REGISTRATION DEADLINE September 6, 2019

Send registrations to:
Deborah Frankland
Canada Research Chair and Laboratory Administrator
COSMO - Stochastic Mine Planning Laboratory
Department of Mining and Materials Engineering
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CIM, SME, AusIMM, and SAIMM Members:
$2,300 USD (Excluding taxes)

Non-members:
$2,400 USD (Excluding taxes)

Title: Name:

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I will bring a laptop: ☐ Yes ☐ No

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Registration includes course notes, lunch, and morning and afternoon tea.

Participation in this course may be a valid activity towards continuing professional development with up to **26 contact hours**. Participants receive a Certificate of Completion.

Notification of Cancellation received in writing up to **September 6, 2019** (minimum of 10 working days before the course) will incur a 20% cancellation fee. No refund will be made after this time. An alternative participant may be nominated.

INSTRUCTORS

Georges Verly, Ph.D., P.Eng., is Chief Geostatistician at Amec Foster Wheeler (now Wood). Georges has close to 40 years of experience in consulting, operations and academic experience on gold, copper, nickel, uranium and other mineral properties and mines worldwide. His areas of specialization include geostatistics, conditional simulation of geological and grade models, mineral resource estimation, grade control, resource audits and training. Before joining Wood, Georges was a Consulting Geostatistician with Placer Dome/Barrick, where he developed practical applications of simulations to resource estimation and grade control for a number of operations and projects, and participated to the development of Placer Dome's standards for geological and resource modeling processes. He has taught geostatistics courses at the University of Nevada's MacKay School of Mines, UBC, Concordia University and Université du Québec à Chicoutimi, as well as to a number of private-sector organizations.

Roussos Dimitrakopoulos is a Professor and Canada Research Chair (Tier I) in Sustainable Mineral Resource Development and Optimization 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 simulation and stochastic optimization in mine planning and production scheduling, the simultaneous optimization of mining complexes and mineral value chains under uncertainty. He has taught short courses and worked in Australia, North America, South America, Europe, the Middle East, South Africa and Japan. He received the Synergy Award of Innovation in 2012 by the Governor General of Canada for research contributions to mining science and engineering and his long-standing partnership with AngloGold Ashanti, Barrick Gold, BHP, De Beers, IAMGOLD, Kinross Gold, Newmont Mining and Vale. In 2013, he received AIME's Mineral Economics Award, and was a CIM distinguished lecturer in 2015-2016.

VENUE DETAILS

McGill University
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3450 University Street
Frank Dawson Adams Building, Room 105
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LOGISTICS

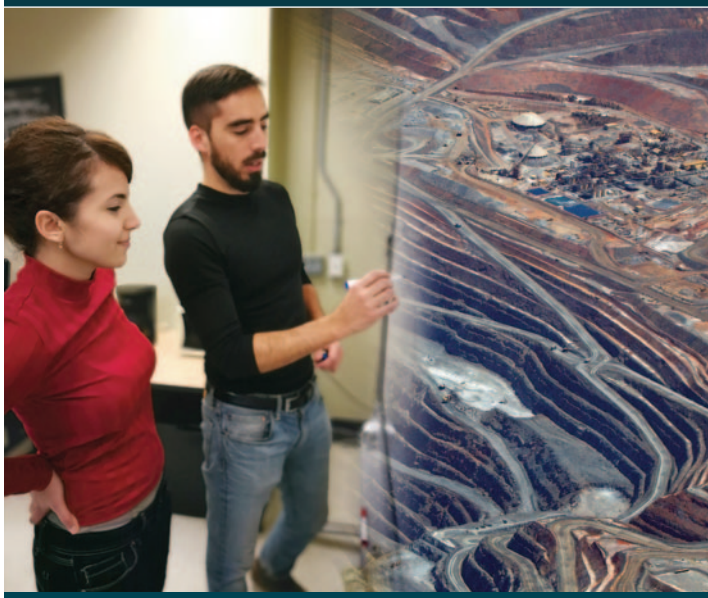
Sign-In: 8:00 to 8:30 on Day 1. Lectures are given from 8:30 AM (refreshments at 8:15 AM) to 5 PM with two 15 minute coffee breaks and one hour lunch break.

COSMO

cosmo.mcgill.ca

COSMO - Stochastic Mine Planning Laboratory, a global centre for leading-edge research and graduate education in "orebody modelling and strategic mine planning with uncertainty", is supported by AngloGold Ashanti, Barrick Gold, BHP, De Beers, IAMGOLD, Kinross Gold, Newmont Mining, Vale, and the Canada Research Chairs Program, NSERC, and CFI.

PROFESSIONAL DEVELOPMENT SERIES **2019**



STRATEGIC RISK QUANTIFICATION & MANAGEMENT FOR ORE RESERVES & MINE PLANNING

GEOSTATISTICAL MINERAL RESOURCE ESTIMATION AND MEETING THE NEW REGULATORY ENVIRONMENT: STEP BY STEP FROM SAMPLING TO GRADE CONTROL

Georges Verly
Wood, Canada
Roussos Dimitrakopoulos
McGill University, Canada

September 23-27, 2019
Montreal, Canada

CIM ICM · SME Society for Mining, Metallurgy & Exploration · AusIMM The Minerals Institute · SAIMM · COSMO

CONTENT AND OBJECTIVES

This course is designed according to the latest regulations on public reporting of Mineral Resources. It aims at showing how state-of-the-art statistical and geostatistical techniques help answering the requirements of those regulations in an objective and reproducible manner. A particular emphasis is put on understanding sampling and estimation errors and how to assign levels of estimation confidence through the application of resource classification fundamentals. In addition to a solid introduction to mining geostatistics this course provides a comprehensive overview of industry's best practices in the broader field of Mineral Resource estimation.

Attendees will learn:

- How to use statistical inference to identify problems with the data
- How to produce models that address the needs of mining companies
- Compliance with the standards of NI43-101, SEC Industry Guide 7 and JORC
- Effective workflows from data preparation to resource classification
- How to validate, reconcile and communicate resource estimation results
- The fundamentals of resource classification and how to apply them in practice
- How to produce auditable and reproducible resource estimates
- Estimation of grade control models and best practices in ore selection
- Spatial estimation of geometallurgical data
- How to use conditional simulations to quantify uncertainty in resource estimates
- How to integrate orebody simulations into mine planning

COURSE OUTLINE

Public Reporting of Mineral Resources and Mineral Reserves

- Resource estimation and the mining business cycle
- Meeting the definition of mineral resources and mineral reserves
- International standards for public reporting

Data Concepts

- Geological data acquisition and data verification
- Quality Assurance and Quality Control
- Detection limit, contamination, precision and accuracy

Geological Modeling

- Geological setting and modeling criteria
- Geological interpretation and 3D modeling
- Common traps and pitfalls

Exploratory Data Analysis

- Statistical inference and spatial declustering
- Identifying geological controls over grades
- Characterizing geological boundaries
- Dealing with outliers
- Selection of compositing methodology and composite size

Variography

- Spatial relationships and the variogram
- Inference of spatial continuity
- Variogram parameters and geology
- Practical modeling of variograms

Estimation

- Change of support concepts
- Spatial estimation and estimation errors
- Kriging explained
- Ordinary Kriging, Indicator Kriging, Uniform Conditioning
- Calibration of estimation parameters
- Block model validation
- Grade control models

Resource classification

Definitions and methodologies

Classification criteria: best practices and applications of technical and economic constraints

Introduction to Conditional Simulation

- Assessment of geological uncertainty
- Methods and applications
- Translating geological uncertainty into production risks
- Geological risk in mineral value chain optimization

Special topics

- Spatial estimation of geometallurgical attributes
- Reconciliation - Delivering on promises

WHO SHOULD ATTEND

Exploration and mine geologists, resource analysts, mining engineers, and anyone acting in the role of "qualified" or "competent person".

Please note: It is strongly recommended that participants bring a laptop and no previous exposure to statistics and geostatistics is required.

www.cim.org/mcgill

2018 Springer publication entitled:
"Advances in Applied Strategic Mine Planning"
(Editor Roussos Dimitrakopoulos)
is included with the course materials.