

**1. General information****Course:** CONSTRUCTION III**Type:** CORE COURSE**Degree:** 315 - UNDERGRADUATE DEGREE IN BUILDING ENGINEERING**Center:** 308 - SCHOOL POLYTECHNIC OF CUENCA**Year:** 2**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 59316**ECTS credits:** 9**Academic year:** 2019-20**Group(s):** 30**Duration:** AN**Second language:** Spanish**English Friendly:** Y**Bilingual:** N

Lecturer: JESUS ALFARO GONZALEZ - Group(s): 30				
Building/Office	Department	Phone number	Email	Office hours
ESCUELA POLITÉCNICA DE CUENCA / Despacho 2.02	INGENIERÍA CIVIL Y DE LA EDIFICACIÓN		jesus.alfaro@uclm.es	It will be 6 hours to determine during the course.
Lecturer: DAVID VALVERDE CANTERO - Group(s): 30				
Building/Office	Department	Phone number	Email	Office hours
ESCUELA POLITECNICA/1.13	INGENIERÍA CIVIL Y DE LA EDIFICACIÓN	9691791004814	david.valverde@uclm.es	Monday 10:30-12:30 Monday 15:30-17:30 (will be confirmed at the beginning of each semester)

2. Pre-Requisites

In order to take the course, some basic prior knowledge of other subjects is required; otherwise, learning knowledge and obtaining competences becomes very complex:

BUILDING:

- Terminology of the elements and construction systems.
- Knowledge of the essential construction systems of any construction.
- Knowledge of the historical evolution of basic construction systems.

DRAWING:

- Be able to express oneself with ease in two and three dimensions.
- Be able to move from 2D to 3D with ease, both freehand and in Technical Drawing.

CONSTRUCTION MATERIALS:

- Know the characteristics, physical and stereotomic properties of reinforced concrete, wood and steel.

MATERIAL RESISTANCE:

- Basic knowledge of structural behavior.

COMPUTERS AND BIM METHODOLOGY:

User-level management of the most common presentation and production programs in Windows: MS Project, Excel, Word, Handling of Sketch up, knowledge of the environment CYPECAD, Modeling software on the platforms of Revit, Archicad. Coming from the subjects of Representation and Construction Systems I and II. Various software dedicated to the modeling of structures will be applicable during the development of the course (Tekla Structure and Dlubal). The student will also be sought to familiarize himself with BIM visualizers to check interoperability between software (BIM vision, Tekla Bimsight, Trimble Connect).

The student will be introduced to the collaborative work through computer tools that allow him to work online with his colleagues: Skype, Hangout, Trello, Slack

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

JUSTIFICATION IN THE STUDY PLAN AND WITH THE PROFESSION: The knowledge of the techniques and processes of execution of the architectural constructions are necessary in all the phases of the architectural fact, those of design, those of execution, for the documentation and the analysis of the architecture already built or for the rehabilitation and reconstruction of the damaged or disappeared. Without this subject, the architectural fact itself is not possible as a tangible reality. The Construction III subject is integrated into the central part of the Construction subjects after having passed the basic knowledge corresponding to Construction I and II. Being the central part of this field, and being this field so essential and fundamental within the set of knowledge of the Technical Architect, it seems obvious to say that the importance of this subject gives it the character of indispensable. The engineer of the building must know, the techniques constructive, their way of working, their constitution, the relationship of some construction systems with others, the disposition of their materials, their execution process, their control and maintenance conditions.

RELATIONSHIP WITH OTHER SUBJECTS: Being a subject centered within the rest of the Construction, has a direct sequential relationship with them. It should be understood that the proper way to study them will be in its correlative order since the teachings that are given in some are necessary for the next and so on. Fundamentals of physics: High previous dependence. It is considered essential to have previously studied it in order to understand the foundations on which the constructive applications that are discussed here are based. Drawing and Representation Systems: High prior dependency: Drawing and Representation Systems, especially modeling with BIM Methodology tools, are a tool that the student must know to understand the applications that will be seen here and to be able to apply the knowledge on practical cases with a suitable tool. A medium level of Sketch Up knowledge of Modeling in Revit, Archicad is required. Group of

Materials of Construction and Control: High previous dependency as regards the knowledge of the material, its physical-chemical properties to be able to proceed to its appropriate choice. Regarding the control of the same and their execution conditions, a later average dependency ratio is detected. Structures : There is a simultaneous high dependency ratio, since they are subjects that occur in the same course and two complementary conceptions of the same are seen. In Structures, its calculation and sizing is checked, while in Construction II its construction is analyzed. The study and monitoring of the two subjects simultaneously is considered especially suitable for the complementary understanding of them.

BIM METHODOLOGY:

The work carried out in previous courses and subjects related to the BIM methodology will be continued. The objective is to get the student to become familiar with modeling platforms, structure design, visualization, protocols and communication tools. The current reality of the profession and the need in the immediate future for the application of these techniques, make them essential in the formation of the future building engineer.

4. Degree competences achieved in this course

Course competences

Code	Description
E15	Ability to identify the elements and construction systems, define their function and compatibility, and their implementation in the construction process. Formulate and resolve constructive details.
E16	Knowledge of the specific control procedures of the material execution of the construction work.
E23	Aptitude for the pre-measure, design, calculation and verification of structures and to direct their material execution.
E29	Ability to analyze, design and execute solutions that facilitate universal accessibility in buildings and their surroundings.
G01	Ability for analysis and synthesis
G02	Organization and planning ability
G03	Ability to manage information
G04	Problem resolution
G05	Decision making
G06	Critical thinking
G07	Teamwork
G12	Autonomous learning
G15	Sensitivity to environmental issues
G16	Creativity and innovation
G19	Motivation for quality
G21	Command of Information and Communication Technologies (ICT)
G22	Correct oral and written communication
G23	Ethical commitment and professional ethics

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Manage market information, corresponding to currently constructive systems.
Propose and resolve constructive details appropriate to previous requirements.
Implementation of the construction elements and systems.
Understanding the behavior of the structures to specify their appropriate construction.
Physical and mechanical characteristics that define the construction systems.
Understanding the way of working of the constructive elements, defining their function and compatibility.

Additional outcomes

Inclusion of the knowledge acquired in the BIM Methodology in relation to other disciplines of the career. Cooperative inclusion of knowledge and learning about virtual models.

6. Units / Contents

Unit 1: CONSIDERATIONS ON THE CONSTRUCTION OF THE STRUCTURES

Unit 1.1 INTRODUCTION TO THE CONSTRUCTION OF THE STRUCTURES

Unit 2: FOUNDATION AND CONTAINMENT SYSTEMS

Unit 2.1 ELEMENTS OF ARMED CONCRETE. COMMISSIONING, PUT INTO WORK.

Unit 2.2 FORMWORK

Unit 2.3 SUPERFICIAL FOUNDATIONS

Unit 2.4 DEEP FOUNDATIONS

Unit 2.5 SURFACE CONTAINMENT SYSTEMS

Unit 2.6 DEEP CONTAINMENT SYSTEMS

Unit 3: CONSTRUCTION OF THE ARMED CONCRETE STRUCTURES

Unit 3.1 PORTICATED STRUCTURES. SUPPORTS AND BEAMS

Unit 3.2 HORIZONTAL SLABS

Unit 3.3 SINGULAR ELEMENTS OF ARMED CONCRETE

Unit 4: CONSTRUCTION OF METALLIC STRUCTURES

Unit 4.1 STRUCTURAL SYSTEMS AND MEANS OF UNION

Unit 4.2 STEEL SLABS FOR BUILDING

Unit 4.3 STRUCTURES FOR LARGE LENGTHS

Unit 5: CONSTRUCTION OF WOOD STRUCTURES

Unit 5.1 QUALITIES AND TYPES OF UNION

Unit 5.2 WOODEN SLABS

Unit 5.3 TYPOLOGY AND CONSTRUCTIVE SOLUTIONS

Unit 6: CONSTRUCTION OF THE MIXED MATERIAL STRUCTURES

ADDITIONAL COMMENTS, REMARKS

The syllabus will be developed through the monitoring and application of the knowledge acquired about each student's own project. This project may be applicable in other subjects. The modeling will allow to locate and coordinate the structural elements within a virtual parametric model.

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]	Lectures	E15 E16 E29 G01 G06	2	50	N	-	-	
Study and Exam Preparation [OFF-SITE]	Self-study	E15 G01 G03 G04 G06 G16 G22	2.2	55	N	-	-	
Class Attendance (practical) [ON-SITE]	Problem solving and exercises	E15 E16 G01 G03 G04 G05 G06 G22	1	25	Y	N	Y	
Study and Exam Preparation [OFF-SITE]	Problem solving and exercises	E15 G01 G02 G04 G05 G06 G21 G22	1	25	N	-	-	
Progress test [ON-SITE]	Case Studies	E15 G01 G02 G04 G06 G07 G12 G15 G19 G21 G23	0.3	7.5	N	-	-	
Other off-site activity [OFF-SITE]	Guided or supervised work	E15 E16 G01 G03 G05 G07 G15 G21 G22	1.1	27.5	Y	N	Y	
Analysis of articles and reviews [OFF-SITE]	Reading and Analysis of Reviews and Articles	E15 G01 G03 G05 G06 G07 G16 G21	1.1	27.5	Y	N	Y	
Final test [ON-SITE]	Assessment tests	E15 G01 G02 G03 G04 G05 G06 G07 G12 G15 G16 G19 G21 G22 G23	0.2	5	Y	Y	Y	
Individual tutoring sessions [ON-SITE]	Self-study	E15 G01 G03 G05 G07 G15 G16 G21	0.1	2.5	N	-	-	
			9	225	Y	N	Y	
			9	225	Y	N	Y	
			9	225	Y	N	Y	
			9	225	Y	N	Y	
Total:			45	1125				
Total credits of in-class work: 3.6				Total class time hours: 90				
Total credits of out of class work: 5.4				Total hours of out of class work: 135				

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	
Progress Tests	10.00%	10.00%	ACTIVE PARTICIPATION IN CLASS IN PROGRESS TESTS
Theoretical papers assessment	10.00%	10.00%	THEORY WORK
Assessment of problem solving and/or case studies	10.00%	10.00%	CLASS PRACTICES
Practicum performance	10.00%	10.00%	FOLLOW UP OF WORK. REAL OR DIGITAL BUILDING
Final test	60.00%	60.00%	FINAL EXAM: 30% THEORY, 30% PRACTICE
Total:	100.00%	100.00%	

Evaluation criteria for the final exam:

THE EXAMINATION OF THE ORDINARY CALL WILL ALWAYS COMPACT 60%. THE CORRESPONDING NOTES WILL BE ADDED TO THE REST OF WORK. IF THE STUDENT CHOOSES NOT TO PRESENT IN THE ORDINARY CALL, THE NOTES OF THEIR WORKS WILL BE SAVED UP TO THE EXTRAORDINARY CALL.

Specifications for the resit/retake exam:

IN THE EXTRAORDINARY CALL, THE NOTES OF THE WORKS WILL BE COMPUTED, SO THAT THE ASSESSMENT OF THE EXAM WILL BE 60%

Specifications for the second resit / retake exam:

IN THE SPECIAL CALL FOR COMPLETION, A SINGLE EXAM WILL BE CARRIED OUT COMPUTING 100%, WITHOUT CONSIDERATION OF THE WORK CARRIED OUT IN THE COURSE OR PREVIOUS COURSES. THE EXAMINATION WILL CONSTITUTE A PRACTICAL PART (50%) AND ANOTHER THEORETICAL (50%).

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Other off-site activity [AUTÓNOMA][Guided or supervised work]	27.5
Analysis of articles and reviews [AUTÓNOMA][Reading and Analysis of Reviews and Articles]	27.5
Final test [PRESENCIAL][Assessment tests]	5
General comments about the planning: The content of the subject will be developed sequentially beginning with topic 1 until it reaches the end of it.	
Unit 1 (de 6): CONSIDERATIONS ON THE CONSTRUCTION OF THE STRUCTURES	
Activities	Hours

Class Attendance (theory) [PRESENCIAL][Lectures]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	2
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	2
Progress test [PRESENCIAL][Case Studies]	.5
Individual tutoring sessions [PRESENCIAL][Self-study]	.25
Teaching period: WEEKS 1 AND 2	
Comment: INTRODUCTION TO THE CONSTRUCTION OF THE STRUCTURES.	
Unit 2 (de 6): FOUNDATION AND CONTAINMENT SYSTEMS	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	18
Study and Exam Preparation [AUTÓNOMA][Self-study]	18
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	6
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	6
Progress test [PRESENCIAL][Case Studies]	1.5
Individual tutoring sessions [PRESENCIAL][Self-study]	1
Teaching period: WEEKS 3 AND 4	
Comment: FOUNDATION AND CONTAINMENT SYSTEMS	
Unit 3 (de 6): CONSTRUCTION OF THE ARMED CONCRETE STRUCTURES	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	9
Study and Exam Preparation [AUTÓNOMA][Self-study]	9
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	6
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	6
Progress test [PRESENCIAL][Case Studies]	1.5
Individual tutoring sessions [PRESENCIAL][Self-study]	.5
Teaching period: WEEKS FROM 5 TO 16	
Comment: CONSTRUCTION OF ARMED CONCRETE STRUCTURES	
Unit 4 (de 6): CONSTRUCTION OF METALLIC STRUCTURES	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	9
Study and Exam Preparation [AUTÓNOMA][Self-study]	9
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	6
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	6
Progress test [PRESENCIAL][Case Studies]	1.5
Individual tutoring sessions [PRESENCIAL][Self-study]	.25
Teaching period: WEEKS FROM 17 TO 23	
Comment: CONSTRUCTION OF STEEL STRUCTURES	
Unit 5 (de 6): CONSTRUCTION OF WOOD STRUCTURES	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	6
Study and Exam Preparation [AUTÓNOMA][Self-study]	6
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	4
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	4
Progress test [PRESENCIAL][Case Studies]	2
Individual tutoring sessions [PRESENCIAL][Self-study]	.25
Teaching period: WEEKS 24 TO 27	
Comment: CONSTRUCTION OF WOOD STRUCTURES	
Unit 6 (de 6): CONSTRUCTION OF THE MIXED MATERIAL STRUCTURES	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	1
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	1
Progress test [PRESENCIAL][Case Studies]	.5
Individual tutoring sessions [PRESENCIAL][Self-study]	.25
Teaching period: WEEKS 28 AND 29	
Comment: CONSTRUCTION OF MIXED MATERIAL STRUCTURES	
Global activity	
Activities	hours
Study and Exam Preparation [AUTÓNOMA][Self-study]	55
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	25
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	25
Progress test [PRESENCIAL][Case Studies]	7.5
Other off-site activity [AUTÓNOMA][Guided or supervised work]	27.5
Class Attendance (theory) [PRESENCIAL][Lectures]	50
Analysis of articles and reviews [AUTÓNOMA][Reading and Analysis of Reviews and Articles]	27.5
Final test [PRESENCIAL][Assessment tests]	5
Individual tutoring sessions [PRESENCIAL][Self-study]	2.5
Total horas: 225	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Harry Parker, James Ambrose	Diseño simplificado de estructuras de madera	Limusa Wiley, cop. 2000	México	968-18-5071-8	2000	
Araujo, Ramón	Construir con acero : arquitectura en España	ENSIDESA		84-87405-10-X	1994	
Araujo, Ramón	Construir con acero : arquitectura en España 1993-2007	APTA		978-84-692-3058-9	2009	
Basterra Otero, Luis-Alfonso	Construcción de estructuras de madera	COACYCLE/Valladolid (Colegio Oficial de Arquitectos de Castilla y León Este)		978-84-8448-530-8	2009	Construcción de estructuras de madera.
Beinhauer, Peter	Atlas de detalles constructivos : con más de 400 ejemplos	Gustavo Gili		978-84-252-2057-9	2006	
Calavera Ruiz, José	Muros de contención y muros de sótano	Instituto Técnico de Materiales y Construccione		84-600-7377-7	1990	
Calavera Ruiz, José	Manual de detalles constructivos en obras de hormigón armado	Instituto Técnico de Materiales y Construccione		84-88764-00-6	1993	
Alberto Pérez, Beatriz Remiro ;	Manual técnico para la construcción con madera laminada	[Navarra] : Paul Gauthier, D.L. 2003	navarra	84-607-7079-6	2003	
Castell, Vicente	Biblioteca de detalles constructivos metálicos, de hormigón	CYPE Ingenieros		84-933675-0-8	2004	
Castell, Vicente	Biblioteca de detalles constructivos metálicos, de hormigón	CYPE Ingenieros		84-933675-0-8	2004	
Castell, Vicente (Castell Herrera)	Biblioteca de detalles constructivos. Forjados inclinados :	CYPE Ingenieros		84-930696-8-X	2004	
Catherine Vandier	Uniones metálicas en estructuras de madera : manual técnico / [dirección, supervisión, y desarrollo de contenidos técnicos,	T&T Aginco, D.L.		84-609-0569-1	2004	
Eduardo Medina Sánchez	Construcción de estructuras de madera	Bellisco Ediciones	Madrid	978-84-92579-84-2	2013	
Medina Sánchez, Eduardo	Construcción de estructuras de madera	Bellisco	Madrid	978-84-92579-84-6	2013	
Regalado Tesoro, Florentino	Breve introducción a las estructuras y sus mecanismos resist	CYPE Ingenieros		84-930696-1-2	1999	
Regalado Tesoro, Florentino	Los forjados reticulares : diseño, análisis, construcción y	CYPE Ingenieros		84-930696-0-4	2003	
Regalado Tesoro, Florentino	Los pilares : criterios básicos para su proyecto, cálculo y	CYPE Ingenieros		84-930696-0-4	1999	
Rodríguez Nevado, Miguel Angel	Diseño estructural de madera : una aproximación en imágenes	AITIM		84-87381-16-2	1999	
Rodríguez-Avial Azcunaga, Fernando	Construcciones metálicas	Librería Bellisco		84-85198-20-4	1987	
Río Zuloaga, Juan Manuel del	La construcción en las estructuras	[s.n.]		84-604-0450-1	1991	
Serrano López, Miguel Ángel	Formulario-prontuario de estructuras : estructuras de acero,	Bellisco		978-84-96486-39-3	2009	
Torroja, Eduardo (1899-1961)	Razón y ser de los tipos estructurales / Eduardo Torroja Mir	Ministerio de Fomento Ministerio de Mdio Ambi		978-84-7790-456-4	2007	
	Acero para estructuras de edificación . Valores estáticos. E	ENSIDESA		84-87405-05-3	1993	
	Casas de madera : los sistemas constructivos a base de mader	Asociación de Investigación Técnica de las Indu		84-87381-08-1	1995	
						CODIGO TECNICO DE LA EDIFICACIÓN
	http://www.codigotecnico.org/web/					CATALOGO DE ELEMENTOS CONSTRUCTIVOS
	http://www.codigotecnico.org/web/recursos/aplicaciones/contenido/texto_0012.html					DETALLES CONSTRUCTIVOS CYPE
	http://detallesconstructivos.cype.es/					

<http://www.geoteknia.com/normas/nte/nte.htm>

<http://www.tectonica.es/>

http://www.detail.de/thema_arquitectura_74_Es.htm

<http://www.infomadera.net/modulos/index.php>

<http://www.ictubular.es/>

NTEs en PDF

REVISTA TECTONICA

REVISTA DETAIL

AITIM (MADERA)

ESTRUCTURAS

METALICAS

TUBULARES