Mining Optimization Laboratory
Professional Development Workshops

**Location**
Edmonton, Alberta, Canada
Faculty of Extension, University of Alberta
2-231, Enterprise Square, 10230 Jasper Avenue,
Edmonton, AB, Canada, T5J 4P6

**Mine Planning and Design Series**

**Course 1** - March 20 to 23, 2012 - 4 days

**Mine Planning Software Foundation**

**Course 2** - March 26 to 28, 2012 - 3 days

**Resource Modelling**

**Course 3** - May 1 to 4, 2012 - 4 days

**Strategic Mine Planning and Optimization**

**Course 4** - May 9 to 11, 2012 - 3 days

**Open Pit Mine Design & Short-Term Planning**

**Discrete Event Simulation Series**

**Course 1** - April 11 to 13, 2012 - 3 days

**Foundation & Basic Simulation Modeling**

**Course 2** - April 16 to 18, 2012 - 3 days

**Intermediate Simulation & Statistical Analysis**

**Course 3** - May 29 to 31, 2012 - 3 days

**Advanced Simulation / Continuous Modeling**

**Instructor**
Hooman Askari
Email: hooman@ualberta.ca

**Registration**
Use online checkout registration at http://www.ualberta.ca/MOL/
Or call: +1 (780) 492-3116
Irene Ng, Program Coordinator
Email: irene.ng@ualberta.ca
Tel: +1 (780) 492-3158

**Software: Gemcom Gems and Whittle**

Designed for mining professionals who wish to update their
theoretical and practical knowledge in drillhole databases,
geological modeling, resource modeling, optimization,
strategic mine planning, short-term planning, and open pit
mine design. The course complements the theory with
comprehensive instructions and hands-on computer labs
using Gemcom Software.

**Course 1 - 4 days - March 20 to 23, 2012**

**Mine Planning Software Foundation**

The Foundation course is a comprehensive four-day course
designed as the basis of the Mine Planning & Design
professional development series. The course covers principles
and fundamental concepts involved in drillhole database
management; data entry and editing; data manipulation,
filtering, and validation techniques; creating points, polylines,
and triangulations; drillhole compositing techniques; plot
generations of plans and sections; and surface and solid
modeling for geological domain characterization. The course
complements theory with comprehensive instructions and
hands-on experience. Using modern mine planning software.
Participants will complete a project with real drillhole data.
The project covers all the required steps from drillhole data to
surface and solid modelling techniques used to model
different orebody types and country rock environments using
polylines, drillholes, surfaces, and solids.

**Course 2 - 3 days - March 26 to 28, 2012**

**Resource Modelling**

The Resource Modelling course is a three-day course for
resource geologists, geoscientists, and mining engineers who
want to update their knowledge of resource estimation and
classification techniques. The course includes review of basic
statistics, review of drillhole compositing, basic geostatistical
analysis, variography and search ellipsoids, block model
setup and updating, single and multiple folder block models,
inverse distance estimation, theory of kriging, application of
kriging, change of support, cross validation, and NI-43-101
resource classification into measured, indicated, and inferred
categories. This course will also explore different methods of
categorizing and reporting volumes and tonnages for
resources. Participants will complete a resource modeling
project. The project covers all the required steps from basic
statistical analyses, experimental variogram calculation,
variogram modeling, search ellipsoid setup, grade

using inverse distance and kriging, cross validation of results,
and finally resource classification.

**Course 3 - 4 days - May 1 to 4, 2012**

**Strategic Mine Planning and Optimization**

The Strategic Mine Planning and Optimization course is a
comprehensive four-day course designed for mine planners,
mining engineers, managers, and decision makers in the
mining industry. Principles and fundamental concepts
involved in strategic mine planning and design of open pit
mines are presented. Subjects covered are geometrical layout
design; open pit limit optimization using manual method,
floating cone, and 2D & 3D Lerchs and Grossmann
algorithms; production planning; mine-life estimation, cut-off
grade optimization and Lane’s theory; final pit limit
optimization and production scheduling in the presence of
grade uncertainty; risk based mine planning. The course also
covers an introduction to mathematical programming
for mining engineers using Excel Solver. Mathematical
optimization models and case studies for long and short-term
open pit mine planning are presented. The course
complements theory with comprehensive instructions and
hands-on experience using Whittle strategic mine planning
software and Excel Solver. Participants will complete a
project quantifying uncertainty in production plans using
multiple realizations of conditionally simulated orebodies in
Whittle.

**Course 4 - 3 days - May 9 to 11, 2012**

**Open Pit Mine Design & Short-Term Planning**

Open Pit Mine Design & Short-Term Planning course is a
comprehensive three-day course designed for mine planners,
mining engineers, and geologists who are responsible for
activities that require them to design and manage pits, ramps,
switchbacks, slots, dumps. Also, polygon workspaces used in
various tools such as 2D polygonal reserve estimations,
geological mapping, ore control operations, and cut
evaluations for short-term planning. The course complements
theory with comprehensive instructions and hands-on experience using modern mine planning software.
Participants will complete a project with real data. The
project covers all the required steps from an optimal pit shell
and long-term schedule generated in Whittle to open pit &
dump design, cut evaluation for short-term planning and a
blast design.

Register Online
Simulation Software: Arena
Fundamentals of Discrete Event Simulation (DES) modeling and its industrial applications are presented. Theoretical and statistical aspects of simulation, including input and output analysis, experimental design, and variance reduction techniques are presented. Arena Simulation Environment (Rockwell Automation) is used as the primary modeling tool for explaining simulation concepts. The course is intended for all engineering disciplines and participants who would like to use simulation to design and optimize real-world systems, but most of the computer labs and instructions are specifically tailored for mining applications. On completion of this series, you will have an in-depth understanding of principles and methodologies of discrete event simulation. A series of labs using Arena Simulation Software are undertaken to model and optimize real-world systems. Students undertake a complete simulation modeling/analysis project in parallel to the labs.

Course 1 – 3 day - April 11 to 13, 2012
Foundation & Basic Simulation Modeling
The Foundation course is a comprehensive three-day course designed as the basis of the Discrete Event Simulation professional development series. The course covers principles and fundamental concepts involved in discrete event simulation and the pertinent Arena concepts and constructs. The Foundation course covers a comprehensive review on probability and statistics, fundamental simulation concepts, simulation using spreadsheets, a guided tour through Arena, and modeling basic operations and inputs in details in Arena. The course complements theory with comprehensive instructions and hands-on experience using Arena Simulation Software. Participants will complete a project parallel to the labs instructions.

Course 2- 3 days - April 16 to 18, 2012
Intermediate Simulation & Statistical Analysis
The Intermediate Simulation Modeling and Statistical Analysis course is a comprehensive three-day course designed as part of the Discrete Event Simulation professional development series. The course covers principles and fundamental concepts required to model real-world applications with discrete event simulation. The Intermediate course covers a comprehensive review on lower level modeling and sub-models; batching, separation, and matching; transporters and materials handling; modeling input & output data; statistical analysis, multiple systems configuration comparison; and experimental design. The course complements theory with comprehensive instructions and hands-on experience using Arena Simulation Software. Participants will complete a project parallel to the labs’ instructions.

Course 3 - 3 days - May 29 to 31, 2012
Advanced Simulation & Continuous Modeling
The Advanced Simulation Modeling and Combined Discrete/Continuous Modeling course is a comprehensive three-day course designed as part of the Discrete Event Simulation professional development series. The course covers advanced topics for modeling complex real-world problems. Principles and fundamental concepts involved in discrete event simulation and the pertinent Arena concepts and constructs are presented. The advanced course covers a comprehensive review on continuous simulation, combined discrete/continuous simulation, Flow Process Template using tanks, regulators and regulator sets to model flow, implementing Pseudo Agent-based modeling techniques, and an introduction to using Visual Basic for Applications with Arena. The course complements theory with comprehensive instructions and hands-on experience using Arena Simulation Software. Participants will complete a project parallel to the labs’ instructions.

Instructor
Hooman Askari
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http://www.ualberta.ca/MOL/

Dr. Askari is an assistant professor of mining engineering in the School of Mining and Petroleum Engineering, Department of Civil & Environmental Engineering at the University of Alberta, Canada. He teaches and conducts research into mine planning and simulation of mining systems. He is the director of industrial research consortium, Mining Optimization Laboratory (MOL) – sponsored by mining industry companies. He is a registered Professional Engineer in Alberta. He offers consulting services to mining industry through OptiTek Mining Consulting Ltd. in the area of open pit mine planning and design and simulation of mining systems.

Mining Optimization Laboratory
Mining Optimization Laboratory (MOL) is an industrial research consortium directly sponsored by mining companies who exclusively receive research results. MOL research focuses on two major themes:
- Mine Planning and Design.
- Simulation Optimization of Mining Systems.
MOL research focuses on using operations research and advanced analytical methods such as mathematical modeling, optimization, discrete event/continuous simulation, and intelligent agents to arrive optimal or near-optimal solutions to complex, large-scale mine planning/operations decision-making problems.