

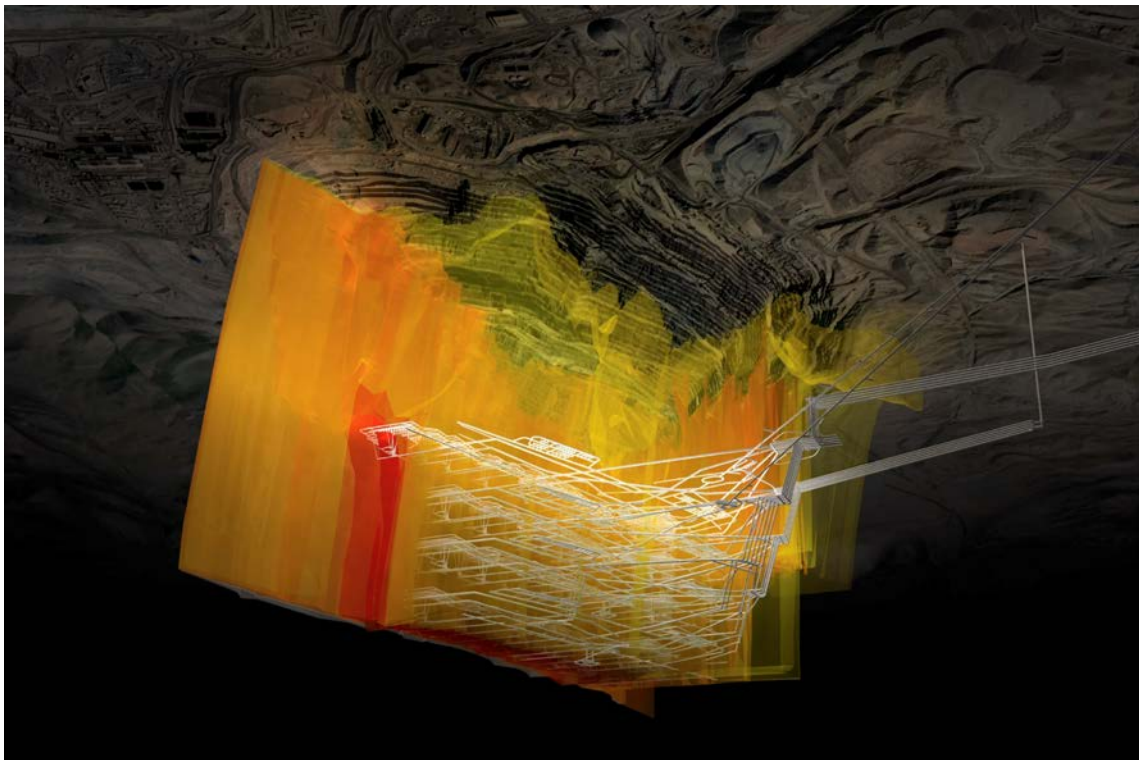


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Ingeniería de Minas
FACULTAD DE CIENCIAS
FÍSICAS Y MATEMÁTICAS
UNIVERSIDAD DE CHILE

Diploma

Block Caving Engineering



Version: October 2016

Director: Prof. Raúl Castro

Presentation

The Department of Mining Engineering offers the **Diploma of Block Caving Engineering**. The program is oriented to **engineers, geologists and others related engineering professionals**. This program provides students with a broad-based fundamental knowledge of mine design, planning, and operation of Block/Panel Caving systems. It is also designed to **strengthen students' communication, problem-solving, critical thinking, and teamwork skills**.



The Diploma is organized in:

- Seven modules of one-week length covering different areas of the Block/Panel Caving mining.
- Personal work between modules.
- A case study developed by the own student.
- A written Project where the student should apply the subjects reviewed during the program. The project will also be orally presented in the last module.

Objectives

The objective of this program is to provide theoretical and advanced tools for the design, planning, and operation of underground mining mines, with a strong focus on Block/Panel caving system. This tools include the geo - characterization of rock mass and its geomechanical properties, construction techniques of underground mines, planning and logistics, mining design, material handling and mine ventilation.

At the end of the program, students will obtain a strong scientific - technological background that will help them face the complexity of caving operations.

Location: Department of Mining Engineering, Faculty of Physical and Mathematical Sciences - Universidad de Chile, Av. Tupper 2069, Santiago.

Time: Monday to Friday from 9:00 to 13:00 and from 14:00 to 18:00.

Contact: Ingrid Thiele - Verónica Möller

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***Note 1:** The Departamento of Mining Engineerring has the right to suspend the Diploma if the number of students is not enough to ensure minimum administrative conditions and the quality of the program. **Note 2:** If one of the lecturers or professors needs to be replace, the program has the commitment to find a new one with similar background.*

Course description

The Diploma considers 7 modules of one-week length (280 hours) covering different areas of the Block/Panel Caving mining and personal work (80 hours) between modules. Here you can find a brief description or contents of the courses of the Diploma. Courses consider among their activities exercises with the supervision of assistants.

1. Geo-characterization of exploitation zones

Stresses, fracture criteria, fracture types, rock properties, classification methods (RMR, GSI, Q, etc.), Hoek & Brown rock mass strength criteria, rock permeability, shear strength for discontinuities, study cases.

2. Geomechanics applied to Block/Panel Caving mines

Underground excavations, introduction to numerical modelling and use of software (Rock Lab, Phase2, Induced seismicity/ Rockburst, Rock mass stability, Caving mechanisms, Open pit – underground interaction, Subsidence mechanisms.

3. Mine Operations for Block/Panel Caving.

Conceptual framework and fundamentals of Pre-conditioning (Hydraulic Fracture “HF”, Dynamic Weakening with Explosives “DWE” and mixed techniques HF+DWE). Experimental plans and review of results in industrial testing (Codelco and Newcrest Mine), Calibration, monitoring and control.

Production and material handling, drawpoint and drifts, grills, loaders, and crushers. Secondary, monitoring and KPIs, material handling systems for coarse material (Railway, trucks, conveyor belts, shafts, and other material handling systems)

Fundamentals of Mine ventilation, fan curves and laws, ventilation studies, techniques and methods, thermodynamics and ventilation economics, monitoring and control, ventilation applied to caving mines, dust control, challenges.

4. Mine Design for Block/Panel Caving

Underground mining methods selection (mine design, selection and criterion of underground system, others). Block/Panel Caving mining methods (basics, characteristics, variants/ classification of caving methods, parameters that support the mine design process), challenges and perspectives.

5. Mine Planning for Block/Panel Caving

Definition of ore resources and reserves, drawpoint and gravitational flow, extraction pattern, area and extraction rate, definition of opportunity cost, mine planning, long-term planning, optimization, reliability and uncertainty in mine planning applied to caving methods.

6. Mine Preparation

Underground facilities, introduction to Mine Preparation (horizontal and vertical works and constructions methods, tunneling). Management and the construction processes, Costs, Cycle calculation, uncertainties in the construction process. Construction methods for shafts (Blind Hole and Raise Borer Machine). Crushers room, key factors and excavation sequence and methodology. Drilling and Blasting for Block Caving mines (explosives and initiation systems, rock-explosive interaction, production and blasting, caving and blasting, monitoring and analysis of blasting rate, monitoring and analysis of induced vibrations by blasting). Digital image processing for fragmentation analysis. Jksimblast software training (2dface & 2dring)

7. Presentations, Case Study

The objective of the course is to allow the student to apply knowledge and techniques acquired during the Diploma, through conducting a project of their choice, on a Block Caving related topic. For this, the necessary, infrastructure for its development is offered by the University of Chile.

Each program's module will be evaluated through tests/readings/presentations/reports and/or a final exam. The minimum passing grade is 4,0 on a scale from 1,0 to 7,0.

Professors and Lecturers

- **Dr. Andrés Brzovic**, Geologist, Ph.D., Curtin University,
- **Prof. Javier Vallejos**, Civil Engineer, Ph.D., Queen`s University
- **Ing. Ernesto Arancibia**, Mining Engineer, MBA, Tulane University
- **Prof. Raúl Castro**, Mining Engineer, Ph.D., The University of Queensland
- **Dr. Nelson Morales**, Mathematical Engineer, Ph.D., Université de Nice Sophia-Antipolis
- **Ing. Alfonso Ovalle**, Mining Engineer, Universidad de Chile
- **Ing. Gustavo Reyes**, Mining Engineer, Universidad de Chile
- **Dr. Héctor Parra**, Mining Engineer, Ph.D., The University of Queensland

Application and Admission Requirements

Seats are limited to 20 students and are offered in strict registration order and requirement compliance. Candidates have to the following requirements may apply to the Diploma:

- Hold a bachelor degree in a discipline related to the program. They may also apply those who hold a professional degree which level, content and duration of studies correspond to an equivalent to the degree of Bachelor of the University of Chile.
- Curriculum Vitae
- Application Form (has to be requested to diploma@minas.uchile.cl)
- Sponsor letter (company's financing) and payment order

Each application will be resolved by the Academic Director of the Program, who will decide the acceptance or decline of the admission, based on the information presented.

Interested people registering the Diploma must apply to the program by sending the documents described above to: diploma@minas.uchile.cl

Fees

CLP\$ 6,000,000 – US\$ 9,000 per student

- All candidates must pay an enrollment fee of US\$ 500 -CLP \$ 350,000. This amount will be discounted from the total cost.
- Students that are sponsored by their companies must send a letter of support and a payment order.

Certification

After requirements are fulfilled, the student will receive a **Diploma in Block Caving Engineering**, issued by the Faculty of Physical and Mathematical Sciences of the University of Chile.