



## Teaching Guide

Identifying Data					2016/17
Subject (*)	Physics 1		Code	630G01008	
Study programme	Grao en Arquitectura				
Descriptors					
Cycle	Period	Year	Type	Credits	
Graduate	2nd four-month period	First	FB	6	
Language	SpanishEnglish				
Teaching method	Face-to-face				
Prerequisites					
Department	Tecnoloxía da Construción				
Coordinador	Vazquez Rodriguez, Jose Antonio	E-mail	jose.vazquez@udc.es		
Lecturers	Vazquez Rodriguez, Jose Antonio	E-mail	jose.vazquez@udc.es		
Web	<a href="http://www.estructuras.udc.es">http://www.estructuras.udc.es</a>				
General description	<p>Esta asignatura tiene extinguida su docencia de acuerdo con el cronograma de implantación de la titulación de Grado en Estudios de Arquitectura.</p> <p>Todos los alumnos de la asignatura deben conocer, comprender y saber manejar con soltura los contenidos básicos que integran el documento disponible en este enlace <a href="http://etsa.udc.es/web/wp-content/uploads/2012/06/Precurso-Física.pdf">http://etsa.udc.es/web/wp-content/uploads/2012/06/Precurso-Física.pdf</a></p>				

## Study programme competences

Code	Study programme competences
A53	CÁLCULO MATEMÁTICO: comprensión ou coñecemento do cálculo numérico, a análise matemática, a xeometría analítica e diferencial e os métodos alxebraicos, como bases do entendemento dos fenómenos físicos que atinxen aos sistemas, equipos e servizos propios da edificación e o urbanismo.
A56	BASES DE MECÁNICA XERAL: comprensión ou coñecemento dos principios da mecánica básica e aplicada, a estática, a xeometría de masas e os campos vectoriais e tensoriais necesarios para entender as condicións de equilibrio dos edificios e obras civís e de urbanización.
A57	MECÁNICA ESTRUCTURAL E DO TERREO: comprensión ou coñecemento dos principios de mecánica de sólidos e de medios continuos, dos de mecánica do solo e das calidades plásticas, elásticas e de resistencia dos distintos materiais empregados en estruturas portantes, obra civil e cimentacións.
B1	Learn how to learn
B2	Resolver problemas de forma efectiva.
B3	Aplicar un pensamento crítico, lóxico e creativo.
B4	Traballar de forma autónoma con iniciativa.
B5	Traballar de forma colaborativa.
B7	Comunicarse de maneira efectiva nun entorno de traballo.
B11	Capacidade de análise e síntese.
B12	Toma de decisións.
B18	Razoamento crítico.
B21	Intuición mecánica.
B24	Coñecementos de informática relativos ao ámbito de estudo.
B28	Comprensión numérica.
C1	Expresarse correctamente, tanto de forma oral coma escrita, nas linguas oficiais da comunidade autónoma.
C2	Dominar a expresión e a comprensión de forma oral e escrita dun idioma estranxeiro.
C3	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
C6	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.

## Learning outcomes



Learning outcomes	Study programme competences		
1- Determine the equilibrium conditions of a rigid body in the plane as much space.	A53 A56	B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28	C1 C2 C3 C6
2- Knowing the kind of connection of isostatic structure	A53 A56 A57	B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28	C1 C2 C3 C6
3- Evaluate reactions of isostatic structure	A53 A56 A57	B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28	C1 C2 C3 C6
4- Know and calculate the internal forces of isostatic frame structure (shear, bending, ....)	A53 A56 A57	B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28	C1 C2 C3 C6



5- Learn a mixed structure subdivided into parts to proceed with its independent calculation	A53 A56 A57	B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28	C1 C2 C3 C6
6- Know and calculate the internal force of isostatic articulated structure (tensile and compressive forces. ...)	A53 A56 A57	B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28	C1 C2 C3 C6
7- Know and calculate internal forces of isostatic structure cables (tensile forces)	A53 A56 A57	B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28	C1 C2 C3 C6
8- Locate the mass center of a rigid body.	A53 A56 A57	B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28	C1 C2 C3 C6



9- Calculate moments and product of inertia of area respect to a plane, axes or point	A53 A56 A57	B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28	C1 C2 C3 C6
10- Evaluate the connections in a structure by energy methods / virtual work	A53 A56 A57	B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28	C1 C2 C3 C6

Contents	
Topic	Sub-topic
1- STATIC SOLID RIGID	Review of Mechanics. Concept of force Basic hypothesis Force systems. Properties: Composition of forces. Resultant. Moment of a force respect to a point. Moment of the system. Moment of a force respect to axes. Moment of the system. Torque. Pair composition force. Reduction systems. Invariant of a system. Central axes. Equilibrium conditions in 3D and 2D. Particular cases: Solid rigid balance under the action of two forces. Solid rigid balance under the action of three forces.



<p>2- CONNECTIONS AND REACTIONS FORCES. EQUILIBRIUM OF RIGID SOLID</p>	<p>Introduction. Concept of rigid solid. Free Solid / Solid linked. Support, connection and joint. Definition. Classifications. Active Forces (or actions) and Reactive Forces (or effects). Freedom Degree: Internal, External and Total. Connection or constraints two-dimensional systems (2D). Connection in three-dimensional systems (3D). Immobilization of the body: 2D and 3D. Isostatic, hyperstatic and mechanisms systems. Balance in two-dimensional. Calculation of reactions. Balance in three-dimensional. Calculation of reactions. Diagram of rigid solid.</p>
<p>3- ARTICULATED STRUCTURAL ANALYSIS</p>	<p>Introduction. External and internal forces. Equilibrium of solid under action of two forces Axial forces: Tension and Compression Truss structures. Definition. Basic hypothesis . Types Condition Isostatic system Calculation methods truss structures Method sections or Ritter Method joints Particular load cases</p>
<p>4- BEAMS: EXTERNAL AND INTERNAL FORCES</p>	<p>Introduction. Prismatic section. Beams. Types of beams. Loads. Types of loads. External and internal forces. Sign convention. Balance of a section. Axial, shear and bending moments diagrams Drawing diagrams Supported at one articulated at end beam with concentrated load Supported at one articulated at end with uniformity distributed load. Cantilever with concentrated load Cantilever with uniformity distributed load.</p>
<p>5- ISOSTATIC BEAM RESOLUTION</p>	<p>Beams with any types of load Inclined beams with any types of load Beams with hinged connection and intermediate supports: Gerber beam. Broken beams</p>
<p>6- RESOLUTION OF ISOSTATIC PORTAL FRAME</p>	<p>Definition. Types Method of study Portal frame supported-articulated Portal frame with cantilevers Three articulated portal frame Compound porches</p>
<p>7- CABLE STRUCTURES</p>	<p>Basic hypothesis Solidification principle. Balance. Cables with concentrated loads Cables with distributed load Differential equation of a cable Parabolic cable.</p>



8- GRAVITY CENTER AND MASS CENTER	<p>Introduction. Center parallel forces system            Weight and mass. Gravity center and mass center            Application to Discrete Systems and Dynamic Systems            Gravity center of surface. Centroids            Static moment            Properties of the center of mass.            Pappus-Guldin theorems</p>
9-MOMENTS OF INERTIA	<p>Introduction            Moments of inertia of a particles system            Product of inertia of a particles system            Properties            Moments and products of inertia of continuous systems            Moments and products of inertia of plane systems            Moments and products of inertia of surfaces and lines            Distributive property            Steiner theorem applied to moments of inertia            Steiner theorem on products of inertia            Moments of inertia of compound areas            Turning radius of an area.            Moment of inertia about any straight line. Rotation of Axes            Principal axis of inertia            Principal moments of inertia            Maximum and minimum moments of inertia            Mohr circle for moments and products of inertia            Graphical representation of the Mohr circle</p>
10-METHOD OF VIRTUAL WORKS	<p>Introduction            Work of a system of forces on a rigid solid            Definition virtual displacement. Virtual work            Principle of virtual works</p>

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Multiple-choice questions	A53 A56 A57 B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28 C1 C2 C3 C6	1	22	23
Objective test	A53 A56 A57 B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28 C1 C2 C3 C6	3	123	126
Personalized attention		1	0	1
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Multiple-choice questions	A multiple choice test will assess the level of learning by the student on theoretical and practical aspects of the subject.
Objective test	Numerical and graphical issues will be proposed on the contents of the subject and the supporting literature will arise. It will assess the level of learning by the student around practical aspects of the subject.



## Personalized attention

Methodologies	Description
Multiple-choice questions Objective test	<p>Attendance and activity will be controlled to the student. He will prove his autonomous work with the delivery of a series of individual solved exercises.</p> <p>A minimum of five exercise of each of the topics of the subject what will be delivered on deadlines determined by the teacher in class.</p> <p>The tutorial schedule for the personalized attention to the student will be exposed in the notice board and web.</p>

## Assessment

Methodologies	Competencies	Description	Qualification
Multiple-choice questions	A53 A56 A57 B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28 C1 C2 C3 C6	The accuracy in answering ten questions about practical and theoretical aspects with four options, of which only one is correct. Wrong answers do not subtract . His calculation of the total assessment of the subject will be two points [2ptos.] A minimum of 1 point is established in this test to pass the course, otherwise the student will be qualified as not presented, do not meet the requirements for the consideration of the objective test.	25
Objective test	A53 A56 A57 B1 B2 B3 B4 B5 B7 B11 B12 B18 B21 B24 B28 C1 C2 C3 C6	<p>Three problems or case studies based on the contents and bibliography are raised. Students will give numerical answer to each of them even showing the results graphically. The maximum note of this part is six points [6 pts.]</p> <p>The exam is individual; non-compliance with this requirement will result in his expulsion and implementation of current regulations. Mobile phones turn on, during the examination, is strictly prohibited. During the development of theoretical test, materials of any kind will not be allowed except for pens; while for the realization of the practical question, calculator and drawing materials should be used.</p> <p>Each problem will be answered and will qualify in a DIN A3 format. Each one will be delivered independently, written in indelible ink. The result will be given so that it is clearly visible, indicating the numeric value with precision and its corresponding units. Invalid parties must be clearly crossed out. All papers submitted, tehorical and practical test, will take written the name of the student and his group to be corrected.</p>	75
Others			

## Assessment comments



## CRITERIA

### FOR OBTAINING A FAVORABLE EVALUATION:

Approved is

set in five points over ten possible according to this breakdown (idem in 1st and 2nd chance):

Theory test

multiple choice: 2,5 pts. [1 point minimum is required to consider practical objective tests]

Practical

objective test: 7,5 pts.

## CRITERIA OF

**CORRECTION:** adjusted to those derived from professional reality of the architect. As a general rule, misconceptions and numerical error are valued according to their seriousness, and may nullify the exercise; for example a wrong sign means an error of 200%.

### Sources of information

<b>Basic</b>	<ul style="list-style-type: none"> <li>- Gere, James (2002). Resistencia de Materiales. Editorial Thomson</li> <li>- Beer. F.P. &amp; Johnson. (). Mecánica Vectorial para Ingenieros. Estática. Ed. McGraw-Hill.</li> <li>- Lamas, V; Otero, Mª Dolores (2002). Cálculo de estructuras articuladas. Editorial Gráficas del Noroeste</li> <li>- Meriam, J.L. ? Kraige, L.G (). Mecánica para Ingenieros. Estática. Editorial Reverté</li> <li>- Durá Doménech, A. ? Vera Guarinos, J. (). Fundamentos Físicos de las Construcciones Arquitectónicas . Universidad de Alicante</li> <li>- Lamas, V; Otero, Mª Dolores (2002). Cálculo de solicitaciones en vigas isostáticas. Editorial Gráficas del Noroeste</li> <li>- Fontán, A; Nogueira, P; Pico; J.M.; Vázquez, J.A. (2004). Precurso I. Física. Vicerrectorado de Innovación Tecnológica</li> </ul>
<b>Complementary</b>	- Herrero Arnaiz ? Rodríguez Cano ? Vega González (). Estática: Problemas Resueltos. Editorial Reverté

### Recommendations

#### Subjects that it is recommended to have taken before

#### Subjects that are recommended to be taken simultaneously

Proxectos I/630011106  
 Xeometría Descritiva I/630011102  
 Debuxo I/630011103  
 Fundamentos Físicos na Arquitectura I/630011104  
 Fundamentos Matemáticos na Arquitectura I/630011105  
 Construción I/630011107  
 Xeometría Descritiva II/630011108  
 Fundamentos Matemáticos na Arquitectura II/630011110

#### Subjects that continue the syllabus

Física 2/630G01013  
 Estruturas 1/630G01019

#### Other comments



