

ESC417
Sustainable Mining Practices
3 Credits

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ESC417 Version: 2



Sustainable Mining Practices

Calendar Description

This course reviews environmental management practices used in the development, operation, monitoring and reclamation of large scale mining operations. This includes a review of the regulatory approvals process for mines and the scientific basis for monitoring and reporting requirements during development, operation, and reclamation of mine sites. The course also covers methods commonly used to manage and protect ecosystems, landscapes, soils, water, air, vegetation and wildlife during various phases of mine development. The four mining environments that are focused on are: mountain coal mining, prairie coal mining, oil sands mining and diamond mining.

Rationale

This is a required course for most students in Bachelor of Applied Science: Environmental Management.

Mining is a growing industry that is gaining social awareness for its environmental impacts at the same time it provides economic opportunities for Canada.

An understanding of mining regulations, operations and environmental issues are essential in the applied environmental science areas of restoration, wildlife habitat management, and enforcement and compliance with regards to natural resource extraction.

This course provides an overview of mining in western Canada including; regulations, mining procedures, environmental monitoring and protection, and environmental restoration.

Prerequisites

None

Co-Requisites

None

Course Learning Outcomes

Upon successful completion of this course, students will be able to

1. evaluate the impact of mining in Canada with regards to history, economics and social values.
2. analyze and assess land use regulations that are unique to surface mining.
3. diagram the mine exploration and planning process.
4. plan and design the removing and placement of overburden.
5. evaluate and illustrate the steps and equipment utilized in the salvage of topsoil and seedbank materials.
6. illustrate the steps involved with mineral extraction and processing.
7. analyze the effects of mining operations to the hydrology of the area and generate recommendations to the management of hydrologic resources.
8. create post mining restoration plans that include recreational components, wildlife habitat and the return of ecosystem function.
9. design long term environmental monitoring and protection systems.
10. demonstrate working knowledge in the four primary areas of mining in western Canada, mountain coal mining, prairie coal mining, oil sands mining and diamond mining.
11. research and communicate effectively.

Essential Employability Skills

Essential employability skills are critical for workplace success and lifelong learning. Lakeland College prepares its graduates for the workplace and lifelong learning by integrating and promoting essential employability skills development in its curricula. Each credit course offered at Lakeland College emphasizes one or more of the following five essential employability skills:

- A. **Communication Skills** that enable individuals to listen, interpret, express, and convey knowledge and ideas so that they are received and understood.
- B. **Teamwork Skills** that enable individuals to respect the thoughts and opinions of others as they work together to plan activities, meet deadlines, complete projects, and contribute to an organization's goals.
- C. **Critical Thinking Skills** that enable individuals to conceptualize and analyze issues from various perspectives while rationally evaluating the strengths and limitations of each perspective and deciding what action to take.
- D. **Adaptability Skills** that enable individuals to respond quickly, willingly, and positively to new conditions and changing times.
- E. **Positive Attitude and Behavioural Skills** that enable individuals to be confident about themselves and to deal with people, problems, and situations with honesty, integrity, and personal ethics.

Please refer to the Knowledge/Skills Matrix of this course outline to review the essential employability skills emphasized in this course.

Resource Materials

Required Text:

There are no required texts for this course.

Reference Text:

Dunn, K. 1996. The complete environmental auditing handbook. Templegate Information Services Inc., Toronto, ON.

Hartman, H.L., and J.M. Mutmansky. 2002. Introductory mining engineering. 2nd ed. John Wiley and Sons Inc., Hoboken, New Jersey.

Ibbotson, B., and J.D. Phyper. 1996. Environmental management in Canada. McGraw-Hill Ryerson Ltd., Whitby, ON.

Moon, C.J., M.K.G. Whateley, and A.M. Evans. 2006. Introduction to mineral exploration. 2nd ed. Blackwell Publishing, Malden, Massachusetts.

Schor, H.J., and D.H. Gray. 2007. Landforming: An environmental approach to hillside development, mine reclamation and watershed restoration. John Wiley and Sons Inc. Hoboken, New Jersey.

Hustrulid, W., and M. Kutcha. 2006. Open pit mine planning and design. Taylor and Francis, London, U.K.

Younger, P.L., S.A. Banwart, and R.S. Hedin. 2002. Mine water: hydrology, pollution, remediation. Kluwer Academic Publishers Dordrecht, Netherlands.

Conduct of Course

The course consists of approximately 42 hours of lecture.

The lecture is a formalized classroom situation where the instructor discusses pertinent topics and students normally take notes. Student-questions are encouraged to clarify subject areas.

Evaluation Procedures

Lecture exams may contain discussion-type, short answer, matching, true-false-justify, and multiple-choice questions. The final grade for the course is weighted according to the following schedule:

Lecture Midterm Exam	25%
Final Exam	35%
Assignments	<u>40%</u>
Total	100%

To obtain credit for this course all assignments must be completed and a minimum grade of 1.0 must be achieved.

Late assignments are not graded and a zero mark is assigned. Any assignment that is missed due to tardiness or unexcused absenteeism results in a zero.

All reports, assignments and exams are graded on a percentage (%) basis and a total course percentage is calculated using the above weighting values. Finally, the total course percentage is converted to a letter grade using the scheme following the Knowledge/Skills Matrix section.

Knowledge/Skills Matrix

Students apply and demonstrate their knowledge and skills to use

A. Communication Skills

A1. by listening, reading, interpreting information, and communicating effectively
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goals 1-11
A2. by using written, spoken, and/or visual formats and media to communicate and meet needs of each particular audience
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goal 11
A3. by using libraries, Internet, technical publications, journals and other sources to find pertinent information
Evaluation(s)/Goal(s): Goal 11

B. Teamwork Skills

B1. by using interpersonal skills to create an atmosphere that maximizes the strengths of group members to accomplish tasks
Evaluation(s)/Goal(s): n/a
B2. by using interpersonal skills to resolve conflict, relate to others, and assist others
Evaluation(s)/Goal(s): n/a
B3. by contributing and listening to others as group determines realistic objectives, prioritizes tasks, and identifies resources and timelines
Evaluation(s)/Goal(s): n/a
B4. by treating other members of the group open-mindedly and fairly
Evaluation(s)/Goal(s): n/a
B5. by developing tactics/strategies to accomplish tasks
Evaluation(s)/Goal(s): n/a

C. Critical Thinking Skills

C1. by seeing critical thinking as a lifelong process of self-assessment
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goals 1-11
C2. by examining problems closely
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goals 1-11
C3. by examining beliefs, assumptions, and opinions, and weigh them against the facts
Evaluation(s)/Goal(s): Goals 1-11
C4. by seeking out the truth
Evaluation(s)/Goal(s): Goals 1-11
C5. by finding solutions; make decisions
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goals 1-11
C6. by incorporating new ideas that may not necessarily agree with previous thought on the topic
Evaluation(s)/Goal(s): Goals 1-11
C7. by seeing connections between topics and use knowledge from other disciplines to enhance reading and learning experiences
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goals 1-11

D. Adaptability Skills

D1. by working independently or as part of team
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goals 1-11
D2. by carrying out multiple tasks or projects
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goals 1-11
D3. by being innovative and resourceful: identify and suggest alternative ways to get the job done
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goals 1-11
D4. by being open and respond constructively to change and uncertainty
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goals 1-11

E. Positive Attitude and Behavioural Skills

E1. by dealing with people, problems, and situations with honesty, integrity, and personal ethics
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goals 1-11
E2. by showing interest, initiative, and effort
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goals 1-11
E3. by affirming the need for positive solutions and encourage positive interaction and feedback
Evaluation(s)/Goal(s): Lecture Exam 1 and 2, Final exam; Goals 1-11
E4. by balancing personal and family activities with job-related activities
Evaluation(s)/Goal(s): Goal 11

Grade Equivalents and Course Pass Requirements

A minimum grade of D (50%) (1.00) is required to pass this course.

Letter	F	D	D+	C-	C	C+	B-	B	B+	A-	A	A+
Percent Range	0-49	50-52	53-56	57-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Points	0.00	1.00	1.30	1.70	2.00	2.30	2.70	3.00	3.30	3.70	4.00	4.00

Students must maintain a cumulative grade of C (GPA - Grade Point Average of 2.00) in order to qualify to graduate.

Attendance

Classroom and laboratory attendance is considered vital to the learning process and as significant to the students' evaluation as examinations and reports, therefore absenteeism is recorded.

- a. Students having a combination of excused and/or unexcused absence of 20 percent or higher for the scheduled course hours can be required to withdraw and would then automatically receive a "RW" (required withdrawal) for the course, regardless of any other evaluation results. (RW is a failing grade).
- b. An excused absence is one that is verified with your instructor. Verification should be prior to the absence or the next class day following the absence. Verification of the absence may take the form of a note from your doctor/College nurse regarding illness, or a note from another instructor regarding a field trip or other activity, or authorization by your instructor following an in-person meeting. Be sure to contact your instructor and ask what they will require from you as verification of each absence. An unexcused absence is anything NOT verified by the instructor prior to the absence or the next class day following the absence.

NOTE: Any exceptions to the above attendance policy (e.g. timetable conflicts, work-related issues) must be approved in writing by the Department Chair prior to the beginning of the course.

It is the students' responsibility to know their own absentee record.

Normal hours are 8:30 a.m. to 6:30 p.m., with potential for evening courses, exams or extended field trips. Students are expected to be available for classes during these times.

Course Units/Topics

Lecture Units:

1. Introduction to mining in Canada
2. Coal, oil sands and diamonds
3. Exploration
4. Mine planning
5. Overburden and soil handling and salvage procedures
6. Mineral extraction methods, handling and processing
7. Hydrologic resources
8. Monitoring and protection
9. Landforming: An environmental approach



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