

SUBJECT TEACHING GUIDE

G636 - Mining Topography

Degree in Mining Resources Engineering First Degree in Mining Resources Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Mining Resources Engineering First Degree in Mining Resources Engineering			Type and Year	Compulsory. Year 4 Compulsory. Year 4
Faculty	School of Mines and Energy Engineering				
Discipline	Subject Area: Technology of Mine Exploitation Module: Training in Exploitation of Mines				
Course unit title and code	G636 - Mining Topography				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA GEOGRAFICA Y TECNICAS DE EXPRESION GRAFICA
Name of lecturer	JULIO MANUEL DE LUIS RUIZ
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Other lecturers	RAUL PEREDA GARCIA

3.1 LEARNING OUTCOMES

-- Knowledge about the calculation and adjustment of polygonal, direct intersections, inverse sections and other methodologies.

-- Knowledge about the location of a star in the celestial sphere. The time, general considerations and measurement.
 - Knowledge about astronomical corrections, orientation and determination of geographic coordinates.

-- Knowledge about the actual shape of the earth.
 - Management approach as set eliposide, reference systems.
 - Treatment of classical geodetic observations.
 - Management of thematic cartography and map projections.
 - Design, observe and calculate UTM observations.
 - Design, observe and calculate elevation geodetic observations.
 - Design, observe and calculate geodetic observations using GPS.

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-- Application of conventional surveying in the field of mining.
 - General knowledge of Remote Sensing applied to mining and mapping.
 - General knowledge of Geographic Information Systems applied to mining and cartography
 - General knowledge of the fundamentals and applications of laser scanning.
 - General knowledge of the fundamentals and applications of Georadar.

4. OBJECTIVES

The main objective of the course is focused students in all surveying techniques that are usually developed in the context of engineering, especially in mining engineering. To achieve this goal is proposed as secondary objectives, but no less important for students to achieve the acquisition of the competencies defined in the previous section.

6. SUBJECT PROGRAM	
CONTENTS	
1	<p>THEMATIC BLOCK I: ADVANCED TOPOGRAPHIC METHODOLOGIES.</p> <p>1.- Calculation and adjustment of polygonal. 2.- The direct intersections. 3.- The reverse intersections. 4.- Other methodologies.</p>
2	<p>THEMATIC BLOCK II: FOUNDATIONS OF GEODETIC ASTONOMY.</p> <p>1.- The location of a star in the celestial sphere. 2.- The time, general considerations and measurement. 3.- Astronomical corrections. 4.- Guidance and determination of geographic coordinates</p>
3	<p>THEMATIC BLOCK III.- THEMATIC BASIS GEODESY AND CARTOGRAPHY</p> <p>1. APPROACH TO THE THEORY OF REAL FIGURE OF THE EARTH. 1.1 The geoid, physical figure of the earth. 1.2 Calculation procedures and key relationships.</p> <p>Ellipsoid of revolution 2. THE FIGURE OF THE EARTH APPROACH. 2.1 Analytical Expression of a surface. 2.2 Tangent plane and normal line to a surface. 2.3 intrinsic geometry of a surface. 2.4 Curvature of surfaces. 2.5.- The normal gravity field.</p> <p>3. TREATMENT OF CLASSIC geodetic observations, reduction. Supporting 3.1 Introduction. 3.2 Corrections weather the current electro instrumentation. Reduction 3.3 points and distances. 3.4.- Reduction of observed angles.</p> <p>4. GENERAL INTRODUCTION TO mapping systems. 4.1 Elements of the flat representation of the ellipsoid. 4.2 map projection systems. 4.3 Introduction to the cartographic developments. 4.4.- Characterization of Lambert coordinates.</p> <p>5. PROJECTION Universal Transverse Mercator (UTM). 5.1 Framework. 5.2 Characteristic features of application of the UTM projection. 5.3 Applications keen interest in the aggregate of engineering.</p> <p>6. Geodetic Aspects elevation. 6.1 particularized aspects of the trigonometric leveling. 6.2 Geometric leveling accuracy.</p> <p>7. GLOBAL POSITIONING SYSTEMS GPS). 7.1 Introduction to GPS. 7.2 Description of the system. 7.3 How GPS works. 7.4.- Geodetic Aspects. 7.5.- methods of observation and calculation with GPS.</p>

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THEMATIC BLOCK IV.- APPLICATIONS IN THE FIELD OF MINING SURVEYING

1. Mine Surveying.
 - 1.1 Introduction.
 - 1.2 The Optional principal.
 - 1.3.- The topography in mining.
 - 1.4.- surveying instruments.
 - 1.5.- The topographical methodologies.
 - 1.6.- Special performances.
 - 1.7.- underground topography.
2. BASIC PRINCIPLES OF REMOTE SENSING.
 - 2.1 Introduction.
 - 2.2 Basis of observation.
 - 2.3 sensors and satellites.
 - 2.4 Remote sensing platforms.
 - 2.5.- Digital image analysis.
 - 2.6.- Extracting information.
 - 2.7.- Verification of results.
 - 2.8.- Remote Sensing and GIS.
3. basics of GIS.
 - 3.1 Basics.
 - Databases 3.2.
 - 3.3 GIS models.
 - 3.4.- capabilities and sources of error in GIS.
4. BASICS OF LASER LIDAR scanner.
 - 4.1 Basics.
 - 4.2 The sensor.
 - 4.3 Practical application.
5. GEORADAR.
 - 5.1 Basics.
 - 5.2 Fundamentals of instrumental and observation method.
 - 5.3 Practical application

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
periodic evaluations not qualifying	Written exam	No	Yes	40,00
evaluating practices	Laboratory evaluation	No	No	20,00
Ordinary test of the subject	Written exam	Yes	Yes	40,00
TOTAL				100,00
Observations				
<p>If the student does not achieve the minimum grade in the ordinary/extraordinary assessment (3/10), the overall grade for the subject will be the lower of 4.9 and the weighted average of the assessment tests [article 35 of the UC Assessment Processes Regulations].</p> <p>All those students who do not pass the course in the Ordinary exam may sit the Extraordinary exam, respecting the grade obtained in the practicals and the periodical evaluations. If the student so wishes in the extraordinary exam, he/she can re-sit the continuous assessment tests of the Didactic Units, respecting the most favourable grades for the student.</p>				
Observations for part-time students				
<p>Students enrolled part-time will be offered the following alternative assessment:</p> <ul style="list-style-type: none"> - Continuous assessments of the Didactic Units will be carried out on a date agreed by the teacher and the student at the beginning of the term. - The assessment of the practicals will be carried out by means of an equivalent work and the corresponding knowledge test on the practicals, on a date agreed between the teacher and the student at the beginning of the term. - The ordinary and extraordinary exams of the subject will be the same. <p>The student will have to contact the lecturer in charge during the first two weeks of the term to arrange the dates of the assessment and the work to be done.</p>				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
<ol style="list-style-type: none"> 1. MARTIN ASIN, Fernando: Geodesia y cartografía matemática. Paraninfo. Madrid, 1983. 2. WOLFGANG, Jorge: Geodesia. Editorial Diana. México, 1983 3. SEVILLA, M.J.; NUÑEZ, A.; VALBUENA, J.L.: VII Curso de Geodesia Superior. Instituto de Astronomía y Geodesia. Madrid, 1991. 4. HEISKANEN, Weikko A.; MORITZ, Helmut: Geodesia física. I.G.N.. Madrid, 1985. 5. EXTRUCH SERRA, M.: Topografía aplicada a la Minería. Manresa, 1983. 6. FERNANDEZ FERNANDEZ, Luis: Topografía minera. Universidad de León. León, 1990. 7. CHUVIECO, Emilio: Fundamentos de la teledetección espacial. Rialp, S.A. Madrid, 1990. 8. BOSQUE SENDRA, J.: Sistemas de Información Geográfica. Rialp, S.A. España. 1992.