BASIC DETAILS:

Subject:	ESTRUCTURAS I		
Id.:	30200		
Programme:	GRADUADO EN ARQUITECTURA. PLAN 2009 (BOE 21/03/2015)		
Module:	TECNICO		
Subject type:	OBLIGATORIA		
Year:	2	**Teaching period:**	Primer Cuatrimestre
Credits:	3	**Total hours:**	75
Classroom activities:	28	**Individual study:**	47
Main teaching language:	Inglés	**Secondary teaching language:**	Castellano
Lecturer:	BERTOL GROS, ANA (T)	**Email:**	abertol@usj.es

PRESENTATION:

This is the first contact the students of architecture have with engineering inside the degree. Thus, the course is proposed as a transition from architectural to structural concepts. The course's main goal is for the student to acquire the fundamental concepts of resistance, equilibrium and stability, the three concepts needed to design a structure.

The course will begin with the understanding of the forces affecting a building. Afterwards, the course will focus on the inner forces affecting a structure's different elements. For this, it will focus on the different geometry and materials which are part of a structure. Once all this basic concepts are stablished, the course will focus on more complex matters, such as strains, deflections and strength, so that the student will be ablo to calculate and understand the bending moment and axial force diagrams.

With all of this knowledge, the student will be able to comprehend the way a structure behaves, being able to analyze and design a structure for any kind of typology. Therefore, the course is the student's first contact with Continuous Mechanics and the technological disciplines that derive from it. It is therefore a fundamental preliminary step for the understanding of basic concepts further developed in subsequent courses.

PROFESSIONAL COMPETENCES ACQUIRED IN THE SUBJECT:

General programme competences	G02	Ability to resolve problems and make decisions throughout their lifetime and choose professional and educational pathways independently.
	G03	Ability for autonomous learning and self-criticism.
	G04	Ability to transfer the knowledge acquired in practical work and skills to the field of work.
	G06	Demonstrate critical and analytical ability to conventional approaches of the discipline.
Specific programme competences	E03	Knowledge applied to: Numeracy, analytical and differential geometry and algebraic methods.
	E04	Ability to conceive, calculate, design, integrate into buildings and urban units and execute: Building structures (T); Interior division systems, carpentry, stairways and other finished work (T); Locking systems, roof and other structural work (T); Foundation Solutions (T); Supply facilities, water treatment and disposal, heating and air conditioning (T).
Regulated profession competences	P06	Ability to understand the architectural profession and its role in society, in particular by developing projects that take social factors into account.
	P08	Understand the problems of the structural design, construction and engineering associated with building projects.
	P09	Adequate knowledge of physical problems and the different technologies and of the function of buildings so as to provide them with internal conditions of comfort and protection against the climate conditions.
	P10	Design capacity to meet the requirements of building users within the limits imposed by budget factors and building regulations.
Learning outcomes	R01	Resolve structural problems applying fundamentals of statics and strength of materials.
	R02	Understand the concept of tension, compression and bending, as well as the effect on structural systems used in buildings.
	R03	Understand the concept of shear and axial bending and torque, as well as the effect on

		structural systems used in buildings.
	R04	Resolve structural problems relating to the static degree of the structure and understand know how to use knots systems and structural links between the different elements that make up a structure.
	R05	Predict and analyse qualitative and quantitative diagrams of shear and bending moments.
	R06	Calculate deformations of structural elements subjected to simple loads using different methods.

PRE-REQUISITES:

Students are required to have physics and maths basic knowledge, as taught on the previous year, to be able to fully understand the course's new concepts. Furthermore, there will be needed willingness to work, in a guided but autonomous way, those concepts which require a complementary review.

DISCLAIMER: Students who have another course with the same schedule, have the obligation to attend the more recent enrollment course, while assuming the responsability of working and studying for the course as proposed in this guide, but in an autonomous way.

SUBJECT PROGRAMME:

Subject contents:

1 - INTRODUCTION TO BUILDING STRUCTURES
1.1 - New vocabulary
1.2 - Physics concepts
2 - WHAT IS A STRUCTURE?
2.1 - Sructural geometry
2.2 - Structural materials
2.3 - Structural forces
3 - LOADS THAT AFFECT A STRUCTURE
3.1 - Stress-Strain
3.2 - Axial force
3.3 - Bending
3.4 - Shear
3.5 - Torsion
4 - STRESS DIAGRAMS
4.1 - Bending moment diagrams
4.2 - Shear force diagrams
5 - STRESS-STRAIN
5.1 - Mohr's circle
5.2 - Longitudinal stress
5.3 - Tangential stress
6 - STRUCTURAL SAFETY
6.1 - Failure methods
6.2 - Ultimate limit state
6.3 - Serviceability limit state
7 - STRUCTURAL FORCES
7.1 - Forces in nature
7.2 - Calulation of forces acting on a building

Subject planning could be modified due unforeseen circumstances (group performance, availability of resources, changes to academic calendar etc.) and should not, therefore, be considered to be definitive.

TEACHING AND LEARNING METHODOLOGIES AND ACTIVITIES:

Teaching and learning methodologies and activities applied:

As this is the first time students will have to learn not only new structural knowledge but also in a different language. And to ensure a fruitful achievement of the course's competences. The majority of the effort and work for this course will take place during class time. Being utterly important that students attend all of the sessions.

There will be theorical lessons where the teacher will teach the new concepts through a reflexion process, intreacting with the students. For this activity the teacher will have the support of TIC methodoloies (blackboard, computer and projector).

There will be practical sessions where students will be guided by the teacher, conveniently grouped, to solve the practical exercises proposed each lesson, solving any doubt that may arise during the activity.

The exercises proposed in class wil be solved colectively. The teacher will explain the proccess that should be followed and will stress out the most important concepts in relation with the theory. Afterwards each student can check his results.

There will be some written tests where the teacher will be able to evaluate whether the competences of the course have been rightly acquired and aknowledged by the students.

There will be tutorial sessions where the student will be able to ask any question or problem they may be facing during the development of the course. This consultation could be made in person or through webmail.

Students must study the course during his autonomous time. The student will have different source of information (notes, books, webages,...) to solve and comprehend the exercises proposed during the course.

Students attendance to all of the proposed activities is compulsory. Students must take the orientations derived from each master class, prepare the practical activities prior to the attendance to each lecture and study continuosly to comprehend all of the course's learning objectives. Students will be evaluated continuously and systematically throughout the four-month period. The student is responsible for properly planning their work in accordante witht the indications of this teaching guide and the instructions received from the teacher; as well as to clarify any doubt that may arise from the study of the course.

Student work load:

Teaching mode	Teaching methods	Estimated hours
Classroom activities	Master classes	9
	Practical exercises	4
	Practical work, exercises, problem-solving etc.	8
	Other practical activities	3
	Assessment activities	4
	Asistencia a tutorías	0
Individual study	Tutorials	2
	Individual study	15
	Individual coursework preparation	20
	Project work	2
	Research work	4
	Other individual study activities	4
	Total hours:	75

ASSESSMENT SCHEME:

Calculation of final mark:

Written tests:	15	%
Individual coursework:	15	%

Group coursework:	10	%
Final exam:	50	%
Participation:	10	%
TOTAL	100	%

*Las observaciones específicas sobre el sistema de evaluación serán comunicadas por escrito a los alumnos al inicio de la materia.

BIBLIOGRAPHY AND DOCUMENTATION:

Basic bibliography:

GERE, James M. Timoshenko: Resistencia de Materiales. Thomson, 2006.
ORTIZ BERROCAL, L. Resistencia de materiales. McGraw Hill, 2007.
GORDON, John Edward. Estructuras o por qué las cosas no se caen. Calamar Ediciones, 2006.

Recommended bibliography:

BEER, Ferdinand P. Mecánica de Materiales. Mc. Graw-Hill, 2007.
SALVADORI, Mario. Why Buildings Stand Up: Strength of Architecture from the Pyramids to the Skyscraper. Norton, 2002.
MATTHYS, Levy. Why buildings fall down. Norton, 2002.
NASH, William A. Teoría y Problemas de Resistencia de Materiales. Schaum, Mc. Graw-Hill, 1992

Recommended websites:

Estructurando	http://estructurando.net/