

PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE
COLLEGE OF ENGINEERING
DEPARTMENT OF MINING ENGINEERING
ABET COURSE SYLLABI

IMM 2213 FUNDAMENTALS OF THE ECONOMY OF MINERALS

Credits and contact hours:	10 UC credits / 10 hours (3 h. Lectures; 1.5h. site visit and 5.5h. Independent learning experiences)
Instructor's name:	Juan Ignacio Guzmán
Course coordinator's name	To be defined
Textbook:	“Dynamic Optimization: The Calculus of Variations and Optimal Control in Economics and Management”. Kamien, M., Schwartz, N., 1991.
Course Catalog Description:	<p>In this course students will understand the problem of optimal inter-temporal exploitation of mineral resources (both operation and market level), allowing them to analyze strategic decisions of mining companies (production, investment, exploration, etc.) based on maximizing the economic value of their deposits. For the problem conceptualization and solution, dynamic optimization tools are developed, modeling the space of control variables and decisions as physical space and time. Towards the end of the course concepts applied to discrete time and space are studied using specialized software.</p>
Prerequisite Courses:	MAT1640 Differential equations, IMM2013 Open pit mining, ICS2523 Microeconomics, ICS2123 Stochastic models
Co-requisite Courses:	None
Status in the Curriculum:	Required
Course Learning Outcomes:	<ol style="list-style-type: none">1. Identify and assess the significance of factors determining mineral supply in short and long term.2. Identify and assess the significance of factors determining mineral demand in short and long term.3. Incorporate the above information to analyze and explain the past behavior of a mineral market and project its future behavior (trends in prices and production).4. Evaluate public policy topics related to mineral production and use, including long term scarcity and availability, mining and economic development, sustainability, cartels and market power, etc.5. Carry out an original research on mineral market issues based on the principles of mineral economics.

**Relation of Course to ABET
Criteria:**

- b. Design and conduct experiments: analyze and interpret data
- c. Design a system, component, or process
- e. Identify, formulate, and solve engineering problems
- h. Broad education necessary for global, economic, environmental and societal context
- j. Knowledge of contemporary issues
- k. Techniques, skills, and modern tools for engineering practice.

Topics covered:

- 1. Commodities.
 - 1.1. Metal demand and consumption; demand determinants; intensity of use; material substitution; demand elasticity.
 - 1.2. Metal supply and demand; main products; byproducts and coproducts; recycling and secondary production.
 - 1.3. Technology and costs; comparative cost analysis; cost determinants; aggregate supply; long-term trends.
 - 1.4. Metal markets; industrial organization paradigm; mineral/metal market types.
 - 1.5. Prices; cyclical volatility; long-term trends.
 - 1.6. International trade; doctrine of comparative advantage; commercialization determinants in commodities markets.
- 2. Mining and environmental policies.
 - 2.1. Sustainable development; land use; indigenous peoples, flora and fauna, biodiversity; mining wastes; life cycle assessment; small and medium scale mining, artisanal mining.
- 3. Non-renewable resources exploitation. Extinction.
- 4. Economic Development; Dutch disease; curse hypothesis of natural resources; income and commercialization instability implications in economies based on the exploitation of natural resources; public mining vs private mining.
- 5. Revenue and profits in mining industry; nature and profitability sources; earning trends.
- 6. Markets structure and performance; industrial organization in mining; public mining companies - trends; private mining companies - trends; mergers and acquisitions; competitiveness.