Teaching Guide				
Identifying Data				2019/20
Subject (*)	Descriptive Geometry		Code	670G01004
Study programme	Grao en Arquitectura Técnica			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	First	Basic training	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Expresión Gráfica Arquitectónica			
Coordinador	Fernández Álvarez, Ángel José	E-mail	angel.fernandez.alvarez@udc.es	
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General description	Descriptive Geometry aims geometric rationalization of space issues. In the academic field, this is the unit that serves as a base for other specialized graphics disciplines such as Architectural Graphic Expression, Topography and Technical Projects and the use of Computer Aided Design and Computer Graphics. In the professional field, being able to read and understand construction plans is a basic skill in order to execute the work properly. This implies a knowledge of of representation methodology, whose base is the Descriptive Geometry. In the field of writing technical projects, Descriptive Geometry provides the academic training of the necessary spatial vision for the creation of the three dimensional final solution. Through plans and sketches, this course provides the theoretical foundation basics of the different representation systems. This, as well as providing students with the capability to develop their creativity and imagination, are the reasons why this course is an essential pillar in the Degree in Engineering Building. Furthermore, the contribution to professional practice is clear, in terms of representation, resolution and restitution of any space or 3D-element in the field of construction.			

Study programme competences / results	
Code	Study programme competences / results
A2	Adquirir os coñecementos fundamentais sobre os sistemas e aplicacións informáticas específicos e xerais utilizados no ámbito da edificación.
A6	Coñecer e aplicar os distintos sistemas de representación así como as técnicas e procedementos de expresión gráfica aplicados á edificación e ás construcións arquitectónicas.
B1	Capacidade de análise e síntese.
B3	Capacidade para a procura, análise, selección, utilización e xestión da información.
B4	Coñecementos de informática relativos ao ámbito de estudo.
B5	Capacidade para a resolución de problemas.
B7	Capacidade de traballo en equipo.
B8	Capacidade para traballar nun equipo de carácter interdisciplinario.
B12	Razoamento crítico.
B14	Aprendizaxe autónomo.
B16	Capacidade de aplicar os coñecementos na práctica.
B17	Creatividade e innovación.
B25	Hábito de estudo e método de traballo.
B27	Capacidade de comunicación a través da palabra e da imaxe.
C1	Adequate oral and written expression in the official languages.
C3	Using ICT in working contexts and lifelong learning.
C4	Acting as a respectful citizen according to democratic cultures and human rights and with a gender perspective.
C5	Understanding the importance of entrepreneurial culture and the useful means for enterprising people.

C6	Acquiring skills for healthy lifestyles, and healthy habits and routines.
C7	Developing the ability to work in interdisciplinary or transdisciplinary teams in order to offer proposals that can contribute to a sustainable environmental, economic, political and social development.
C8	Valuing the importance of research, innovation and technological development for the socioeconomic and cultural progress of society.
C9	Ability to manage times and resources: developing plans, prioritizing activities, identifying critical points, establishing goals and accomplishing them.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Understanding the geometry as a graphic model able to establish spatial relationships that allow understanding, description and control of construction and architectural forms.	A6	B1 B4 B7 B12 B14 B25	C1 C3 C6 C7 C8
Knowing and applying graphical representations used in building and architecture through different systems, procedures and techniques.	A2 A6	B1 B4 B7 B12 B14 B16 B25 B27	C1 C3 C6 C8
Identifying and understanding spatial relationships and the connection between the real sensible space and geometric space represented.	A6	B1 B4 B7 B12 B14 B25	C1 C3 C5 C6 C8
Knowing the theoretical foundations of the different systems of graphic representation by applying them in building and architecture.	A6	B1 B4 B12 B14 B16 B25 B27	C1 C3 C6 C8
Knowing the main bodies and geometric surfaces in constructive and architectural applications, both in terms of mathematical concept as analysis and graphical representation in major systems.	A2 A6	B1 B3 B4 B5 B7 B12 B14 B16 B25 B27	C1 C3 C4 C6 C8

Developing the ability known as "spatial imagination" so the student can "think space" (three-dimensional), an object represented in the plane (two dimensions), as well as being able to represent in the plane what has been previously imagined in space.	A2 A6	B1 B3 B4 B5 B7 B12 B14 B16 B17 B25 B27	C1 C3 C6 C7 C8
Knowing the complements of plane, spatial or projective geometry in general, necessary for the theoretical development of the course.	A6	B1 B3 B4 B7 B12 B14 B17 B25 B27	C1 C3 C6 C8
Knowing the terminology, fundamental concepts, conventions and theoretical principles that define the elements of Representation Systems in Building.	A6	B1 B4 B5 B8 B12 B14 B16 B25 B27	C1 C3 C4 C5 C6 C7 C8
Knowing and applying methods and paths of Representation Systems used in Building and Architecture.	A2 A6	B1 B3 B4 B5 B8 B14 B16 B25 B27	C1 C3 C4 C5 C6 C7 C8
Developing habits of clarity, simplicity and precision and the ability of understanding, analysing and synthesising knowledge and application of methods and paths of representation systems.	A6	B1 B3 B4 B5 B8 B12 B14 B16 B25 B27	C1 C3 C4 C5 C6 C7 C8 C9

Learning to evaluate the solution of chosen paths using logical, coherent and technical criteria.	A6	B1 B4 B5 B8 B12 B14 B16 B25 B27	C1 C3 C4 C5 C6 C7 C8
Applying the methods and layouts of each of the studied Representation systems to the resolution of practical exercises.	A6	B1 B3 B4 B5 B8 B12 B14 B16 B25 B27	C1 C3 C4 C5 C6 C7 C8 C9
Representing the primary geometric shapes in any position in space.	A2 A6	B1 B4 B5 B8 B12 B14 B16 B25 B27	C1 C3 C4 C5 C6 C7 C8
Solving positional problems of intersections, parallelism, perpendicularity and metrical problems of distances and angles determination between various geometric elements.	A6	B1 B3 B4 B5 B8 B14 B16 B25 B27	C1 C3 C4 C5 C6 C7 C8
Representing simple geometric shapes in different systems with special emphasis on the representation of elements and architectural, constructive or in any builgin applications.	A6	B1 B3 B4 B5 B8 B12 B14 B16 B17 B25 B27	C1 C3 C4 C5 C6 C7 C8

Knowing the general principles of the Shadow Theory as geometric rationalization of the luminous phenomenon in the different systems of representation of architectural application.	A2 A6	B1 B4 B5 B8 B12 B14 B16 B25 B27	C1 C3 C4 C5 C6 C7 C8
Applying the figured planes system (topographic projection) to graphic resolution of roofs, to the representation of the terrain and the resolution of topographies modified in the execution of earthworks and roads.	A2 A6	B1 B4 B5 B8 B14 B16 B25 B27	C1 C3 C4 C5 C6 C7 C8
Assessing the graphical representation in aspects of communication and reflection.	A6	B1 B3 B4 B8 B12 B14 B17 B25 B27	C1 C3 C4 C5 C6 C7 C8

Contents	
Topic	**Sub-topic**
Thematic Block I. DIHEDRAL REPRESENTATION SYSTEM: FUNDAMENTALS AND POSITIONAL PROBLEMS	Lesson 1. Introduction. Basics. Lesson 2. Fundamentals. Representation of point, line and plane. Lesson 3. Spatial basic geometric relations. Parallelism. Lesson 4. Intersections. Lesson 5. Perpendicularity
Thematic Block II DIHEDRAL REPRESENTATION SYSTEM: GRAPHICS METHODS AND METRIC PROBLEMS.	Lesson 6. Geometric Procedures (I): Change of planes of projection. Lesson 7. Geometric Procedures (II): Rotations. Lesson 8. Geometric Procedures (III): Plans' Abatment. Lesson 9. Distances. Lesson 10. Angles.

Thematic Block III DIHEDRAL REPRESENTATION SYSTEM: ANALYSIS AND REPRESENTATION OF SURFACES	Lesson 11. Representation of surfaces. Lesson 12. Regular polyhedra. Lesson 13. Radiating polyhedra: Pyramid and Prism. Lesson 14. Radiated Quadrics: Cone and Cylinder. Lesson 15. Representation of the Sphere.
Thematic Block IV. DIHEDRAL REPRESENTATION SYSTEM: INTERSECTION OF SURFACES AND THEORY OF SHADOWS	Lesson 16. Intersection of surfaces. Methods. Lesson 17. Architectural applications: vaults, domes and lunettes. Lesson 18. Shadow Theory applied to Diedral System.
Thematic Block V.- FIGURED PLANS SYSTEM (TOPOGRAPHICAL PROJECTION): FUNDAMENTALS	Lesson 19. Introduction. Fundamentals. Lesson 20. Representation of the plane. Lesson 21. Positional Problems: parallelism, perpendicularity, intersections. Lesson 22. Abatments. Metrical problems: distances and angles. Lesson 23. Representation of geometric surfaces.
Thematic Block VI.- FIGURED PLANS SYSTEM (TOPOGRAPHICAL PROJECTION): APPLICATIONS IN BUILDING. ROOFS. LAND REPRESENTATION.	Lesson 24. Graphical resolution of roofs. Lesson 25. Topographical and interventions surfaces on the ground: earthworks and road layout.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A2 A6 B1 B4 B8 B12 B14 B27 C1 C3 C4 C5 C6 C8	27	42	69
Problem solving	A2 A6 B1 B3 B4 B5 B7 B8 B16 B25 B27 C1 C3 C4 C5 C6 C7 C8 C9	27	45	72
Objective test	A2 A6 B1 B4 B5 B12 B16 B17 B27 C1 C3 C4 C5 C6 C7 C8 C9	6	0	6
Personalized attention		3	0	3
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Oral and graphic presentation in the classroom supplemented by the optional use of audiovisual media and ICT as well as the introduction of questions to students in order to transmit knowledge and facilitate learning.
Problem solving	Students will face situation where they will solve a particular problem with multiple solutions using the knowledge we have worked in the lecture. Within this dynamic, interactive personalized attention will take place.

Objective test	Graphic test for the assessment of learning, whose distinctive feature is the ability to determine whether the answers are correct or not. It is a measuring element that allows to assess knowledge, abilities, skills, performance, attitudes, intelligence, etc. It is applicable for both diagnostic, formative and summative evaluation.

Personalized attention	
Methodologies	**Description**
Problem solving	The needs and questions of the students related to the study or similar topics with the course will be adressed, while giving them orientation, support and motivation throughout the learning process.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Objective test	A2 A6 B1 B4 B5 B12 B16 B17 B27 C1 C3 C4 C5 C6 C7 C8 C9	Graphic test for the assessment of learning, whose distinctive feature is the ability to determine whether the answers are correct or not. It is a measuring element that allows to assess knowledge, abilities, skills, performance, attitudes, intelligence, etc. It is applicable for both diagnostic, formative and summative evaluation.	100

Assessment comments
There will be three tests of similar during the semester . They will present similar characteristics to the exercises developed in the interactive classes and that will serve to evaluate through a process of continuous evaluation. The first test will cover the contents of blocks I and II (items 1 to 10) corresponding to the Dihedral System. The second test will cover the contents of blocks III and IV (items 11 to 18) corresponding to the Dihedral System. The third test will cover the contents of blocks V and VI (items 19 to 25) corresponding to the Figured Plans System-Topographical Representation.OBSERVATIONS OBSERVATIONS It is considered compulsory to attend both the lectures ("TEORÍA"/THEORY) and the interactive classes ("PRÁCTICA"/PRACTICE) so that students must meet minimum attendance requirements in order to be able to attend the tests. This minimum attendance will be 80% of all the lectures. The three scoring tests will be scored out of 10 points each. The overall final grade of these tests will be obtained by adding up the grades of each one of them and dividing this sum by three. It is stated that in order to be able to be eligible to get the average done, the minimum qualification in each of the tests must be 5 points out of 10, except in the first test corresponding to the Diédrico System (items 1 to 10) in which the minimum qualification for average may be 3.5 points out of 10. In addition to attendance, participation and carrying out supervised work, the necessary tests may be carried out in order to adequately assess the degree of assimilation of the conceptual and procedural contents of the subject. The student who achieves an overall average grade of 5 points or higher (out of 10) in the sum of the three scoring tests will exceed the subject without taking part in the final exam. Students who do not reach the minimum overall grade of 5 points must be submitted to the official Final Exam of the subject to be held at the end of the corresponding term (First Call) according to official calendar approved in School Board. The grade from the passed partial tests will be saved but by complete systems.This condition is considered linked to the corresponding academic year and therefore these passing grades will be kept for the First Chance (January) and Second Opportunity (July) but exclusively during the current course and it will not be kept for later academic years. The correction of the exercises of the scoring tests and the final exams and the subsequent revision of them will be done by the teacher responsible for teaching the subject in the group to which the student belongs. IMPORTANT NOTE. In order for the student to have a passing grade in the final exams he must obtain an overall average grade of 5 points or higher in the sum of the proposed exercises but it will be mandatory to score in the exercises corresponding to the Dihedral System and in the Topographical Projection System. A grading of 0 will cause the failing of the course.

Sources of information

Basic	- BARDÉS FAURA, Lluis; GIMÉNEZ RIBERA, José Manuel (1999). Geometría Descriptiva. Sistema Dièdric. Exercicis. Edicións UPC - BARDÉS FAURA, Lluis; GIMÉNEZ RIBERA, José Manuel (2001). Geometría Descriptiva. Plans acotats i perspectives. Exercicis. Edicións UPC - COBOS GUTIERREZ, Carlos (2001). Geometría para Ingenieros. Tomo I: Representación Diédrica. Tébar - COBOS GUTIERREZ, Carlos (2009). Geometría para Ingenieros. Tomo II: Sistema de Planos Acotados. Tébar - FERNÁNDEZ SAN ELÍAS, Gaspar (1999). Fundamentos del Sistema Diédrico. Universidad de León - FERNÁNDEZ SAN ELÍAS, Gaspar (2004). Sistema Acotado. Problemas y Aplicaciones. - FRANCO TABOADA, José Antonio (2011). Geometría Descriptiva para la representación arquitectónica. Vol. 1. Fundamentos. Santiago de Compostela: Andavira Editora - GENTIL BALDRICH, José María (1998). Método y aplicación de representación acotada y del terreno. - GIMÉNEZ PERIS, Vicente (2007). Diédrico Directo. Tomo I. Teoría y 190 ejercicios de aplicación. Edición del autor - GIMÉNEZ PERIS, Vicente (2014). Diédrico Directo. Tomo II. Superficies, Intersecciones, CAD, Sombras. Edición del autor - IZQUIERDO ASENSI, Fernando (Varias ediciones). Geometría Descriptiva. - MARTÍN MOREJÓN, Luís (1978-80). Geometría Descriptiva. Sistema Diédrico (2 vol). - RODRÍGUEZ DE ABAJO, F. J. (Varias ediciones). Geometría Descriptiva. Tomo I. Sistema Diédrico. - RODRÍGUEZ DE ABAJO, F. J. (Varias ediciones). Geometría Descriptiva. Tomo II. Sistema de Planos Acotados. - SÁNCHEZ GALLEGO, Juan Antonio (1997). Geometría Descriptiva. Sistemas de Proyección Cilíndrica. Edicións UPC - TAIBO FERNÁNDEZ, Ángel (2010). Geometría Descriptiva y sus aplicaciones. Tomo I. Punto, Recta y Plano.. Tébar - TAIBO FERNÁNDEZ, Ángel (2007). Geometría descriptiva y sus aplicaciones. Tomo II. Curvas y Superficies. Tébar
Complementary	- IZQUIERDO ASENSI, F. (2002). Construcciones Geométricas. - IZQUIERDO ASENSI, F. (2005). Fórmulas y Propiedades Geométricas. - IZQUIERDO ASENSI, F. (Varias Ediciones). Geometría Descriptiva Superior y Aplicada. - RENDÓN GÓMEZ, Álvaro (2016). Geometría paso a paso. Vol. I. Elementos de Geometría Métrica y sus aplicaciones en Arte, Ingeniería y Construcción. Editorial Tébar Flores

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Architectural Graphic Expression I/670G01008
Subjects that continue the syllabus
Geometry of Illustrations/670G01018
Other comments
By addressing the basics of graphical representation, it is recommended to study the subject of Descriptive Geometry prior or simultaneous to other subjects in the area of Architectural Graphic Expression.Prerequisites. It is recommended to have studied the subject of Technical Drawing in high school or equivalent training as it is considered that the student must be accustomed to using conventional instruments of graphical representation. They also should know the most basic aspects of the different systems of representation, especially Diedric System and basic flat geometry layouts (polygons, conic sections, elementary trigonometry, etc.).