UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: BUILDING STRUCTURES II
Type: CORE COURSE
Degree: 315 - UNDERGRADUATE DEGREE IN BUILDING ENGINEERING
Center: 308 - SCHOOL POLYTECHNIC OF CUENCA
Year: 3
Main language: Spanish
Use of additional languages:
Web site:

Code: 59321
ECTS credits: 6
Academic year: 2023-24
Group(s): 30
Duration: First semester
Second language:
English Friendly: Y
Bilingual: N

Lecturer: **ANTONIO GARRIDO MARTÍNEZ** - Group(s): **30**

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Lecturer: **JESUS GONZALEZ ARTEAGA** - Group(s): **30**

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2. Pre-Requisites

Previous knowledge of physics-mechanics
Knowledge of vector systems
Knowledge of rigid solid and applied statics.
Material resistance limits
Own knowledge of concrete and steel as construction materials
To have taken the subject of Building Structures I.

It is recommended to have taken the subjects of Construction II and III and Construction Materials I and II

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

Specific training subject that complies with one of the basic guidelines of the degree.

Regarding its location within the Study Plan, the subject is supported by basic subjects such as mathematical and physical foundations, it is interrelated with other specific subjects of the degree such as Construction, Construction Materials, Installations, Pathology and Restoration, being of direct application in the subject of Technical Projects and Final Degree Project.

This subject constitutes an important professional activity of the Building Engineer, covering some of its essential competences in terms of the development of structural calculation activities, project writing, technical reports, technical directions, etc.

4. Degree competences achieved in this course

Course competences

Code	Description
E21	Ability to apply technical regulations to the building process, and generate documents of technical specification of building procedures and construction methods.
E23	Aptitude for the pre-mesure, design, calculation and verification of structures and to direct their material execution.
G01	Ability for analysis and synthesis
G02	Organization and planning ability
G04	Problem resolution
G05	Decision making
G06	Critical thinking
G12	Autonomous learning
G21	Command of Information and Communication Technologies (ICT)

5. Objectives or Learning Outcomes

Course learning outcomes

Description
Apply practical conclusions that constitute the object of the research carried out
Apply the above to the calculation of wooden, metal, reinforced concrete and prestressed structures.
Learn the concept of the Resistance of Materials.
Know how to interpret the results of computer programs.
Learn what Structural Safety is.

Idealization of the object to be calculated, obtaining diagrams.

6. Units / Contents

Unit 1: Reinforced Concrete

- **Unit 1.1** Introduction to the CE-2021 standard- Eurocodes.
- **Unit 1.2** Basis for CE-2021 design. Limit states. Deformation domains
- **Unit 1.3** Structural design documentation

Unit 2: Applications to reinforced concrete design

- **Unit 2.1** Reinforcement of beams. Bending
- **Unit 2.2** Beam reinforcement. Shear
- **Unit 2.3** Reinforced concrete supports
- **Unit 2.4** Reinforced concrete slabs
- **Unit 2.5** Service limit states
- **Unit 2.6** Reinforced concrete foundations
- **Unit 2.7** Reinforced concrete walls
- **Unit 2.8** Other elements

Unit 3: Applications to the calculation by computer systems applied to the material execution management

- **Unit 3.1** Computerized computing systems
- **Unit 3.2** Calculation procedure
- **Unit 3.3** Study of the results. Optimization
- **Unit 3.4** Practices

Unit 4: BIM work methodology in the area of structures

- **Unit 4.1** BIM methodology in building structures
- **Unit 4.2** Practices

ADDITIONAL COMMENTS, REMARKS

The concept of collaborative work in the BIM methodology environment is addressed, and other collaborative work tools are enabled/fostered through which it is possible to collect/filter/use the advances/incidents that, proposed by both teachers and students, are related to the development of the subject and the work proposed in it.

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	E21 E23 G01 G02 G04 G05 G06	0.28	7	N	-	
Class Attendance (practical) [ON-SITE]	Project/Problem Based Learning (PBL)	E21 E23 G01 G02 G04 G05 G06 G21	0.6	15	N	-	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	E21 E23 G01 G02 G04 G05 G06 G21	1.36	34	Y	N	Practical work in class, to be completed autonomously by the student, with the delivery of one or more structural calculations. The recovery will be made by means of a new delivery through the virtual campus. In case of plagiarism, the current regulations will be followed.
Study and Exam Preparation [OFF-SITE]	Self-study	E21 E23 G01 G02 G04 G05 G06 G12 G21	3.6	90	N	-	The EPC provides a workshop for teaching use to channel the preparation of reports, practices, works¿ of the different subjects, with the aim of promoting student work in a collaborative work environment typical of the BIM methodology -for this purpose, this workshop is equipped with the hardware and software necessary for the development of work in this environment, and is also responsible for emphasizing the implementation in the use of the tools/software necessary for the same-. Translated with www.DeepL.com/Translator (free version)
Final test [ON-SITE]	Assessment tests	E21 E23 G01 G02 G04 G05 G06	0.16	4	Y	Y	
		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

		Non-	

Evaluation System	Continuous assessment	continuous evaluation*	Description
Final test	60.00%	70.00%	Test with theoretical and practical contents. It will be necessary to achieve a minimum grade of 4 out of 10 to be able to weight with the rest of the course.
Assessment of problem solving and/or case studies	40.00%	30.00%	Calculation of one or several building structures. Contribution to collaborative work. Delivery of generated documentation and IFC model. It will be necessary to achieve a minimum grade of 4 out of 10 to be able to weight with the rest of the course.
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:

In the practical theoretical exam the student will solve questions and exercises of the practices carried out. The difficulty of the exercises will be variable, with the basic contents of the subject foundation until reaching higher levels of complexity.
The calculation of one or more structures will be delivered, along with the descriptive and supporting documentation thereof.
It will be necessary to achieve a 4 out of 10 in each of these two sections to pass the subject.

Non-continuous evaluation:

The student will take a test in which it is possible to achieve 100% of the contents and comprehensive skills of the continuous assessment.

Specifications for the resit/retake exam:

In the practical theoretical exam the student will solve questions and exercises of the practices carried out. The difficulty of the exercises will be variable, with the basic contents of the subject foundation until reaching higher levels of complexity.
The calculation of one or more structures will be delivered, along with the descriptive and supporting documentation thereof.
It will be necessary to achieve a 4 out of 10 in each of these two sections to pass the subject.

Specifications for the second resit / retake exam:

In the practical theoretical exam the student will solve questions and exercises of the practices carried out. The difficulty of the exercises will be variable, with the basic contents of the subject foundation until reaching higher levels of complexity.
The calculation of a structure will be delivered, along with descriptive and supporting documentation. The statement of the structure to be calculated will be provided to the student 15 days before the exam and will be delivered at the beginning of the test.
It will be necessary to achieve a 4 out of 10 in each of these two sections (exam and calculation of structure) to pass the course.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	.5

General comments about the planning: The dates of the subjects will be adapted to the UCLM degree calendar, starting with subject 1, continuing simultaneously with subjects 2 and 3 and ending with subject 4.

Unit 1 (de 4): Reinforced Concrete

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Class Attendance (practical) [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	8.1
Final test [PRESENCIAL][Assessment tests]	1

Teaching period: WEEKS 1 TO 4

Unit 2 (de 4): Applications to reinforced concrete design

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3.5
Class Attendance (practical) [PRESENCIAL][Project/Problem Based Learning (PBL)]	12.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	14.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	51.9
Final test [PRESENCIAL][Assessment tests]	3

Unit 3 (de 4): Applications to the calculation by computer systems applied to the material execution management

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Class Attendance (practical) [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	14
Study and Exam Preparation [AUTÓNOMA][Self-study]	25.5

Unit 4 (de 4): BIM work methodology in the area of structures

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	.5
Class Attendance (practical) [PRESENCIAL][Project/Problem Based Learning (PBL)]	.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	4.5

Global activity

Activities	hours
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	34
Study and Exam Preparation [AUTÓNOMA][Self-study]	90

Class Attendance (theory) [PRESENCIAL][Lectures]	7
Class Attendance (practical) [PRESENCIAL][Project/Problem Based Learning (PBL)]	15
Final test [PRESENCIAL][Assessment tests]	4
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Asociación de Consultores de Estructuras de Edificación	Guía sobre estructuras de edificación	ACIES	Madrid	978-84-09-23263-5	2021	
Arroyo Portero, Juan Carlos; Morán Cabré, Francisco; García Meseguer, Álvaro	Jiménez Montoya ESENCIAL. Hormigón Armado	CINTER	Madrid	978-84-939305-7-8	2018	
Carretero Ayuso, Maunel Jesús; Moyá Borrás, Mateo	guía de análisis del proyecto para la dirección de la ejecución de obra	Fundación MUSAAT	Madrid	978-84-697-7227-0	2017	
	Eurocódigo 2: Proyecto de estructuras de hormigón	AENOR Internacional, S.A.U		9788481431124		
CYPE Ingenieros	Manuales y documentación de los programas http://www.manuales.cype.es/					
Calavera Ruiz, J.	Cálculo de estructuras de cimentación /	INTEMAC,		978-84-88764-26-3	2015	
Calavera, J.	Proyecto y cálculo de estructuras de hormigón : en masa, arm	Instituto Técnico de Materiales y Construcciones,		84-88764-05-7 (Obra	2008	
Ministerio de Fomento	Codigo Tecnico de la Edificación http://www.codigotecnico.org/					
Ministerio de Fomento	EHE-08 https://www.cscae.com/images/stories/Noticias/Tecnica/EHE2008comentada1.pdf				2010	
Rodriguez Val, Javier	estructuras de hormigón para edificios	Gabinete Técnico Aparejadores Guadalajara	Guadalajara		2015	
Trimble	Tekla Structures 21.0 PDF documentation https://teklastructures.support.tekla.com/tekla-structures-210-pdf-documentation					
Gobierno de España - Ministerio de Transportes, Movilidad y Agenda Urbana	Codigo Estructural 2021 https://www.mitma.gob.es/organos-colegiados/comision-permanente-de-estructuras-de-acero/cpa/codigo-estructural				2021	
Juan Carlos Arroyo Portero Francisco Moran Cabre Alvaro Garcia Meseguer	MONTOYA-ESENCIAL. HORMIGON ARMADO	Cinter Divulgación TécnicaL.		Cinter Divulgación T	2018	
Muñoz Tejada, Sergio	Dimensionado de estructuras de la edificación	S. Muñoz]		978-84-616-6088-9	2013	
	Números gordos en el proyecto de estructuras /	Cinter Divulgación Técnica,		978-84-932270-4-3	2018	
IECA	Prontuario informático del hormigón adaptado al CÓDIGO ESTRUCTURAL https://www.ieca.es/producto/prontuario-informatico-del-hormigon-adaptado-al-codigo-estructural/					