MIN E 413 Surface Mining Methods and Operations Management

Fall 2024 - September 03 to December 09

Class time: Tuesday, Thursday 9:30-10:50 Location: GSB 8-11

Instructor:

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ICE 6-243
Office Hours: Mondays 10:00-12:00

Course Description:

*3.8 (fi) (first term, 3-0-3/2) Principles and application of surface mining methods (mechanical, aqueous, and continuous surface mining methods). Production and productivity considering the generation of mine specific landform structures. Loading and hauling systems. Water drainage systems. Haul road design and maintenance. Waste dump and tailings facility design and management. Closure and reclamation.

Prerequisites: MIN E 310, 330, 323, and 325

Course synchronous and asynchronous content delivery schedule:

Land Acknowledgment:

The University of Alberta respectfully acknowledges that we are located on Treaty 6 territory, a traditional gathering place for diverse Indigenous peoples including the Cree, Blackfoot, Métis, Nakota Sioux, Iroquois, Dene, Ojibway/ Saulteaux/Anishinaabe, Inuit, and many others whose histories, languages, and cultures continue to influence our vibrant community.

TA Information:

Emmanuel Donea, donea@ualberta.ca
NREF L1-008

Lab Sections:

Section	Day	Time	Location
LAB D51	Friday (check Bear Tracks)	14:00 - 16:50	NRE 2-118

Course Objectives & General Content:

In this course students will have the opportunity to develop their knowledge and skills in the following subjects:

1) Selection and evaluation of surface mining methods for a mineral deposit with given ore body characteristics and ground conditions.
2) Calculation of cut-off grades and stripping ratio.
3) Determination of optimum production rates for a surface mine and development of a mine production schedule.
4) Identification of the unit operations in an open pit production cycle and selection of the equipment best suited for each operation based on pit configuration, production requirements and equipment productivity.
5) Calculation of the equipment productivity for open-pit and strip mining.
6) Evaluation of different mine waste structures and their stability.
7) Application of DragSim, Open pit mine metals, and Haulsim software packages in surface mining
8) Determining Rolling Resistance and Dump stability in the lab and upscaling them to the real operation.

Learning Outcomes:

By the end of this course, students should be able to:

1. Differentiate and explain the differences between the different types of surface mining methods.
2. Identify and evaluate core risks in each surface mining method
3. Identify the surface mining method most appropriate for ore extraction from a given deposit based on consideration of cost and market conditions, ore grades and stripping ratios, access, environmental limitations, and available infrastructure
4. Recognize, describe, and evaluate different mine waste structures
5. Identify and describe roles within the team while being a responsible and respectful member of the team by completing all expected tasks and actively contributing to team discussions
6. Demonstrate awareness of major technological trends
7. Assess and analyze the surface mining operation through Haulsim, Open pit metal mines , and Dragsim software packages.
8. Apply effective teamwork practices as a member and leader in multidisciplinary teams. Organize tasks, collaborate, and evaluate team roles to achieve project goals.
9. Apply ethical standards, accountability, and equity principles. Analyze and evaluate scenarios to propose solutions and defend ethical decisions in professional settings.

Marking Scheme:

Activity	(A)Synchronous	Due/Scheduled	Weight
Assignments		Sep (24th), Oct (3rd, 17th, 31st), Nov (19th), Dec (3rd)	15%
Labs		Sep (26th), Oct (10th, 24th), Nov (7th, 26th)	15%
Term project		Nov (29th)	20%

Midterm examinatiom		Oct 22nd	20%
Final examination		Check Beartracks	30%

The Faculty recommended grade point average for a 400 level course is 3.1. Instructors have the leeway to deviate from this average and can assign grades based on their own scheme. All grades are approved by the department chair (or delegate). The office of the Dean has final oversight on all grades.

Term Work

All term work solutions will be posted no later than the last day of classes. All term work will be returned to students by the final day of classes, with the exception of major term work due in the last week of classes. The latter will be returned by the day of the final examination or the last day of the examination period if there is no final examination in the course as per university policy; instructors will make accommodations to return these term work. It is the responsibility of the student to pick up all their term work at the specified time and place. Any unreturned term work, shall be retained and then shredded six months after the deadline for reappraisal and grade appeals. Final examinations will be kept for one year as required by university guidelines and the Government of Alberta's Freedom of Information and Protection of Privacy Act.

Additional Notes

Course delivery:
The course delivery method for MINE 413 in Fall 2024 is in person.
In the case of instructor illness, recorded lecture material will be made available on eClass for asynchronous consumption.

Academic Integrity:
Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances, are prohibited. 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 (available on the course webpage) 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.

Assignments, Lab, Quizzes, and term project:
Students are expected to submit assignments, lab reports, and term project as scheduled. Failure to submit when due will earn you zero for that assignment, report, quiz, or project. 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, and it will automatically incur a 50% penalty. Attendance in MINE 413 lab sessions is compulsory.

Office Hours:
Office hours is Mondays 10:00 AM-12:00 PM.
I am also available outside office hours. Contact by email for a 10 to 30-min appointment. Please include “MINE 413 Appointment Request” in the subject line.

Calculator Policy

Only approved non-programmable calculators are permitted in examinations. Any calculator taken into an examination must have a sticker identifying it as an acceptable non-programmable calculator (gold sticker). Students can purchase calculators at the University Bookstore with the stickers already affixed. Calculators purchased elsewhere can be brought to the Student Services where the appropriate sticker will be affixed to the calculator.

Expectations for AI use

In this course, we commit to AI use guided by ethical and transparent principles. While students are allowed to use advanced automated tools (such as ChatGPT or Dall-E 2) for certain written assignments, it is crucial to adhere to the following guidelines:
Seek prior approval from the instructor for AI use in specific assignments.
When allowed, clearly attribute and cite any AI-generated content in your work, including prompts and AI outputs as part of your academic record. Include an additional reflection component in your assessments, discussing how AI tools contributed to your learning process.
IMPORTANT: Please note that AI use is strictly prohibited in assessments and assignments not approved by the instructor. Failure to abide by this guideline may be considered an act of cheating and a violation as outlined in the relevant sections of University of Alberta (November 2022) Code of Student Behaviour .

Text and References (Recommended):

Course materials will be made available on the Canvas.

The following references can help you understand the course materials. There is a direct link to each of the following references on eClass, and you can read them online.

1. Darling, P., (2023), “SME surface mining handbook”, Society for Mining, Metallurgy, and Exploration, 652 pages.
2. Thompson R., Peroni R., and Visser A. T., (2018), " Mining haul roads: theory and practice", 1st edition, CRC Press, 294 pages.
3. Hawley M., and Cunning J., (2017), “Guidelines for mine waste dump and stockpile design”, CRC Press, 368 pages.
4. Beale G., and Read J., (2013), “Guidelines for evaluating water in pit slope stability”, CSIRO publishing, 600 pages.
5. Darling, P., (2011), “SME mining engineering handbook”, Vol. I and II, 3rd edition, Society for Mining, Metallurgy, and Exploration, 1984 pages.
6. Read J., and Stacey P., (2009), “Guidelines for open pit slope design”, CRC Press, 510 pages.
7. Bruce A. Kennedy, (1990), “Surface mining”, 2nd edition, Society for Mining, Metallurgy, and Exploration, 1194 pages.

Website:

Canvas

Lab Information:

Lab Topic	Date
Lab 1: Production Scheduling: Open-pit metals (Simulation)	2024-09-13

Lab 2: Rolling resistance, Dump stability (Hands-on)	2024-09-27
Lab 3: Shovel dipper-dig face interaction (Hands-on)	2024-10-11
Lab 4: Haul road design: Haulsim (Simulation)	2024-10-25
Lab 5: Strip Mining: DragSim (Simulation)	2024-11-08
Lab 6: Data Analysis (Term Project)	2024-11-29

Did you know that the University of Alberta has various low-to-no-cost services to help students succeed? Visit http://www.deanofstudents.ualberta.ca/ for information about the academic, wellness, and various other support services available to U of A students. It's never too early or too late to seek help!

MIN E 413: Surface Mining Methods and Operations Management- Fall 2024 Tentative Schedule

Day	Date	LEC/ LAB	Description	Labs (15%)	Assignment (15%)	Project (20%)
September						
Tue	3	Lec 01	Introduction			
Thu	5	Lec 02	Open-pit Mining (1)			
Tue.	10	Lec 03	Open-pit Mining (2)			
Thu.	12	Lec 04	Open-pit Mining (3)			
Fri.	**13**	**LAB 01**	**Open-pit Metal** and Term Project Explanation			
Tue.	17	Lec 05	COG (1)			
Thu.	19	Lec 06	COG (2)			
Tue.	24	Lec 07	Mine Haul Roads (1)		#1 @ 13:00	
Thu.	26	Lec 08	Mine Haul Roads (2)	#1 @ 13:00		
Fri.	**27**	**LAB 02**	**Rolling Resistance**			
October						
Tue.	1	Lec 09	Equipment (1): Loading and Mining Methods			
Thu.	3	Lec 10	Equipment (2): Time Usage Models		#2 @ 13:00	
Tue	8	Lec 11	Equipment (3): Equipment Selection (1)			
Thu.	10	Lec 12	Equipment (4): Equipment Selection (2)	#2 @ 13:00		
Fri.	**11**	**LAB 03**	**Shovel Dipper-dig face Interaction**			
Tue.	15	Lec 13	Continuous Mining (1)			
Thu.	17	Lec 14	Midterm Review Session		#3 @ 13:00	
Tue.	22	**Midterm Exam (20%)**				
Thu.	24	Lec 15	Continuous Mining (2)	#3 @ 13:00		
Fri.	**25**	**LAB 04**	**Haulsim**			
Tue.	29	Lec 16	Oil Sands Mining (1)			
Thu.	31	Lec 17	Oil Sands Mining (2)		#4 @ 13:00	
November						
Tue.	5	Lec 18	Open Cast Mining & Related Methods			
Thu.	7	Lec 19	Dragline Operating Methods	#4 @ 14:00		
Fri	**8**	**LAB 05**	**DragSim**			
Tue.	12	**Fall term Reading Week**				
Thu.	14					
Tue.	19	Lec 20	Aqueous Mining Methods		#5 @ 13:00	
Thu.	21	Lec 21	Waste Dump + DSR_WSRHC			
Tue.	26	Lec 22	Slope Stability	#5 @ 13:00		
Thu.	28	Lec 23	Tailings			
Fri.	29	Term project MUST be submitted (Report, Evaluation form, and Presentation) BY 13:00 and then Presentations will start. Term project (Report (5%) + Product (5%) + Evaluation (5%) + Presentation (5%)				Due @ 13:00
December						
Tue.	3	Lec 24	Mine Closure		#6 @ 13:00	
Thu.	5	Lec 25	Final Review			
Final Exam: TBA (30%)						

University and faculty policies

Respect and professionalism

The Faculty of Engineering is committed to fostering and protecting an equitable, inclusive, and respectful work and study environment in line with University of Alberta policies and professional engineering industry standards.

The faculty prepares students to uphold industry standards to become a Professional Engineer (P.Eng). Therefore, respect, professionalism, and accountability must be upheld within the Faculty of Engineering and the University of Alberta.

Academic integrity

All students are expected to follow the University of Alberta's Student Code of Behaviour and Student Conduct Policy. The faculty expects an environment free of harassment, discrimination, and bullying. We encourage you to talk to the Office of Safe Disclosure and Human Rights about experiences, questions, or concerns. Additional resources and support for students are attached below.

Engineering students studying in the province of Alberta must also follow the Code of Ethics set by the Association of Professional Engineers and Geoscientists of Alberta (APEGA).

Course outline policies, course requirements, evaluation and grading information can be found in the University Calendar.

Safety during learning activities

In all Faculty of Engineering courses, labs, seminars or other learning activities, safety is of paramount importance. In some cases, laboratory work in a program requires high standards for risk management to keep potential hazards safely under control.

Anyone found to be unable to function safely in the class, lab, seminar or other learning activity may be asked to leave or be removed for their and the safety of other participants and instructors in alignment with the Student Code of Behaviour and Student Conduct Policy. As members, or prospective members, of the engineering profession, it is your responsibility to identify and inform the proper authorities of unsafe work.

Audio and video recording

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan.

Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Only those items specifically authorized by the instructor may be brought into the exam facility. Students must not bring any unauthorized electronic device into an examination room, including cell phones or other devices.

Student services and support

Health & Wellness Support

Counselling and Clinical Services

Free, short-term, appointment-based counselling and psychiatric services. Also offers drop-in workshops. Book an initial consultation. Visit uab.ca/CCS to learn more.

Wellness Supports Social Workers

Free one-on-one support for students in the areas of housing, finances, academics, personal wellness, life skill development, family dynamics, system navigation, and any area of life where there is a desire to invite change. Visit uab.ca/wellness to learn more.

Sexual Assault Centre

Free, anonymous, and confidential drop-in counselling. Visit uab.ca/UASAC to learn more.

The Office of Safe Disclosure & Human Rights (OSDHR)

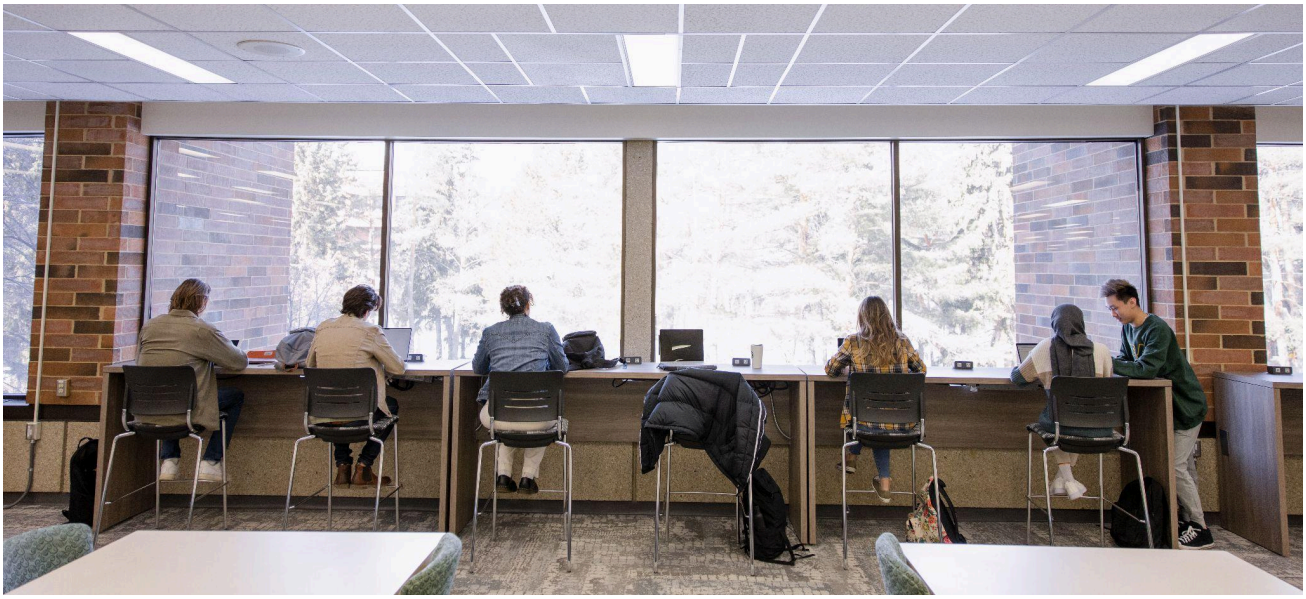
The OSDHR advises confidentially on sensitive issues you may not feel comfortable solving on your own. Contact the OSDHR if you want to get help or to make a report while keeping your privacy. Visit uab.ca/OSDHR to learn more.

HIAR (Helping Individuals at Risk)

If you're worried about someone, contact HIAR, who can help assess risk and connect individuals to support. Learn more at uab.ca/HIAR.

Immediate External Supports

Health Link Alberta: 811
Suicide Crisis Helpline: 988



Academic support

Academic Success Centre
Access to a variety of services to maximize your academic success. Learn more at uab.ca/ASC.

Accessibility Resources
Connects students with disabilities to accommodations. Learn more at uab.ca/Access under accommodations + accessibility.

Decima Robinson Support Centre
Academic support for 100- or 200-level introductory calculus, linear algebra and statistics courses. Visit uab.ca/DSC to learn more.

Engineering Student Success Centre
The Faculty of Engineering provides drop-in tutoring for first-year courses. Visit uab.ca/ESSC to learn more.

Office of the Student Ombuds
Call for complex problems and conflict mediation. Learn more at uab.ca/ombuds.

Financial support

Student Service Centre

For awards and other funding support. Learn more at uab.ca/ask.

Campus Food Bank

The Campus Food Bank Society is an independent charity supporting University of Alberta students, faculty, staff, and alumni for up to five years. For additional information visit their website at campusfoodbank.com.