



# UNIVERSIDAD DE CASTILLA - LA MANCHA

## GUÍA DOCENTE

### 1. General information

**Course:** EXPLORATION TECHNOLOGY  
**Type:** ELECTIVE  
**Degree:** 384 - MINING AND ENERGY ENGINEERING DEGREE  
**Center:** 106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING  
**Year:** 4

**Code:** 19559  
**ECTS credits:** 6  
**Academic year:** 2023-24  
**Group(s):** 51  
**Duration:** C2  
**Second language:**  
**English Friendly:** Y  
**Bilingual:** N

**Main language:** Spanish  
**Use of additional languages:**  
**Web site:**

| Lecturer: <b>LUIS MANSILLA PLAZA</b> - Group(s): <b>51</b>          |                               |              |                       |              |
|---|-------------------------------|--------------|-----------------------|--------------|
| Building/Office   | Department                    | Phone number | Email                 | Office hours |
| Laboratorio de Ciencias de la Tierra. Primera planta edificio Störr | INGENIERÍA GEOLÓGICA Y MINERA | 6002         | luis.mansilla@uclm.es |              |

### 2. Pre-Requisites

It is a subject with no established requirements, but it would be advisable for the student to have passed the subjects related to geology, mining research, mineral deposits, etc.

### 3. Justification in the curriculum, relation to other subjects and to the profession

Among the many tools that a graduate in the mining branch must use and know are drilling techniques by means of boreholes, which will allow them to work in the fields of mining research, exploration and exploitation of hydrocarbons, geology, mine exploitation, etc. This is a very useful and versatile subject that is an ideal complement to achieve the competences of the mining engineer.

### 4. Degree competences achieved in this course

| Course competences |   |
|--------------------|---|
| Code               | Description   |
| A10                | Technical and scientific capacity for the profession of Technical Mining Engineer and knowledge of the duties of consultancy, analysis, design, calculation, project, construction, maintenance, preservation and exploitation.   |
| A11                | To understand the multiple legal and technical restrictions which are to be considered in the Mining Engineering field and which are intended, according to what it was established in part 5 of the ministerial order CIN/306/2009 of 09-02-2009, the prospection and mining-geological research, all kind of geological exploitations including ground water, underground works, underground storage, treatment and processing plants, energy plants, metallurgical as well as iron and steel plants, building material plants, carbon and chemical, petrochemical, gas, waste treatment plants and effluents, explosive factories, and capacity to use verified methods and recognized technologies with the aim of getting the highest efficacy having environmental concern and protecting the health and security of workers and users of those facilities. |
| A13                | Capacity to design, plan, operate, inspect, sign and manage projects, plants or installations in their field.   |
| CB01               | Prove that they have acquired and understood knowledge in a subject area that derives from general secondary education and is appropriate to a level based on advanced course books, and includes updated and cutting-edge aspects of their field of knowledge.   |
| CB02               | Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.  |
| CB03               | Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.  |
| CB04               | Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.   |
| CB05               | Have developed the necessary learning abilities to carry on studying autonomously   |
| CT00               | To promote respect and promotion of Human Rights as well as global access principles and design for everybody according to the 10th final order of the Law 51/2003 of December 2nd, about equal opportunities, non-discrimination and universal accessibility for people with disabilities.   |
| CT02               | To be acquainted with Information and Communication Technology ICT  |
| CT03               | Capacity for written and oral communication skills.   |
| CT04               | Capacity to accept ethical and deontological professional responsibility.   |
| E12                | Capacity to know, understand and use the principles of design, planning and execution for the prospection and extraction of minerals, rocks, fossil fuels, nuclear fuel, underground waters and geotechnical. Design, execution and planning for fluid injection in underground structures  |

### 5. Objectives or Learning Outcomes

| Course learning outcomes  |  |
|---|--|
| Description   |  |
| To be able to use bibliography and documentation to write reports and practical assignments   |  |
| To express yourself with a minimum vocabulary in the professional drilling field  |  |
| To know and understand the basic principles which shape drilling investigation in the mining field, underground water, hydrocarbons and geotechnics |  |

Capacity to plan, manage and run drilling the mining field, underground water, geotechnics, hydrocarbons and fluid injection.

## 6. Units / Contents

- Unit 1: Introduction. General information**
- Unit 2: Percussion Drilling**
- Unit 3: Rotopercussive drilling**
- Unit 4: Rotational drilling**
- Unit 5: Rotation drilling with core recovery**
- Unit 6: Directional drilling**
- Unit 7: Safety and environment in drilling**
- Unit 8: Applications for groundwater abstraction**
- Unit 9: Applications for geological-mining research**
- Unit 10: Applications for hydrocarbon research**
- Unit 11: Civil engineering applications**

## 7. Activities, Units/Modules and Methodology

| Training Activity                              | Methodology               | Related Competences (only degrees before RD 822/2021)        | ECTS  | Hours      | As | Com | Description |
|--|---------------------------|--|---|------------|----|-----|-------------|
| Class Attendance (theory) [ON-SITE]            | Lectures                  | A10 A11 A13 CB01 CB02 CB03 CB04 CB05 CT00 CT02 CT03 CT04 E12 | 0.79  | 19.75      | N  | -   |             |
| Class Attendance (practical) [ON-SITE]         | Combination of methods    | A10 A11 A13 CB01 CB02 CB03 CB04 CB05 CT00 CT02 CT03 CT04 E12 | 0.5   | 12.5       | Y  | N   |             |
| Other on-site activities [ON-SITE]             | Case Studies              | A10 A11 A13 CB01 CB02 CB03 CB04 CB05 CT00 CT02 CT03 CT04 E12 | 0.6   | 15         | Y  | N   |             |
| Study and Exam Preparation [OFF-SITE]          | Self-study                | A10 A11 A13 CB01 CB02 CB03 CB04 CB05 CT00 CT02 CT03 CT04 E12 | 3.6   | 90         | N  | -   |             |
| Individual tutoring sessions [ON-SITE]         | Guided or supervised work | A10 A11 A13 CB01 CB02 CB03 CB04 CB05 CT00 CT02 CT03 CT04 E12 | 0.26  | 6.5        | N  | -   |             |
| Final test [ON-SITE]                           | Assessment tests          | A10 A11 A13 CB01 CB02 CB03 CB04 CB05 CT00 CT02 CT03 CT04 E12 | 0.25  | 6.25       | Y  | Y   |             |
| <b>Total:</b>                                  |                           |  | <b>6</b>                                    | <b>150</b> |    |     |             |
| <b>Total credits of in-class work: 2.4</b>     |                           |  | <b>Total class time hours: 60</b>           |            |    |     |             |
| <b>Total credits of out of class work: 3.6</b> |                           |  | <b>Total hours of out of class work: 90</b> |            |    |     |             |

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

## 8. Evaluation criteria and Grading System

| Evaluation System                                     | Continuous assessment | Non-continuous evaluation* | Description   |
|---|-----------------------|----------------------------|---|
| Practicum and practical activities reports assessment | 15.00%                | 15.00%                     | Resolution and delivery of practical exercises carried out in class.                        |
| Other methods of assessment                           | 15.00%                | 15.00%                     | Proposal of solutions to typical cases in the world of the surveys studied by the students. |
| Final test  | 70.00%                | 70.00%                     | Final examination eminently practical and applied to the world of drilling.                 |
| <b>Total:</b>   | <b>100.00%</b>        | <b>100.00%</b>             |   |

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

### Evaluation criteria for the final exam:

#### Continuous assessment:

The continuous assessment of the subject will consider: the value obtained in the final exam (this exam will consist of a series of exercises whose subject matter will try to cover most of the aspects of the subject, establishing the evaluation scales in each question), the work and practices elaborated throughout the course, and the results of the final exam.

#### Non-continuous evaluation:

The non-continuous evaluation of the course will include the final exam, where there will be an exercise of the typical cases of the world of surveys developed in class, plus the delivery of the practical report.

### Specifications for the resit/retake exam:

The extraordinary evaluation of the course will consider: the value obtained in the final exam (this exam will consist of a series of exercises whose subject matter will try to cover most of the aspects of the course, establishing the evaluation scales in each question), the work and practices developed throughout the course.

### Specifications for the second resit / retake exam:

The evaluation of the special call for the end of the course will consider: the value obtained in the final test (this test will consist of a series of exercises whose subject matter will try to cover most of the aspects of the subject, establishing the evaluation scales in each question), the work and practices elaborated throughout the course.

| 9. Assignments, course calendar and important dates                  |              |
|--|--------------|
| <b>Not related to the syllabus/contents</b>                          |              |
| <b>Hours</b>   | <b>hours</b> |
| Study and Exam Preparation [AUTÓNOMA][Self-study]                    | 90           |
| Individual tutoring sessions [PRESENCIAL][Guided or supervised work] | 6.5          |
| Final test [PRESENCIAL][Assessment tests]                            | 6.25         |
| <b>Unit 1 (de 11): Introduction. General information</b>             |              |
| <b>Activities</b>  | <b>Hours</b> |
| Class Attendance (theory) [PRESENCIAL][Lectures]                     | 1            |
| <b>Unit 2 (de 11): Percussion Drilling</b>                           |              |
| <b>Activities</b>  | <b>Hours</b> |
| Class Attendance (theory) [PRESENCIAL][Lectures]                     | 2            |
| <b>Unit 3 (de 11): Rotopercussive drilling</b>                       |              |
| <b>Activities</b>  | <b>Hours</b> |
| Class Attendance (theory) [PRESENCIAL][Lectures]                     | 4            |
| <b>Unit 4 (de 11): Rotational drilling</b>                           |              |
| <b>Activities</b>  | <b>Hours</b> |
| Class Attendance (theory) [PRESENCIAL][Lectures]                     | 6            |
| <b>Unit 5 (de 11): Rotation drilling with core recovery</b>          |              |
| <b>Activities</b>  | <b>Hours</b> |
| Class Attendance (theory) [PRESENCIAL][Lectures]                     | 4            |
| <b>Unit 6 (de 11): Directional drilling</b>                          |              |
| <b>Activities</b>  | <b>Hours</b> |
| Class Attendance (theory) [PRESENCIAL][Lectures]                     | 1            |
| <b>Unit 7 (de 11): Safety and environment in drilling</b>            |              |
| <b>Activities</b>  | <b>Hours</b> |
| Class Attendance (theory) [PRESENCIAL][Lectures]                     | 1.75         |
| <b>Unit 8 (de 11): Applications for groundwater abstraction</b>      |              |
| <b>Activities</b>  | <b>Hours</b> |
| Class Attendance (practical) [PRESENCIAL][Combination of methods]    | 3            |
| Other on-site activities [PRESENCIAL][Case Studies]                  | 4            |
| <b>Unit 9 (de 11): Applications for geological-mining research</b>   |              |
| <b>Activities</b>  | <b>Hours</b> |
| Class Attendance (practical) [PRESENCIAL][Combination of methods]    | 4            |
| Other on-site activities [PRESENCIAL][Case Studies]                  | 4.5          |
| <b>Unit 10 (de 11): Applications for hydrocarbon research</b>        |              |
| <b>Activities</b>  | <b>Hours</b> |
| Class Attendance (practical) [PRESENCIAL][Combination of methods]    | 4            |
| Other on-site activities [PRESENCIAL][Case Studies]                  | 5.5          |
| <b>Unit 11 (de 11): Civil engineering applications</b>               |              |
| <b>Activities</b>  | <b>Hours</b> |
| Class Attendance (practical) [PRESENCIAL][Combination of methods]    | 1.5          |
| Other on-site activities [PRESENCIAL][Case Studies]                  | 1            |
| <b>Global activity</b>   |              |
| <b>Activities</b>  | <b>hours</b> |
| Class Attendance (practical) [PRESENCIAL][Combination of methods]    | 12.5         |
| Study and Exam Preparation [AUTÓNOMA][Self-study]                    | 90           |
| Other on-site activities [PRESENCIAL][Case Studies]                  | 15           |
| Class Attendance (theory) [PRESENCIAL][Lectures]                     | 19.75        |
| Final test [PRESENCIAL][Assessment tests]                            | 6.25         |
| Individual tutoring sessions [PRESENCIAL][Guided or supervised work] | 6.5          |
| <b>Total horas: 150</b>  |              |

| 10. Bibliography and Sources |  |                                  |      |      |      |             |
|------------------------------|--|----------------------------------|------|------|------|-------------|
| Author(s)                    | Title/Link   | Publishing house                 | Citv | ISBN | Year | Description |
| Pimienta, J.                 | La captación de las aguas subterráneas                                     | Editores técnicos asociados      |      |      | 1973 |             |
| Puy Huarte, J.               | Procedimientos de sondeos  | Servicio de Publicaciones de JEN |      |      | 1984 |             |
| Plote, H.                    | Sondage de reconnaissance hidrogeologique. Methode du marteau fond-de-trou | BRGM                             |      |      | 1985 |             |
| Hartley, J.J.                | Drilling tools and programme   | A.A.Bakaman                      |      |      | 1987 |             |

|                           |  |                                      |      |
|---------------------------|--|--------------------------------------|------|
| Astier, B. et al.         | Realisation des forages dirigés et controle des trajectoires                                   | Technip                              | 1985 |
| Cambefort, H.             | Perforaciones y Sondeos  |                                      | 1980 |
| Mansilla Plaz Luis et. al | Proyecto tipo para la ejecución de un sondeo para captación de aguas subterráneas (2ª edición) | Arcedlande                           | 2015 |
| Nguyent, J.P.             | Le Foreur  | Technip                              | 1993 |
| García, Elvira            | Manual de Perforación Dirigida Horizontal  | U:D: Proyectos de la ETSIM de Madrid | 2002 |
| Lopez Jimeno, C. et al.   | Manual de Sondeos  | U:D: Proyectos de la ETSIM de Madrid | 2000 |
| :F:P                      | Formulaire de Foreur/ Drilling data Handbook   | Technip                              | 2000 |