED CONCRETE TO EUROCODE - 2 Second Edition			9781466573109	2017	
Giandomenico Toniolo, Marco di Prisco	Conseguir este libro impreso ¿ Libros en Google Play Reinforced Concrete Design to Eurocode 2	Springer			2017	
F.Biasioli, G.Mancini, M.Just, M.Curbach, J.Walraven, S.Gmainer, J.Arrieta, R.Frank, C.Morin, F.Robert	EUROCODE 2: BACKGROUND & APPLICATIONS DESIGN OF CONCRETE BUILDINGS			978-92-79-36548-5	2014	
C.H. Goodchild	Economic Concrete Frame Elements to Eurocode 2	Reinforced Concrete			2009	
C.H. Goodchild	Economic Frame Elements	Reinforced Concrete			2000	

CALAVERA, J.	Cálculo de estructuras de cimentación	INTEMAC	1991
CALAVERA, J.	Cálculo, construcción y patología de forjados de edificación	INTEMAC	1998
CALAVERA, J.	Muros de contención y muros de sótano	INTEMAC	1990
CALAVERA, J.	Proyecto y cálculo de estructuras de hormigón. Tomos I y II	INTEMAC	1999
JIMÉNEZ MONTOYA, MASAGUER, MORÁN	Hormigón armado	Gustavo Gil	2000
MURCIA, A. AGUADO, A. MARÍ	Hormigón armado y pretensado	Ediciones UPC/Serie Politext	1993
	Código Técnico de la Edificación. Ministerio de la Vivienda, Madrid.		
	Eurocódigo 1. Acciones en estructuras. AENOR, Madrid		
	Eurocódigo 2. Proyecto de estructuras de hormigón. Parte 1: Reglas generales y para edificación AENOR, Madrid.		
Eastman, C, et al,	BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors		2015
	Instrucción EHE de Hormigón Estructural. Ministerio de Fomento, Servicio de publicaciones, Madrid		
	NCSE. Norma de construcción Sismorresistente. Parte general y de edificación		