# MIN E 325 - Mine Planning and Design

## Course Outline - Winter 2025

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**Prerequisites:**

MIN E 295 and CIV E 265

**Lectures:**

Lectures will be held on Monday, Wednesday, and Friday from 11:00AM to 11:50AM. Some lectures will be held in the computer lab 2-118, these lectures are labeled with a **Lab#** prefix in the schedule.

**Help Desk - NREF 7-109 – Teaching Assistants**

Help Desk hours for Labs, Assignments, and Project.

| | | |
|---|---|---|
| Mondays | 1:00 - 3:00PM | Nasib - nasib@ualberta.ca |
| Wednesdays | 1:00 - 3:00PM | Samaneh - moradipi@ualberta.ca |

**Grade Distribution:**

- Assignments 10%
- Labs 15%
- Project 35%
- Midterm Examination 10%
- Final Examination 30%

**Important Dates:**

- Assignments and Lab reports — Follows the tentative schedule.
- Midterm Examination — Monday, February 24, 2025
- Project Due — Wednesday, April 09, 2025
- Final Examination — Monday, April 14, 2025 (1.00 – 3.00 PM)
- All exams are closed book

**Class Requirements:**

***To pass this course you must receive a passing grade in each of the mine planning project reports.***

Class attendance is required. Students are expected to arrive at a minimum before class begins. Due dates are posted on the webpage. Please ensure that you hand in all required material on the due dates given. **Late assignments will automatically incur a 50% penalty**. It is expected that assignments will be done neatly, and be complete and insightful. **Late acceptance must be pre-arranged by email at least 24 hours before the homework is due.**

***Note: All projects are mandatory.***

**Course Resources:**

The required course material is available on the course webpage and eClass. Lecture notes and tutorials will be provided on-line on the course webpage. References will be made to other relevant materials.

Supplemental texts and material useful for the course may be found in:

- SME's Mining Engineering Handbook, Peter Darling, 2010.
- Open Pit Mine Planning and Design, Hustrulid, W. and Kuchta, M., second edition 2006.
- SME's Mining Engineering Handbook, Hartman, H. L., 1992.
- Surface Mining, Kennedy, B. A., 1990.

**Software:**

- GEOVIA Surpac 2023: General Mine Planning Software
- Deswik 2023.1: Mine Planning and Design Software
- GEOVIA Whittle 2022: Strategic Mine Planning Software

Please contact instructor with all questions regarding course; contact the TAs with all questions regarding the assignments, labs, and project.

**Code of Student Behaviour:**

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold University policies. Students should familiarize themselves with the provisions of the Code of Student Behavior (online at www. ualberta.ca/scretariat/appeals.htm) and avoid behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

**Course Description:**

Introduction to mine planning and design using professional software tools. Drillhole databases; drillhole compositing; surfaces and solids; geological and economic block models; open pit mine layout and planning requirements; pit limit optimization; haul road design; pit and waste dump design; long and short-term mine production scheduling; cut-off grade optimization. Prerequisites: MIN E 295, CIV E 265.

**Course Objectives:**

On completion of this course, successful students should be able to demonstrate an understanding of principles and methodologies, of open pit mine planning and design. Also, they will be able to use the tools and commercial software used in mine planning and design. Specifically, students will be able to:

- Computer-aided mine design.
- Use specialized mining software and spreadsheets for mine planning.
- Understand, use drillhole database and create drillhole composites.
- Compile technical, economic & other data required for mine planning.
- Build solids and surfaces.
- Build geological and economic block models.
- Understand open pit mining terms and definitions.
- Do pit limit analysis and design (manual method).
- Perform pit limit optimization (Floating cone, 2D & 3D Lerchs and Grossmann).

- Design haul roads.
- Plan and schedule mine development and production.
- Present and communicate mine plans in a professional manner.
- Calculate mine life.
- Generate long-term production schedules.

## Learning Outcomes

- Use specialized mine planning software for mine design and scheduling
- Create and manage drillhole databases
- Build geological and economic block models
- Perform pit limit optimization
- Carry out an open pit design
- Present and communicate mine plans in a professional manner.

## Accreditation Units

| Accreditation Units – MINE 325 – 3-0-3 | | | | |
|---|---|---|---|---|
| Lecture | Seminar | Lab | Credits | Total AU |
| 3 | 0/1 | 3/1 | 4.5 | 57 |
| Mathematics (M%) | Natural Science (NS%) | Complementary Studies (CS%) | Engineering Science (ES%) | Engineering Design (ED%) |
| 0 | 0 | 0 | 14.3 (25%) | 42.7 (75%) |

## Graduate Attributes

- **Design**
    - Design – Requirements
        - Elicits and articulates project requirements from the client –Preliminary design report
    - Design – Creativity
        - Synthesizes plausible solutions – Project report I
    - Design – Creativity
        - Synthesizes plausible solutions – Project report II
- **Use of engineering tools**
    - Use of Engineering Tools – System Modeling
        - Uses commercial software for estimation of reserves
            - MIN E 325 assignment or lab
    - Use of Engineering Tools – Analysis
        - Able to analyse sensitivity of production schedules to input parameters
            - MIN E 325 assignment or lab

**Min E 325: Mine Planning and Design- Winter 2025 Tentative Schedule**
**Lectures: M-W-F, 11:00-11:50 – MEC 4 - 1, Laboratories: Thursdays 14:00 –16:50, NREF 2-118**

| Week (Dates) | Date | | Lecture Topic | Labs[1] | Project | Assign/Lab |
|---|---|---|---|---|---|---|
| **January** | | | | | | |
| 1 (06/01 - 12/01) Introduction, Drillholes | 06 | | Introduction | | | |
| | 08 | | Drillholes | | | |
| | 09 | Lab | * | Lab01_Introduction | | |
| | 11 | | Lab02_Drillholes | | | |
| 2 (13/01 - 19/01) Compositing, Plotting | 13 | | Compositing | | | |
| | 15 | | Lab02_Compositing | | | Lab01_due |
| | 16 | Lab | * | Lab02_Drillholes | Start | |
| | 17 | | Lab03_Plotting | | | Assn01_start |
| 3 (20/01 - 26/01) Surfaces-Solids, Block Model | 20 | | Lab04_Surfaces and Solids | | | |
| | 22 | | Block Models | | | |
| | 23 | Lab | * | Lab03_Plotting | | |
| | 24 | | Lab05_Block Models I | | | |
| **February** | | | | | | |
| 4 (27/01 - 02/02) Economic Block Value | 27 | | Lab05_Block Models II | | | Assn01_due |
| | 29 | | EBV + Parcels | | | Lab02_due |
| | 30 | Lab | * | Lab04_Surfaces_Solids | | Assn02_start |
| | 31 | | Cut-Off Grade Calculation | | Proj01 | |
| 5 (03/02 -09/02) Pit Optimization | 03 | | Optimization Costs | | | |
| | 05 | | Pit Limits -2D Lerchs & Grossmann | | | Lab 03_due |
| | 06 | Lab | * | Lab 05_ Block Model | | Assn02_due |
| | 07 | | Lab06_Whittle - Pit Optimization I | | | Assn03_start |
| 6 (10/02 – 16/02) Pit Design | 10 | | Lab06_Whittle - Pit Optimization II | | | |
| | 12 | | Open Pit Design I | | | Lab04_due |
| | 13 | Lab | * | Lab06_Pit Optimization | Proj02 | |
| | 14 | | Midterm Review | | | |
| (17/02-23/02) | | | **Reading Week** | | | |
| 7 (24/02-02/03) Introduction to Deswik | 24 | | **Midterm Exam** | | | Assn03_due |
| | 26 | | Open Pit Design II | | | Lab05_due |
| | 27 | Lab | * | Lab07_Deswik.CAD I | Proj03 | |
| | 28 | | Project04 - Pit Optimization I | | | |

[1] All Lab sessions are Thursdays 2:00-5:00PM at NREF 2-118.
[2] Note: lectures that start with Lab or Project prefix will be held in the computer lab NREF 2-118.

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|---|---|---|---|---|---|---|
| **March** | | | | | | |
| 8 (03/03 – 09/03) Pit Optimization Project | 03 | | Project04 - Pit Optimization II | | | |
| | 05 | | Min Mining Width – Push-Back | | | |
| | 06 | Lab | * | Lab08a_Pit Design I | | Lab 06 due |
| | 07 | | Road Design I | | | |
| 9 (10/03 – 16/03) Road Design | 10 | | Road Design II | | | |
| | 12 | | Lab08a_Pit Design I | | | |
| | 13 | Lab | * | Lab08b_Pit Design II | Proj04 | |
| | 14 | | Lab08b_Pit Design II | | | |
| 10 (17/03 – 23/03) Pit Design Project | 17 | | Production planning – Sequencing | | | |
| | 19 | | Production planning – Mine Life | | | |
| | 20 | Lab | * | | | Lab 08a_due |
| | 21 | | Lab- LOM Plan I – Whittle | | | |
| 11 (24/03 - 30/03) Life of Mine Planning | 24 | | Lab-LOM Plan II – Whittle | | | |
| | 26 | | Project05 – Pit Design I | | | |
| | 27 | Lab | * | Lab09_Waste Dump | | Lab08b_due |
| | 28 | | Project05 – Pit Design II | | | |
| **April** | | | | | | |
| 12 (31/03 – 06/04) Waste Dumps &Productivity | 31 | | Waste Dump Design I | | Proj05 | |
| | 02 | | Waste Dump Design II | | | |
| | 03 | Lab | * | Project Work | | |
| | 04 | | Resources and Reserves Reporting | | | Lab 09_due |
| 13 (07/04 – 13/04) Reserves Reporting & Final Review | 07 | | | | | |
| | 09 | | Final Review | Complete Project | **Proj06_Final** | |
| | 11 | | | | | |
| | 12 | | | | | |

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|---|---|---|---|---|---|---|
| **Final Exam: Monday, April 14, 2025 (1.00 – 3.00 PM)** | | | | | | |
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| Extra support material - will not be taught and won't be on the exam either | | | Net-Value-Grade – Manual Method | | | |
| | | | Net Smelter Return (NSR) | | | |
| | | | Moving Cone | | | |
| | | | 3D Lerchs and Grossmann | | | |
| | | | Pseudo Flow Algorithm | | | |
| | | | Cut-off Optimization | | | |
| | | | Estimating Production – Shovels | | | |
| | | | Estimating Production – Trucks | | | |

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**Weekly Course Schedule**

- Week01 – Introduction & Drillholes
- Week02 – Compositing
- Week03 – Surfaces and Solids
- Week04 – Block Modeling
- Week05 – Economic Block Value
- Week06 – Open Pit Design Concepts
- Week07 – Introduction to Deswik.CAD
- Week08 – Pit Optimization Project
- Week09 – Road Design
- Week10 – Pit Design Project
- Week11 – Life-of-Mine Planning
- Week12 – Waste Dump Design

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