

New Digital Technologies and Risk Management in Strategic Mine Planning: Smart mining complexes and mineral value chains under uncertain metal supply and market demand



March 28th 2019
TU Bergakademie Freiberg
Institute of Mine Surveying and Geodesy

Instructor: Roussos Dimitrakopoulos,
McGill University, Canada

In conjunction with

REAL-TIME Mining
2nd International Conference and
Demonstration Day
26th and 27th of March 2019 in Freiberg



Who should attend

Mining engineers, mine geologists, resource analysts, and project managers involved in feasibility studies, development and operations, interested in new technologies for risk management and optimal decision-making.

Participants are not required to have prior background on the course topic.

Content and Objectives

This one-day course presents the new generation of applied technologies that take mine planning and production scheduling optimization, and asset valuation to a new level: Simultaneous optimization of mining complexes - mineral value chains with uncertainty. Uncertainty refers to material supply (material types and grades) from mines quantified with geostatistical simulations. Demand uncertainty (markets) is also integrated into the new digital technologies for life-of-mine planning, as part of strategic risk management. A mining complex – mineral value chain refers to the integration of mining and processing operations with multiple pits and/or underground mines, multiple metals or minerals, stockpiles, blending options and alternative processing streams to yield sellable products delivered to various customers and/or spot market.

Simultaneous optimization of mining complexes aims to generate a production schedule for the various mines and processing streams that maximizes the economic value of the enterprise as a whole, in terms of market value of metal product(s) market value. Emphasis is placed on the downstream applications pertinent to the feasibility, design, development and planning stages of mining ventures, as well as in the financial optimization of relevant aspects of operations and production. Intelligent computing, self-learning mining complexes and mechanisms using machine learning methods integrating soft sensor data to production scheduling are introduced with examples from major mines.

Learn how you can improve performance by:

- Learning the state-of-the-art strategic mine analysis concepts and next generation approaches that unlock and add value to mining assets
- Discovering methods and tools for the simultaneous risk-managing (stochastic) optimisation of mining complexes and mineral value chains from mines to products to markets

- Discovering how the new developments will help you capture the “upside potential” in mine plans and minimise “downside risks”, as well as increase cash flows
- Learning the new smarter, self-learning mining complex and mechanisms based on search trees and reinforcement learning integrating real-time soft production data
- Exploring and learning from real-world examples, practices and comparisons in diverse applications, from gold and copper mines to iron ore and nickel laterites
- Understanding how to deal with blending and non-linear geo-metallurgical interactions in the processing streams, as materials are transformed from bulk material to refined products

The final stage of the course is a series of computer workshops that introduces participants to new powerful software. Data and software remains with the participants. Workshops include:

- Quantification of supply risk: Simulation of a mineral deposit and quantification of risk from resource uncertainty and variability
- Step-by-step simultaneous life-of-mine optimization of a copper-gold mining complex

Please note: *Participants require a laptop capable of connecting to the internet through WIFI.*

When and Where?

March 28th, TU Bergakademie Freiberg, Germany

At the
TU Bergakademie Freiberg
Institut für Markscheidewesen und Geodäsie
Fucks-mühlenweg 9B
09599 Freiberg
Germany
<https://tu-freiberg.de/fakult3/mage>



Instructor

Roussos is a Professor and Canada Research Chair (Tier I) in Sustainable Mineral Resource Development and Optimisation under Uncertainty, and Director, COSMO - Stochastic Mine Planning Laboratory. He holds a PhD from École Polytechnique de Montréal and an MSc from the University of Alberta. He works on risk-based optimization for strategic mine planning and more recently, the simultaneous optimization of mining complexes and mineral value chains under uncertainty, as well as short-term production planning integrating machine learning technologies. He works in a long-standing partnership with AngloGold Ashanti, Barrick Gold, BHP, De Beers, Anglo American, IAMGOLD, Kinross Gold, Newmont Mining and Vale. He has taught courses and worked in North America, Australia, South America, Europe, the Middle East, South Africa and Japan.

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Course Outline

Introduction - Foundational Concepts, Techniques and Limits

- Strategic mine planning and integrated optimization: multiple mining areas, multiple processing and expansions, surface to underground interfaces
- Technical risk management adds value and shelters investment
- Limits of conventional approaches: need for risk management and integrated models

Risk Quantification and Introducing a New Mine Planning Paradigm

- Breaking down silos: models of mineral deposits and mine planning optimisation
- Understanding how to quantify and utilise grade/tonnage/metal uncertainty and variability; Monte Carlo simulations and risk assessment
- Stochastic optimisation methods and mine planning: concepts and uncovering additional value

Risk Management in Mine Planning: Less risk and higher NPV

- Stochastic pit limits are larger and pushback design with grade uncertainty
- Product quality management and production scheduling with simulated deposits
- Stochastic production scheduling application and comparison to conventional scheduling

The Next Level: Mining complexes and Mineral Value Chains

- Mining complexes - mineral value chains and new smarter digital technologies
- Simultaneous optimisation of mining complexes from pit to port with geological (supply) uncertainty, stockpile and blending optimisation, processing and CAPEX options
- Industry examples and comparisons: diverse applications from gold and copper mines to iron ore and nickel laterite
- Optimisation of mining complexes with joint supply (raw materials) and demand (markets)
- The self-learning mining complex: A fast mechanism using search trees and reinforcement learning

Registration

Please Register by 03.03.2019 at

<https://drupal1.hrz.tu-freiberg.de/fakult3/mage/veranstaltungen/short-course>

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 09599 Freiberg
 Germany

Email: Joerg.Benndorf@mabb.tu-freiberg.de

Participation Fee: 500€

Titel: _____ **Name:** _____

Employer: _____

Address: _____

City/Zip Code: _____

Phone _____ **Fax:** _____

Email: _____

I will bring a laptop Yes No

Registration is complete only with complete transfer of participation fees.

Course, and snacks and refreshments are included in the fee.

The course will take place with a minimum of 5 participants and is limited to maximum 15 participants.

Early registration is recommended.