MIN E 651 Application of Mine Planning and Design

Course Outline Winter 2025

Instructor: Dr. Hooman Askari — Room: DICE Bldg. 6-237
Phone: 492 4053 — email: hooman@ualberta.ca

Nasib Al Habib — Room: NREF 7-109
Phone: N/A — email: nasib@ualberta.ca
Webpage: http://www.ualberta.ca/~hooman/
User name: MINE651 — Password: 65651

Lectures: Lectures/Labs will be held on Tuesday and Thursdays 11:00 AM to 12:20 PM in MEC 4-1 or NREF 2-118.

Grade Distribution:

Bi-weekly Reports	5*6%	30%
Final Report	1*20%	20%
Final Exam		30%
Presentation		20%

Course Resources:

Course labs instructions are going to be available at a nominal fee at the bookstore. The lecture notes will be provided on the course webpage. References will be made to other relevant materials and books.

Plagiarism

Plagiarism will not be tolerated in any form and will be dealt with strictly in accordance with university regulations. Please read the code of student behaviour and don't cheat sheet. The links are posted on the webpage.

Course Description

MIN E 651 is an advanced graduate-level course in the application of mine planning and design for graduate students. The course focuses on the practical integration of resource modeling, strategic mine planning, open pit optimization, production scheduling, pit and waste dump design, and cutoff optimization using professional mine planning software.

Students work through advanced applied mine planning workflows, including drillhole database management, data manipulation, compositing, geological modeling, surface and solid modeling, block modeling, volumetric reporting, resource classification, pit limit optimization, pushback design, practical pit design, mining direction control, production scheduling, and rescheduling of designed pits and pushbacks. The course emphasizes technical judgment, defensible engineering assumptions, professional reporting, and presentation of mine planning results.

Course Objectives

The objective of this course is to develop graduate-level competency in applied mine planning and design. Students will apply mine planning theory, geological and economic data, and professional software tools to solve practical mine planning problems. The course is designed to help students move beyond basic software use and develop the ability to critically evaluate mine planning workflows, assumptions, design constraints, optimization results, schedules, and reporting outcomes.

Learning Outcomes

Upon successful completion of MIN E 651, graduate students should be able to:

- Apply advanced mine planning and design workflows using professional mine planning software.
- Create, manage, and interpret drillhole databases, sections, plan views, and composited datasets.
- Perform data manipulation, geological modeling, surface modeling, solid modeling, and block modeling for mine planning applications.
- Complete volumetric calculations, resource classification, and reporting from geological and block models.
- Evaluate open pit limit optimization results and interpret their technical and economic significance.
- Develop practical pushback designs and understand their relationship to NPV, production scheduling, and mining direction control.
- Apply pit design parameters, bench geometry, ramps, access requirements, and bottom-up and top-down pit design methods.
- Design waste dumps and understand their connection to production scheduling and material movement.
- Export designed pits and pushbacks to strategic planning tools and reschedule them using practical mine planning constraints.
- Apply cutoff optimization concepts, including Lane's theory and simultaneous optimization.
- Critically assess mine planning assumptions, constraints, and results at a graduate engineering level.
- Prepare professional technical reports and presentations that clearly communicate mine planning methodology, results, limitations, and recommendations.

MIN E 651: Application of Mine Planning and Design – Winter 2025 - Tentative Schedule

Week (Dates)	Day	Lec	Lecture Topic	Labs due	Project due
Resource Modeling					
1 (01/06 - 01/12)	07 09	L01 & L02	• Drillhole Databases • Sections & Plan Views		
2 (01/13 - 01/19)	14 16	L03 & L04	• Data Manipulation • Drillhole Compositing	Lab 1	
3 (01/20 - 01/26)	21 23	L05 & L06	• Geological Modeling • Surface Modeling • Solid Modeling	Lab 02	Project 01
4 (01/27 - 02/02)	28 30	L07 & L08	• Basic Statistics • Block Modeling I	Lab 03	Project 02
5 (02/03 - 02/09)	04 06	L09 & L10	• Block Modeling II • Volumetrics • Resource Classification	Lab 04	
Strategic Mine Planning and Pit and Dump Design					
6 (02/10 – 02/16)	11 13	L11 & L12	• Open Pit Limit Optimization • Pushback Analysis and Design • Production Scheduling / Contractors	Lab 05	Project 03
7 (02/24 – 03/02)	25 27	L13 & L14	• Pit Design Parameters • Bench Geometry • Pit Design	Lab 06	
8 (03/03 – 03/09)	04 06	L15 & L16	• Production Scheduling - Practical Pushbacks NPV • Mining Direction Control		Project 04
9 (03/10 – 03/16)	11 13	L17 & L18	• Bottom-Up and Top-Down Pit Design • Ramps • Waste Dump Design	Lab 8a	
10 (03/17 – 03/23)	18 20	L19 & L20	• Exporting Designed Pits/Pushbacks to Whittle • Rescheduling Designed Pits and Pushbacks	Lab 8b	Project 05
11 (03/24 – 03/30)	25 27	L21 & L22	• Cutoff Optimization – Lane's Theory • Simultaneous Optimization	Lab 09	
12 (03/31 – 04/06)	01 03		• Review of contents		Project 06
13 (04/07 – 04/13)	08		• Presentations / Final Report Due / Exam		Final Report