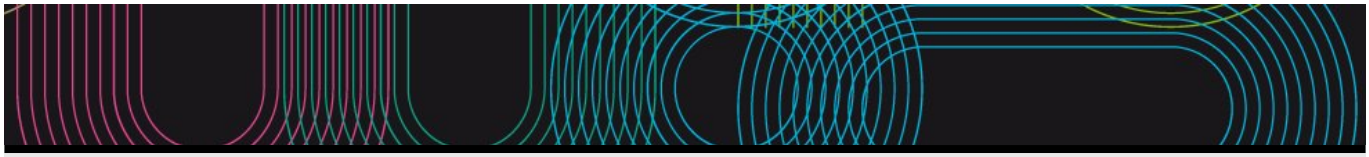

IDENTIFYING DATA				
Graphic expression: Graphic expression				
Subject	Graphic expression: Graphic expression			
Code	V09G311V01101			
Study programme	Grado en Ingeniería de los Recursos Mineros y Energéticos			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish English			
Department				
Coordinator	González Rodríguez, Elena			
Lecturers	González Rodríguez, Elena			
E-mail	elena@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	This subject deals with graphic representation, exact and precise language, and means of visualization, communication, documentation. It is used around the world in multiple fields, especially in Engineering. Technical graphic representation is based on universal principles of Descriptive Geometry and is supported by computer-aided design technology. Their understanding and use are skills demanded in the engineering work environment.			

Training and Learning Results	
Code	
A1	That the students demonstrate to possess and understand knowledge in an area of study that is part of the general education (second level), and often found at a level that, although based on advanced textbooks, also includes some aspects that involve knowledge from the avant-garde of the field of study
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues
A4	That the students can transmit information, ideas, problems and solutions to a specialized and non-specialized audience
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.
C2	Visual-spatial ability and knowledge of the techniques of graphic representation, through use of traditional methods of metric geometry and descriptive geometry, and of computer-assisted design applications.
D1	Ability to draw links between the different elements of all the knowledge they acquired, understanding them as components of a body of knowledge with a clear structure and strong internal cohesion.
D3	To suggest and develop practical solutions, using the relevant theoretical knowledge, to phenomena and problems-situations of ordinary reality that are specific to engineering, developing appropriate strategies.
D4	To foster collaborative working, communication, organization and planning skills, along with the ability to take responsibilities in a multilingual, multidisciplinary work environment that promotes education for equality, peace and respect for fundamental rights.
D5	To be familiar with the relevant sources of information, including constant updating, in order to practice one□s profession competently, accessing all the present and future tools of information search, constantly adapting to technological and social changes.
D7	Ability to organize, understand, assimilate, produce and handle all the relevant information to develop their professional work, using appropriate computing, mathematical, physics tools, etc. when these are required.

D10 To become aware of the need for continuous training and the constant improvement of quality, developing the values that are characteristic of scientific thinking, showing flexible, open and ethical attitudes in the face of different situations and opinions, particularly as regards non-discrimination on the grounds of gender, race or religion, respect for fundamental rights, accessibility, etc.

Expected results from this subject

Expected results from this subject	Training and Learning Results		
To understand the basics appearances of representation systems and their application to engineering activities.	A1 A2 A3 A4 A5	C2	D1 D3 D5 D7
To know how to represent a terrain from a point cloud.	A1 A2 A3 A4 A5	C2	D1 D3 D5 D7 D10
To know the process of preparation and interpretation of drawing: group, list of pieces and dissasembly of a mechanism.	A1 A2 A3 A4 A5	C2	D1 D3 D4 D5 D7 D10
To know the technics to evaluate the orientation of layers and folds using stereographic projection.	A1 A2 A3 A4 A5	C2	D1 D5
To acquire skills to draw free hand representations.	A2 A4 A5	C2	D3
To acquire skills to represent using computer assisted design applications.	A1 A2 A4 A5	C2	D1 D5 D7 D10

Contents

Topic	
PROJECTIVE PRINCIPLES FOR ENGINEERING GRAPHICS	2D and 3D basic elements. Projective invariants. Orthogonal, oblique and central projections. Practice will be done by drawing freehand and using CAD system.
TOPOGRAPHICAL PROJECTION	Point, straight line and plane. Parallelism and perpendicularity. Intersections. Topographical surface: Construction from 3D point cloud. Level countour line. Profile. Outcrop. Cut and fill. Earthwork calculations. Practice will be done with classical drawing instruments and using CAD system.
MULTIVIEW PROJECTION	Changing view point. Obtaining axonometric and central perspectives. Practice will be done with classical drawing instruments and using CAD system.
CURVES AND SURFACES	2D and 3D technical curves. Definition, types and particularities of surfaces. Practice will be done with classical drawing instruments and using CAD system.
TECHNICAL DRAWING STANDARDS	General principles. Standard views, auxiliary views, and sections. Dimensioning. Assembly drawing. Piece drawing. Practice will be done by drawing freehand, with classical drawing instruments and using CAD system.

STEREOGRAPHIC PROJECTION	Fundamentals. Stereographic projection of meridians and parallels. Wulff Net. Straight line and plane. Intersections. Perpendicularity. Angles Practice will be done with classical drawing instruments.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	15	20	35
Problem solving	10	20	30
Laboratory practical	20	20	40
Seminars	1	0	1
Mentored work	4	13.5	17.5
Objective questions exam	1.25	12	13.25
Essay questions exam	1.25	12	13.25
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Explanation by the teacher of the subject matter , theoretical bases and / or guidelines of an assignment, exercise or project to be developed by the student.
Problem solving	Complementary activity to lecturing in which the teacher proposes problems and / or exercises related to the subject and the student must develop the appropriate solutions.
Laboratory practical	Activities for application of knowledge to particular situations and for acquisition of basic and procedural skills.
Seminars	Seminar Activities focused on the work about a specific topic, which allows elaborating and complementing the contents of the subject.
Mentored work	Interviews that the student has with the teacher for advice on the learning process.

Personalized assistance	
Methodologies	**Description**
Lecturing	For all teaching modalities, the tutoring sessions may be carried out by telematic means (email, videoconference, Moovi forums, ...) under the modality of prior agreement.
Problem solving	For all teaching modalities, the tutoring sessions may be carried out by telematic means (email, videoconference, Moovi forums, ...) under the modality of prior agreement.
Laboratory practical	For all teaching modalities, the tutoring sessions may be carried out by telematic means (email, videoconference, Moovi forums, ...) under the modality of prior agreement.
Mentored work	For all teaching modalities, the tutoring sessions may be carried out by telematic means (email, videoconference, Moovi forums, ...) under the modality of prior agreement.

Assessment					
	Description	Qualification	Training and Learning Results		
Mentored work	Mentored work(W) Activity to apply technical drawing standards for defining an object. Attendance at the seminar and class hours scheduled for this task will be compulsory. Expected results of the subject: To know the process of preparation and interpretation of drawing: group, list of pieces and dissasembly of a mechanism. To acquire skills to draw free hand representations.	25	A1 A2 A3 A4 A5	C2	D1 D3 D4 D5 D7 D10
Objective questions exam	Two short answer exams on the topics tackled in the first and second halves of the semester will be carried out (SAE1 and SAE2, each of them representing 12.5% of the total mark. Expected results of the subject: To understand the basics aspects of representation systems and their application to engineering activities.	50	A1 A2 A3 A4 A5	C2	D1 D3 D5 D7

Essay questions exam	Two exams of this type will be given (RP1 and RP2, each one representing 12.5% of the total mark), using freehand drawing, classical instruments, and/or using a CAD system, depending on the case. Expected results of the subject: Know how to represent a landform from a 3D cloud of points. To know the process of preparation and interpretation of drawing: group, list of pieces and dissasembly of a mechanism. To know the techniques to evaluate layers and folds using stereographic projection. To acquire skills to draw free hand representations. Acquire the necessary skills to make representations using CAD system.	25	A1 A2 A3 A4 A5	C2	D1 D3 D5 D7 D10

Other comments on the Evaluation

Continuous Assessment - First Opportunity

- Continuous assessment is carried out through the 5 elements of assessment(SAE1, SAE2, RP1, RP2, W) performed throughout the course and before the final exam. The subject is passed when the sum of S = SAE1 + SAE2 + RP1 + RP2 +W is greater than or equal to 5, provided that at least 30% of its individual values is reached in each of these assessment elements.

- If S is less than 5 points, or in the case of failure to achieve the minimum in one or more of SAE1, SAE2, RP1, RP2, the student may take the examination in that or those assessment element(s) of interest to him/her in the final examination on the official date.

- In case of failure to achieve the minimum in W, RP1 and RP2 are weighted at 25 % each.

Continuous Assessment -Second Opportunity

- In case of not having reached the minimum in one or more of the SAE1,SAE2, RP1, RP2 after the Continuous Assesment - First Opportunity, or in the case of not having reached 5 points in the sum of all the assessment elements, the student may take the assessment element(s) of his/her interest in the final exam on the official date of the Second Opportunity.

- In case of not having reached the minimum in W, RP1 and RP2 are weighted at 25 % each.

Global Assessment - First Opportunity

- The final exam will consist of a written test with four parts, in parallel to SAE1, SAE2, RP1, RP2 described in the previous section. Each of these parts is worth, in this exam, 25 % of the final mark.

- The subject is passed by obtaining a mark greater than or equal to 5 when the scores of the four parts are added together, provided that at least 30 % of their individual value is achieved in each part. If 5 points or more are obtained, but the minimum mark is not reached in any part, the final mark will be 4 points.

Global Assessment - Second Opportunity

- The final exam will consist of a written test with four parts, in parallel to SAE1, SAE2, RP1, RP2 described in the previous section. Each of these parts is worth, in this exam, 25 % of the final mark.

- The subject is passed by obtaining a mark greater than or equal to 5 when the scores of the four parts are added together, provided that at least 30 % of their individual value is achieved in each part. If 5 points or more are obtained, but the minimum mark is not reached in any part, the final mark will be 4 points.

- If, after the Global Assessment - First Chance, the minimum mark is not reached in one or some of the SAE1, SAE2, RP1, RP2, or if the 5 points are not reached in the sum of all the assessment elements, the student may sit the assessment element(s) of interest in the final examination on the official Second Chance date Exam Timetable: Exam dates and rooms must be verified in the official webpage of the school:

http://minaseenerxia.uvigo.es/es/docencia/examenes

Sources of information

Basic Bibliography

González Rodríguez, Elena, **Teacher material for course follow-up**,

Guirado Fernández, Juan José, **Iniciación á Expresión Gráfica na Enxeñería, Segunda edición**, Gamesal, 2004

Menéndez Fernández, Guzmán y Palancar Penell, Manuel, **Geometría descriptiva: sistemas de representación: diédrica, cónica, estereográfica**, Minuesa, 1985

Izquierdo Asensi, Fernando, **Ejercicios de Geometría descriptiva II (sistema Acotado)**, Paraninfo, 2009

Ramos Barbero, Basilio y Esteban García Maté, Esteban, **Dibujo Técnico**, AENOR, 2016

Giesecke, Frederick E. et al., **Technical Drawing with Engineering Graphics**, 15 th, Prentice Hall, 2016

David A. Madsen, David P. Madsen, **Engineering drawing & design**, 6 th, Cengage Learning, 2017

Complementary Bibliography

Recommendations