FACULTAD DE CIENCIAS E INGENIERÍA

MECÁNICA DE ROCAS
2024-2

I. INFORMACIÓN GENERAL

CURSO	MECÁNICA DE ROCAS
CLAVE	MIN266
CRÉDITOS	5.5
HORAS DE DICTADO	CLASE: 4 Semanal LABORATORIO: 3 Semanal EXAMEN:
HORARIO	TODOS
PROFESORES	OSCAR LUIS CABELLO ROBLES

II. PLANES CURRICULARES DONDE SE DICTA EL CURSO

ESPECIALIDAD	ETAPA	NIVEL	CARÁCTER	REQUISITOS
INGENIERÍA DE MINAS	PREGRADO EN FACULTAD	6	OBLIGATORIO	1MIN05 RESISTENCIA DE MATERIALES PARA MINERÍA [07]
INGENIERÍA GEOLÓGICA	PREGRADO EN FACULTAD	6	OBLIGATORIO	1MIN05 RESISTENCIA DE MATERIALES PARA MINERÍA [07]

Tipos de requisito

04 = Haber cursado o cursar simultáneamente
05 = Haber aprobado o cursar simultáneamente
06 = Promedio de notas no menor de 08
07 = Haber aprobado el curso

III. DESCRIPCIÓN DEL CURSO

This course contributes to the following competencies of the Mining Engineering program:

C1. Problem Solving
Students identify, analyze, and solve complex mining engineering problems by applying knowledge of mathematics, sciences, and engineering and design related to mining engineering.

C3. Effective Communication
Students effectively and clearly communicate their ideas, with coherence, and consistency to diverse stakeholders associated with the mining industry.

C5. Teamwork
Students work in diverse multidisciplinary teams contributing to generating a collaborative and inclusive environment to achieve the intended objectives.

IV. SUMILLA

Es un curso teórico-práctico que desarrolla los fundamentos teóricos de la mecánica de materiales al caso particular de medios rocosos en los que se practican excavaciones, sean éstas superficiales o subterráneas. Se identifica y explica los conceptos básicos sobre los que se fundamenta la mecánica de rocas, iniciándose desde la recolección de información geológica geotécnica, para así caracterizar al macizo rocoso, la determinación de sus propiedades físicas y mecánicas y los conceptos de esfuerzos in-situ e inducidos. El curso incluye clases teóricas y de laboratorio, donde se desarrollan casos prácticos y se utilizan programas Rocscience. El curso permite construir modelos geomecánicos y evaluar la estabilidad de excavaciones subterráneas y taludes en roca, contribuyendo a desarrollar las competencias de resolución de problemas y trabajo en equipo. Incluye también redacción de textos académicos y comunicación oral.

V. OBJETIVOS

The course contributes to the achievement of the following Learning Outcomes

LO1: Analyze the stability of underground and surface excavations in rocks using empirical, analytical, and numerical methods (Rocscience).

LO2: Proposes solutions in an interdisciplinary and collaborative manner from the analysis of a geomechanical or geotechnical problem.

LO3: Communicate the solution to the geomechanical or geotechnical stability problem orally and in writing.

VI. PROGRAMA ANALÍTICO

SESIÓN 1 INTRODUCTION (2 horas)

Intact rock, rock mass. Design planning of surface and underground excavations.

SESIÓN 2 GEOLOGICAL AND GEOTECHNICAL INFORMATION COLLECTION (2 horas)

Geological and geotechnical investigations, methods of geological site investigation.

SESIÓN 3 GEOLOGICAL AND GEOTECHNICAL INFORMATION COLLECTION (2 horas)

Processing and interpretation and their use in the design of underground and surface excavations.

SESIÓN 4 STRUCTURAL GEOLOGY (2 horas)

Minor and major structures. Definition of in-situ, gravity, and tectonic stresses.

SESIÓN 5 STRUCTURAL GEOLOGY (2 horas)

Methods of measurement of in-situ stresses.

SESIÓN 6 INTACT ROCK AND ROCK MASS (2 horas)

Physical, mechanical properties and behavior of Intact Rock and Rock Mass.

SESIÓN 7 CHARACTERIZATION AND CLASSIFICATION OF THE ROCK MASS (2 horas)

Basic description of the rock mass according to ISRM. Classification systems and their applications; RMR, Q and GSI. Rock mass strength criteria. Rock mass classification in mining

SESIÓN 8 GROUNDWATER IN THE ROCK MASS (2 horas)

Lugeon and Lefranc tests, hydrogeological model for mining.

SESIÓN 9 STRESSES AROUND UNDERGROUND EXCAVATIONS (2 horas)

Stresses and deformations generated around circular section excavations for cases of hydrostatic stresses and different vertical and horizontal stresses. Interaction between close excavations. Displacements around excavations.

SESIÓN 10 SUPPORT DESIGN FOR UNDERGROUND EXCAVATIONS (2 horas)

Methods of design of support for underground excavations (empirical methods).

SESIÓN 11 SUPPORT DESIGN FOR UNDERGROUND EXCAVATIONS (2 horas)

Design methods of underground excavation support (Static methods of maximum wedge and structural control) Types of support used. Rock - support interaction.

SESIÓN 12 SUPPORT DESIGN FOR UNDERGROUND EXCAVATIONS (2 horas)

Dynamic support, types of bolts. Basic concepts of microseismicity.

SESIÓN 13 UNDERGROUND MINING METHODS (2 horas)

Geomechanical considerations for Cut and Fill mining, room and pillar mining.

SESIÓN 14 UNDERGROUND MINING METHODS (2 horas)

Geomechanical considerations for Sub-level stoping mining

SESIÓN 15 UNDERGROUND MINING METHODS (2 horas)

Geomechanical considerations for the caving mining method

SESIÓN 16 UNDERGROUND DESIGN BY EMPIRICAL METHODS (2 horas)
Span design, Hydraulic radius.

SESIÓN 17 UNDERGROUND DESIGN BY EMPIRICAL METHODS (2 horas)
Stability Number, ELOS.

SESIÓN 18 UNDERGROUND DESIGN BY EMPIRICAL METHODS (2 horas)
Pillar design (bridge, rib, crown pillar).

SESIÓN 19 GEOMECHANICAL COMPARTMENT OF BACKFILL MINE (2 horas)
Detritic, Hydraulic, Paste and CRF backfill

SESIÓN 20 FUNDAMENTALS FOR SLOPE DESIGN (2 horas)
Slope stability as part of the mining process.

SESIÓN 21 FUNDAMENTALS FOR SLOPE DESIGN (2 horas)
Geotechnical design process.

SESIÓN 22 FUNDAMENTALS FOR SLOPE DESIGN (2 horas)
Geotechnical design process, terminology for slope design.

SESIÓN 23 GEOTECHNICAL MODEL FOR SLOPE DESIGN (2 horas)
Geological Model, Structural Model, Rock Mass Model, Hydrogeological Model

SESIÓN 24 GEOTECHNICAL MODEL FOR SLOPE DESIGN (2 horas)
Geotechnical model. design sectors.

SESIÓN 25 METHODS FOR SLOPE DESIGN (2 horas)
Considerations for slope design, design sectors, global slope and inter-ramp analysis.

SESIÓN 26 METHODS FOR SLOPE DESIGN (2 horas)
Bench level stability analysis, limit equilibrium, kinematic analysis

SESIÓN 27 METHODS FOR SLOPE DESIGN (2 horas)
Bench level stability analysis, limit equilibrium, kinematic analysis.

SESIÓN 28 INSTRUMENTATION (2 horas)
Pressure Cells, Extensometers, TDR Cables, Radars.

VII. METODOLOGÍA

The course is theoretical-practical and encourages individual learning, expecting punctual and active participation in both theoretical and laboratory sessions. The theoretical sessions involve interactive presentations using PowerPoint, videos, and solving application exercises through dialogue. In practical sessions, computer exercises are carried out using Rocscience software. These tasks will be collaborative, with opportunities for addressing questions and relevant doubts related to the class topic, thus requiring active participation from students. The Paideia platform will be used as an interactive space for learning between teachers and students.

VIII. EVALUACIÓN

Sistema de evaluación

N°	Codigo	Tipo de Evaluación	Cant. Eval.	Forma de aplicar los pesos	Pesos	Cant. Eval. Eliminables	Consideraciones adicionales	Observaciones
1	Pb	Práctica tipo B	2	Por Evaluación	Pb1=1 Pb2=1			ExLab1 , ExLab2
2	Ex	Examen	2	Por Evaluación	Ex1=1 Ex2=1			

Modalidad de evaluación: 2

Fórmula para el cálculo de la nota final

(1Pb1 + 1Pb2 + 1Ex1 + 1Ex2) / 4

Aproximación de la nota final No definido

IX. BIBLIOGRAFÍA

Referencia obligatoria

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X. POLÍTICA CONTRA EL PLAGIO

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