Teaching Guide				
Identifying Data				2015/16
Subject (*)	Física para a Arquitectura 1		Code	630G02008
Study programme	Grao en Estudos de Arquitectura			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	First	Obligatoria	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	Aragon Fitera, Jorge Cuba Cabana, Hilda Dominguez Diez, Javier Faustino Lamas Lopez, Valentin Vazquez Rodriguez, Jose Antonio	E-mail	j.aragon@udc.es hilda.cuba@udc.es javier.dominguez@udc.es valentin.lamas@udc.es jose.vazquez@udc.es	
Web	http://www.estructuras.udc.es			
General description	La asignatura se estructura en parte teórica y parte práctica, ésta impartida en grupo reducido. En las clases teóricas, la labor expositiva del profesor resulta predominante, si bien el alumno participará de forma activa en su desenvolvimiento. Esta labor se completa con la resolución por parte del alumno de diversos ejercicios sobre los temas del programa propuestos por el profesor durante las clases de prácticas. 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 http://etsa.udc.es/web/wp-content/uploads/2012/06/Precurso-Física.pdf			

Study programme competences	
Code	Study programme competences
A7	"Knowledge of the principles of general mechanics, statics, mass geometry and vector and tensor fields, adapted and applied to architecture and urbanism "
A63	Development, presentation and public review before a university jury of an original academic work individually elaborated and linked to any of the subjects previously studied
B1	Students have demonstrated knowledge and understanding in a field of study that is based on the general secondary education, and is usually at a level which, although it is supported by advanced textbooks, includes some aspects that imply knowledge of the forefront of their field of study
B2	Students can apply their knowledge to their work or vocation in a professional way and have competences that can be displayed by means of elaborating and sustaining arguments and solving problems in their field of study
B3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgements that include reflection on relevant social, scientific or ethical issues
B4	Students can communicate information, ideas, problems and solutions to both specialist and non-specialist public
B5	Students have developed those learning skills necessary to undertake further studies with a high level of autonomy
B6	Knowing the history and theories of architecture and the arts, technologies and human sciences related to architecture
B9	Understanding the problems of the structural design, construction and engineering associated with building design and technical solutions
C1	Expressing themselves correctly, both orally and in writing, in the official languages of the autonomous region
C3	Using basic tools of information technology and communications (ICT) necessary for the exercise of the profession and for lifelong learning
C5	Understanding the importance of entrepreneurship and knowing the means available to the enterpreneur
C6	Critically evaluate the knowledge, technology and information available to solve the problems they must face
C7	Assuming as professionals and citizens the importance of learning throughout life

C8	Assessing the importance of research, innovation and technological development in the socio-economic advance of society and culture

Learning outcomes			
Learning outcomes	Study programme competences		
1- Determine the equilibrium conditions of a rigid body in the plane as much space.	A7 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C5 C6 C7 C8
2- Knowing the kind of connection of isostatic structure	A7 A63	B1 B2 B3 B4 B5 B6 B9	C3 C5 C6 C7 C8
3- Evaluate reactions of isostatic structure	A7 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C5 C6 C7 C8
4- Know and calculate the internal forces of isostatic frame structure (shear, bending, ...)	A7 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C5 C6 C7 C8
5- Learn a mixed structure subdivided into parts to proceed with its independent calculation	A7 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C5 C6 C7 C8
6- Know and calculate the internal force of isostatic articulated structure (tensile and compressive forces. ..)	A7 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C5 C6 C7 C8

7- Know and calculate internal forces of isostatic structure cables (tensile forces)	A7 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C5 C6 C7 C8
8- Locate the mass center of a rigid body.	A7 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C5 C6 C7 C8
9- Calculate moments and product of inertia of area respect to a plane, axes or point	A7 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C5 C6 C7 C8
10- Evaluate the connections in a structure by energy methods / virtual work	A7 A63	B1 B2 B3 B4 B5 B6 B9	C1 C3 C5 C6 C7 C8

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.

2- LINKS AND REACTIONS FORCES. EQUILIBRIUM OF RIGID SOLID	Introduction. Concept of rigid solid. Free Solid / Solid linked. Support, connection and joint. Definition. Classifications. Active Forces (or actions) and Reactive Forces (or effects). Freedon Degreem: 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.
3- ARTICULATED STRUCTURAL ANALYSIS	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
4- BEAMS: EXTERNAL AND INTERNAL FORCES	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 uniform distributed load. Cantilever with concentrated load Cantilever with uniformity distributed load.
5- ISOSTATIC BEAMS RESOLUTION	Beams with any types of load Inclined beams with any types of load Beams with hinged connection and intermediate supports: Gerber beam. Broken beams
6- RESOLUTION OF ISOSTATIC PORTAL FRAME	Definition. Types Method of study Portal frame supported-articulated Portal frame with cantilevers Three articulated portal frame Compound porches
7- CABLE STRUCTURES	Basic hypothesis Solidification principle. Balance. Cables with concentrated loads Cables with distributed load Differential equation of a cable Parabolic cable.

8- GRAVITY CENTER AND MASS CENTER	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. Papus-Guldin theorems
9-MOMENTS OF INERTIA	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
10-METHOD OF VIRTUAL WORKS	Introduction Work of a system of forces on a rigid solid Definition virtual displacement. Virtual work Principle of virtual works

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Introductory activities	B1 B2 B3 B4 C3	2	1	3
Guest lecture / keynote speech	A7 A63 B1 B2 B3 B4 B5 B6 B9 C5 C6 C7 C8	27	40.5	67.5
Problem solving	A63 A7 B1 B3 B4 B5 B6 B9 C3 C5 C6 C7 C8	22	22	44
Multiple-choice questions	A6 A53 A56 A57 B12 B18 B28 C3	1	0	1
Objective test	A7 A63 B1 B2 B3 B4 B5 B6 B9 C1 C3 C5 C6 C7 C8	5	0	5
Diagramming	A63 A7 B1 B2 B3 B4 B5 B9 C1 C3 C6 C7	0	0.5	0.5
Glossary	A6 A53 A56 A57 B1 B2 B3 B9 B11 B12	0	1	1

Supervised projects	A7 A63 B1 B2 B3 B4 B5 B6 B9 C1 C3 C5 C6 C7 C8	2	20	22
Workbook	A7 B1 B2 B3 B4 B5 B6 B9 C3 C5 C6 C7 C8	0	5	5
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**
Introductory activities	Presentation on the subject, explaining its working and aims. Right after class is taught on structural types and overview of vector mechanic.
Guest lecture / keynote speech	Classes in which the teacher will present on the board or searchlight content of theoretical and practical matters.
Problem solving	In small group class the teacher will propose a series of practical problems that students will solve, partially or totally, with help and advice of teacher.
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.
Diagramming	Shorts brief introductions in diagram mode to each topic seek to relate the contents of the subject around the knowledge map of the degree.
Glossary	Student will produces a summary sheet with definitions, formulas and physical units related to each of the topics of the subject.
Supervised projects	Students handed over to the teacher at least five resolved problems of each of the topics of matter, must be made on an individual and personal and It will be delivered in paper format A4 manuscript. It will serve, added with attendance requirements, to have access to additional mark of the subject.
Workbook	The student will selects and analyzes exercise and / or mechanical theory in the bibliography, basic and supplementary, identified by teachers in this guide.

Personalized attention	
Methodologies	**Description**
Supervised projects	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. 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. The tutorial timetable for the personalized attention to the student will be exposed in the notice board and web.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Problem solving	A63 A7 B1 B3 B4 B5 B6 B9 C3 C5 C6 C7 C8	Solution in the classroom, individually, of issues proposed by the teacher throughout the course.	15

Multiple-choice questions	A6 A53 A56 A57 B12 B18 B28 C3	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.	20
Objective test	A7 A63 B1 B2 B3 B4 B5 B6 B9 C1 C3 C5 C6 C7 C8	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.] 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. 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.	60
Supervised projects	A7 A63 B1 B2 B3 B4 B5 B6 B9 C1 C3 C5 C6 C7 C8	The student will need to raise and resolve individually at least five exercises described in the section of the subject content; the teacher will establish them in a timely manner throughout the course along with their deadline.	5
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: 2ptos. [1 point minimum is required to consider practical
objective tests]
Practical
objective test: 6 pts.
Problem
solving and supervised work along the course: 2 pts

a) First chance: the end the fourth month
period, students will have access to the assessment provided that have filled
the different controls of assistance to be presented by the teacher and / or
properly solved exercises, reaching a minimum of 80% of the total.
Noncompliance by the student will imply a rating of NOT PRESENTED and a rating
of 0 points in the section on troubleshooting and supervised works for second
chance.
b) Second chance: It will be open to all
students enrolled in the course maintaining the breakdown of scores for the
first opportunity.

Clarification for assistance and evaluation
for students in second and subsequent enrollment in the course:
-
If the student not exceed 40% of the total assistance may not be admited at the
first opportunity but yes to the second, but only about eight points.
-
If the student over 40% of total assistance, only to theoretical teaching, may
be admited to first chance but only about eight points.
-
A student of second and subsequent enrollment will be eligible for additional
qualification when, after more than 40% assistance the theoretical and practical
sessions, the teacher can to assign an additional mark in terms of practices
and dossiers to be submitted along the academic year.

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

Basic	- Gere, James (2002). Resistencia de Materiales. Editorial Thomson - Beer. F.P. & Jonhson. (). Mecánica Vectorial para Ingenieros. Estática. Ed. McGraw-Hill. - Lamas, V; Otero, Mª Dolores (2002). Cálculo de estructuras artículadas. Editorial Gráficas del Noroeste - Meriam, J.L. ? Kraige, L.G (). Mecánica para Ingenieros. Estática. Editorial Reverté - Durá Doménech, A. ? Vera Guarinos, J. (). Fundamentos Físicos de las Construcciones Arquitectónicas . Universidad de Alicante - Lamas, V; Otero, Mª Dolores (2002). Cálculo de solicitaciones en vigas isostáticas. Editorial Gráficas del Noroeste - Fontán, A; Nogueira, P; Pico; J.M.; Vázquez, J.A. (2004). Precurso I. Física. Vicerrectorado de Innovación Tecnológica
Complementary	- 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
For proper monitoring of the course is the essential previous mastery of the following topics by the students:Logical reasoning. Calculate vector. Unit systems. Calculate matrix. Geometry and trigonometry. Derivation and integration. Solving systems of equations. All students of the subject should know, understand and know how to manage the content available on this link:http://etsa.udc.es/web/wp-content/uploads/2012/06/Precurso-Física.pdf