Professional Development Courses

DRILLHOLES TO BLOCK MODEL USING GEOVIA GEMS

Location

University of Alberta, Edmonton, Canada

Dates

November 16-20, 2020 - 5 days, 8:30-16:30

Early Registration Deadline - 10% discount

Monday, October 19th, 2020

Registration Deadline

Monday, November 9th, 2020

Course Fee

CAD $3950 (excluding taxes)

Instructor

Hooman Askari is a professor of mining engineering in the School of Mining and Petroleum Engineering at the University of Alberta, Canada. He teaches and conducts research into mine planning & design and simulation of mining systems. Hooman is a registered professional mining engineer with more than two decades of operational, consulting, research, and teaching experience in the area of open pit mine planning and design. He has a strong track record of success in leading the Mining Optimization Laboratory (MOL) research team sponsored by industry partners into development, testing, and delivering mine planning optimization prototype software and mine simulation models to major mining companies. He consults as the Principal Engineer on long-term to short-term open pit production scheduling optimization and simulation of mining-systems through OptiTek Mining Consulting Ltd.

Registration

Send the completed registration form to: registration@optitek.ca

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Phone: +1 (780) 893-9365

DRILLHOLES TO BLOCK MODEL USING GEOVIA GEMS

Who Should Attend

Drillholes to Block Model is a five-day course designed for geologists, geo-modelers, geoscientists, mine planners, mining engineers, and technical managers who are responsible for activities that require them to generate or oversee drillhole database management to estimating block models. The course is designed to provide theory through lectures, complemented by a hands-on real-world resource modeling project using GEOVIA GEMS. An iron ore data set is used with other examples presented with a copper deposit.

Cancellation Policy

Notification of cancellation received in writing by **Monday, November 9th, 2020** will incur a 20% cancellation fee. No refund will be made after this time.

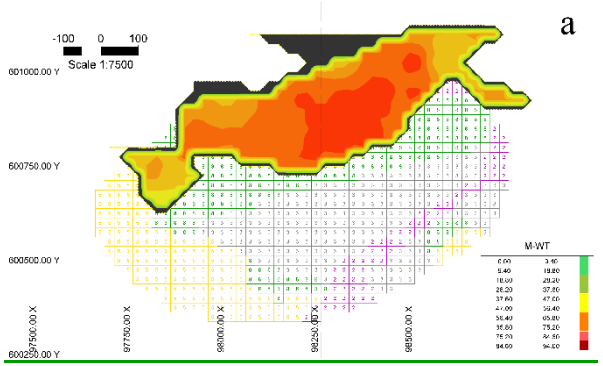
Course Delivery

- Lectures on theoretical concepts
- Documented step by step computer labs instructions
- Incremental exercises and project work
- Presentation of real mining case studies

Mining Optimization Laboratory (MOL)

MOL research focuses on using operations research and advanced analytical methods to arrive optimal or near-optimal solutions to complex mine planning and operational decision-making problems.

http://www.ualberta.ca/MOL/



SOFTWARE: GEOVIA GEMS

Participants are Required to Bring a Laptop
Software will be provided for the course

First Name: _____

Last Name: _____

Company Name: _____

Job Title: _____

Address: _____

_____

City: _____

Prov/ State: _____

Country: _____

Email: _____

Phone: _____

Fax: _____

Visa ☐ Master Card ☐

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(Fee + 5% GST) CDN$_____

Name on Card: _____

Signature: _____

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COURSE DESCRIPTION

Software: GEOVIA GEMS

Drillholes to Block Model is a five-day course that covers principles and fundamental concepts involved in drillhole database management; data manipulation, filtering, and validation techniques; drillhole compositing techniques; plot generations; surface and solid modeling for geological domain characterization; basic geostatistical analysis, variography and search ellipsoids setup, block model setup and estimation, single and multiple folder block models, inverse distance and kriging estimation, 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.

The course complements theory with comprehensive instructions and hands-on experience using GEOVIA GEMS software. Participants will complete a resource modeling project with an iron ore drillhole dataset. The project covers all the required steps from drillhole database setup to statistical analyses, experimental variogram calculation, variogram modeling, search ellipsoid setup, grade estimation using inverse distance and kriging, cross validation of results, and finally resource classification.

The modules for the course are as follows:

- Module 1: Drillholes Databases and Workspaces
- Module 2: Sections, Plan Views, and Plotting
- Module 3: Basic Statistics and Data Manipulation
- Module 4: Drillhole Compositing
- Module 5: Geology – Surface and Solid Modeling
- Module 6: Basic Statistics
- Module 7: Variograms
- Module 8: Single Folder Block Model
- Module 9: Partial Block Models
- Module10: Resource Classification

Outcomes of the course include:

By the end of this course, you will be able to complete the following in GEOVIA GEMS:

- Create new projects and databases
- Add and modify sections and plans views
- Load and display drillholes
- Manipulate data in the database

DRILLHOLES TO BLOCK MODEL USING GEOVIA GEMS

- Perform basic statistics on drillhole data
- Composite drillhole data
- Create points and polylines
- Use Plot Maker
- Use drillhole data to create basic surfaces
- Digitize 3D rings from interpreted drillhole data
- Create and manage triangulation solids ad surfaces
- Perform statistical analysis
- Understand variogram concepts
- Calculate experimental variograms
- Model variograms
- Interpret variogram maps
- Establish search ellipsoids
- Create block model projects
- Update block attributes for rock type and density
- Understand kriging theory
- Estimate grades using inverse distance and kriging
- Use indicator kriging for numerical rock type modeling
- Create partial block models
- Cross validate the estimated block model values
- Import and export block models
- Classify resources based on NI 43-101 guidelines
- Report volumes and tonnages using the block model

Day 1

Module 1: Project Databases and Workspaces

- Drillhole databases
- Workspace and database concepts
- Header, survey, assay, lithology,
- From–to, distance, and point databases
- Workspace concepts
- Data types
- Creating workspaces for drillholes
- Editing data
- Validating the drillhole data
- Defining colour profiles and drillhole display profiles
- Opening drillhole data into the graphical area
- Profiles and profile groups

Module 2: Sections, Plan Views, and Plotting

- Sections and plan views
- Profiles and profile groups
- Cross and longitudinal sections, plan views
- Creating sections and plan views
- Viewing data on sections and plan views
- Creating inclined and diagonal sections

SOFTWARE: GEOVIA GEMS

- Plotting data
- Creating drillhole plots from displayed data
- Creating symbol plots from displayed data
- Creating a grid and contour plot
- Create a structure plot
- Batch plotting
- Defining plot styles
- Creating extra viewports
- Creating title blocks and graphical images
- Saving images into catalogues
- Defining grid transformations

Day 2

Module 3: Basic Statistics and Data Manipulation

- Point data and filtering data
- Validating data
- Creating a workspace structure report
- Generating a quick report
- Preparing a user defined report
- Data extraction from the workspace
- Univariate statistics
- Multivariate statistics
- Creating a point area workspace
- Importing points into a point area workspace
- Defining the point display profile
- Opening points in the graphical area
- Basic statistics on raw data
- Working with data filters
- Working with SQL filters
- Manipulating data
- Defining manipulations
- Simple manipulation and conditional manipulation
- Cross table transfer and de-surveying

Module 4: Drillhole Compositing

- Compositing methods
  - By plan view
  - By equal length
  - By length within intervals from another table
  - By merging intervals from two tables
  - By a single cut-off value.
  - By multiple cut-off values
  - By grouped similar values
  - By Optimal
- Modifying the workspace to accommodate composite results
- Calculating the composite
- Performing a thickness calculation

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SOFTWARE: GEOVIA GEMS

- Displaying drillholes with the calculated composites
- Composite by rock code for geology polylines
- Composite by cut-off grade
- Basic Statistics on Composites
- Determine optimum sample length for compositing
- Composite equal length intervals within geological domains
- Extract composites into a point area workspace
- Carry out and compare basic statistics

Day 3

Module 5: Geology - Surface and Solid Modeling

- **Surface Modeling**
  - Working with polyline data
  - Creating a polyline workspace
  - Importing polylines from DXF or ASCII files
  - Defining the polyline display profile
  - Opening polylines into the graphical area
  - Selecting the drillhole intersects for the surface creation
  - Creating surfaces from active data
  - Preparing the surface using Laplace gridding
  - Gridding and Contouring Surfaces
  - Create and validate surfaces
  - Create topography, weathering, pits, faults, etc.
  - Creating surfaces with two sets of lines
  - Optimizing surfaces
  - Creating Surfaces using Spherical Gridding
  - Defining a spherical grid profile
- **Solid Modeling**
  - What are the basic polyline types and uses
  - Digitizing new polylines
  - Making polyline modifications
  - Drawing close polylines on sections
  - Defining 3D rings on section or plan
  - Using tie lines to connect 3D rings
  - Basics rules for the creations of rings and tie lines
  - Grooming the 3D rings
  - Creating the solid from rings and tie lines
  - Plotting the solid on section
  - Handling split rings
  - Handling dog ears
  - Drawing tie lines
  - Create geological domains using solids
  - Quick tonnes/grade calculations for geological domains
  - Solid boolean operations
  - Solid intersection with clipping boundaries
  - Contouring solids

Day 4

Module 6: Basic Statistics

- Understanding the Geological Domains
  - The Impact of Domains on Estimated Values
- Basic Statistics
  - Descriptive statistics
  - Histograms
  - Cumulative probability plots
  - Probability plots
  - Bimodal distributions
- Outliers
  - Outliers and top cuts
  - Methods for determining a top cut value
  - Confidence interval
  - Percentile
  - Applying a top cut in GEMS
- Anisotropy
  - Viewing a Search Ellipse Sphere
  - Examples of Search Ellipse Parameters

Module 7: Variograms

- Anisotropy
- Variogram concepts
  - What is a variogram?
  - Variogram parameters
  - Linear (downhole) variography
  - Omnidirectional and directional variography
  - Effect of nugget, and range
  - Creating and viewing experimental variograms
  - Changing the variogram type
  - Summary: steps to create an experimental variogram
- Modeling a Variogram
  - Modeling an experimental variogram
  - Viewing different types of variogram models
  - Summary: steps to model an experimental variogram
  - Variogram modelling tips
- Variogram Maps
  - Calculating and modeling the variogram maps
  - Establishing major direction of continuity
  - Saving variography parameters to profiles
- Other geostatistical considerations

Day 5

Module 8 – Block Modeling

- **Single folder block model**
  - Block model geometry and workspace
  - Create additional attributes
  - Create cell display profiles for block model
  - Define block model geometry and set up workspace
  - Create additional attributes and model mappings
  - Initialize/check background values
  - Steps required of block model initiation
    - Colour profiles
    - Rock Codes
    - Grade names
  - Block model interpolation
    - Assignment of rock codes
    - Update rock types from solids
    - Updating density
  - Grade estimation using Inverse Distance Squared (IDS)
    - Inverse Distance (True)
    - Inverse Distance (Anisotropic)
  - Ordinary Kriging
    - Trace blocks
    - Search ellipse,
    - Variogram and kriging profiles
  - Block model manipulations
  - Visual validation
  - Other validation methods
  - Block display
    - Selecting blocks for display
    - Display modes
    - Text height
    - Decimal places for value string
    - Scaling
- **Partial Block Models**
  - Multiple folder block model setup
    - Grade interpolation using ID2 and OK
    - Volume, tonnes and grade reports
    - Compare and validate results
- **Resource Classification**
  - Measured, Indicated, and Inferred
- **Volumetric Resources/Reserves Reports**
  - Reporting groups
  - Rock codes and rock groups
  - Setting up rock codes
  - Setting up rock groups
  - Grade names and grade groups
  - Resource/Reserve reporting groups
  - Volumetrics profile export
  - Volumetrics reports