Course guide
330606 - DMIN - Mining Design and Modeling

Last modified: 02/05/2022

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

Degree: MASTER’S DEGREE IN MINING ENGINEERING (Syllabus 2013). (Compulsory subject).

Academic year: 2022 ECTS Credits: 5.0 Languages: Catalan, Spanish, English

LECTURER

Coordinating lecturer: Sanmiquel Pera, Lluis

Others:

PRIOR SKILLS

Previous knowledge of ploughing, referring to opencast and underground mining.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. (ENG) Coneixement adequat de la tecnologia d’explotació de recursos minerals.
2. (ENG) Coneixement de sistemes de control i automatismes.

Transversal:
3. SUSTAINABILITY AND SOCIAL COMMITMENT. Being aware of and understanding the complexity of social and economic phenomena that characterize the welfare society. Having the ability to relate welfare to globalization and sustainability. Being able to make a balanced use of techniques, technology, the economy and sustainability.
4. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.

TEACHING METHODOLOGY

The course consists of 3 hours a week of classes in the computer room in which the students try out the concepts given by the professor at the same time as the explanations or shortly afterwards. Exercises by the computer.

LEARNING OBJECTIVES OF THE SUBJECT

Achieve adequate knowledge of mineral resource exploitation technology through mining and geological site modelling software such as VULCAN. The above knowledge will be achieved in open pit and underground mining, for both stratigraphic and non-stratigraphic deposits.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>45,0</td>
<td>36.00</td>
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</tbody>
</table>

Total learning time: 125 h
## CONTENTS

### title english

**Description:**
This content has the following parts:
- Data visualization.
- Cad tools for editing drawings.
- Triangulations: general aspects, surface triangulations and solid triangulations.

**Specific objectives:**

Upon completion of this content, the student will achieve the following knowledge:
- Aspects of the generic and basic part of the "VULCAN" software.

**Related activities:**

Clase magistral a través del ordenador en el que los alumnos en aula de informática van probando el mismo momento de las explicaciones o poco después, los conceptos dados por el profesor. Realización de ejercicios con el ordenador.

**Full-or-part-time:** 24h
Laboratory classes: 8h
Self study : 16h

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### title english

**Description:**
This content has the following parts:
- Block construction.
- Block visualization.
- Block manipulation.
- Cubing of reserves from blocks.

**Specific objectives:**

Upon completion of this content, the student will achieve the following knowledge:
- All the aspects related to the generation, edition and manipulation of blocks through the software "VULCAN".

**Related activities:**

Master class through the computer in which the students in the computer room try out the concepts given by the teacher at the same time as the explanations or shortly after. Exercises with the computer.

**Full-or-part-time:** 21h
Laboratory classes: 7h
Self study : 14h
**Description:**
This content has the following parts:
- Design and modelling of open-cast mining operations.
- Calculation of exploited reserves and/or exploitation in an open-cast mining operation.
- Calculation of exploitation costs.

**Specific objectives:**
Upon completion of this content, the student will achieve the following knowledge:
- Design, modelling, calculation of reserves and costs in open-cast mining operations through the software "VULCAN".

**Related activities:**
Master class through the computer in which the students in the computer room are trying out the same moment of the explanations or shortly after, the concepts given by the teacher. Carrying out exercises with the computer.

**Full-or-part-time:** 40h
Laboratory classes: 15h
Self study: 25h

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**Description:**
This content has the following parts:
- Design and modelling of underground mining operations.
- Calculation of exploited reserves and/or mining in an underground mine.
- Calculation of operating costs.
- Situation and location of control systems and automatisms for the sensorisation of a mine.

**Specific objectives:**
Upon completion of this content, the student will achieve the following knowledge:
- Design, modelling, calculation of reserves and costs in underground mining exploitations through the software "VULCAN", as well as knowledge about the best location of control systems and automatisms in the mine for their sensorization.

**Related activities:**
Master class through the computer in which the students in the computer room are trying out the same moment of the explanations or shortly after, the concepts given by the teacher. Carrying out exercises with the computer.

**Full-or-part-time:** 40h
Laboratory classes: 15h
Self study: 25h
**ACTIVITIES**

### TITLE OF ACTIVITY 1: PRACTICE: DESIGN AND MODELLING OF AN OPEN-CAST MINING OPERATION

**Description:**
The aim is to design and model an open-cast mining operation on the basis of given data.

**Specific objectives:**
Practice with the "VULCAN" software and consolidate the knowledge that has been given about design and modelling of open-cast mines.

**Material:**
Computers and VULCAN software.

**Delivery:**
Prior to the full delivery of the internship, 2 deliverables must be submitted in order to monitor the progress of the students in the development of the internship. They represent 70% of the laboratory or practice mark.

**Full-or-part-time:** 18h
- Laboratory classes: 6h
- Self study: 12h

### ACTIVITY TITLE 4: INDIVIDUAL ASSESSMENT PROBLEM TEST 2

**Description:**
Individual performance in a computer classroom of 1 or more exercises of all the contents of the subject covering all the specific learning objectives of the indicated contents. Correction by the teaching staff.

**Specific objectives:**
To evaluate the knowledge acquired by the students with respect to the more practical contents of the subject.

**Material:**
Approach of one or several problems to be solved with computer using the software "VULCAN".

**Delivery:**
Resolution of the problems by the student. It represents a part of the evaluation (60% of the exam marks).

**Full-or-part-time:** 16h
- Practical classes: 2h
- Self study: 14h

### TITLE OF ACTIVITY 2: ECONOMIC STUDY IN AN UNDERGROUND MINING OPERATION THAT HAS BEEN DESIGNED AND MODELLED WITH VULCAN

**Description:**
The aim is to carry out an economic study of an underground mining operation based on a design given to the students.

**Specific objectives:**
Practice with the Vulcan software and consolidate your knowledge of underground mine design and modelling.

**Material:**
Computers and Vulcan software.

**Delivery:**
Prior to the full delivery of the internship, 1 deliverable must be submitted for the purpose of monitoring the progress of the students in the development of the internship. It represents 30% of the laboratory or practical note.

**Full-or-part-time:** 6h
- Laboratory classes: 2h
- Self study: 4h
ACTIVITY TITLE 3: INDIVIDUAL ASSESSMENT THEORY TEST 1

Description:
Individual performance of a theoretical exam in which there may be a combination of test questions, explanatory questions, and calculation of some data with a high conceptual content.

Specific objectives:
To evaluate the knowledge acquired by the students with respect to the more theoretical contents of the subject.

Material:
The approach of test questions, explanatory questions, and calculations of some data.

Delivery:
Delivery of the answers to the questions raised. It represents 40% of the exam marks.

Full-or-part-time: 12h
Laboratory classes: 2h
Self study: 10h

GRADING SYSTEM

The final grade is calculated using the following formula:

\[ N_{\text{final}} = 0.75 - (N_{\text{ExTeo}} - 0.4) + N_{\text{ExProbl}} - 0.6) + 0.25 N_{\text{práct}} \]

\( N_{\text{final}} \): Final qualification.

\( N_{\text{ExTeo}} \): Theory Exam Grade

\( N_{\text{ExProbl}} \): Rating test for problems to be solved by Vulcan

\( N_{\text{práct}} \): qualification of internship activities. This qualification will be obtained according to the attitude of the student in the classes and in the reports/works submitted.

BIBLIOGRAPHY

Basic:

Complementary: