

**SAULT COLLEGE**  
**of Applied Arts and Technology**  
**Sault Ste. Marie**

**COURSE OUTLINE**

MINING

MNG 121-3

revised July, 1980 by M. Engel

MINING

MNG 121-3

TEXT:

None

REFERENCES:

Methods of Working Coal and Metal Mines - Vols. 1, 2, 3 - Woodruff

Elements of Mining - Lewis & Clark

Elements of Mining - Young

Mining Engineer's Handbook - Vols. 1 & 2 - R. Peele

Mine Accounting & Financial Administration - Wilcox

Prospecting in Canada - A. H. Lang

Examination and Valuation of Mineral Property - 4th Edition - Parks

Blasters' Handbook - Canadian Industries Ltd.

Handbook - Rules Governing the Operation of a Mine - Dept. of Mines

Open Pit Mining Practice in Canada (Mineral Resources Deivision -  
Dept. of Mines & Technical Surveys, Ottawa) - Amil Dubnie

COURSE OUTLINE

MINING METHODS

MNG 121-3

3 hours per week-

COURSE DESCRIPTION:

This course is designed to familiarize the student with underground and open pit mining methods- Emphasis is placed on outlining the geologist's function in a mine or pit ie: selection of mining methods, grade control and safety.

COURSE TOPICS:

- 1) site preparation, technical and environmental consideration
- 2) underground mining methods
- 3) open pit mining methods
- 4) other mining methods
- 5) drilling methods
- 6) grade control in mines and pits

RESOURCES:

Lecture notes - no text book  
Library books S periodicals

METHOD OF INSTRUCTION:

Lectures  
Field trip - 2 days

METHOD OF EVALUATION

3 tests - equal value  
passing grade - 60%  
Students with an overall average of more than 50% but less than 60% will be granted a supplemental test.

TOPIC

PERIODS

TOPIC DESCRIPTION

20

Methods of Mining

Underground

- introduction
- opening up the ore body
- access, shaft, cross-cutting, etc

Stoping Methods

- room and pillar
- open cut
- cut and fill
- cut and fill with timber
- strinkage
- other underground stoping
- summary of applications related to nature of the ore body

10

Open Pit

- introduction
- types of ore bodies, advantages & disadvantages of method clearing and site preparation
- stripping - bank waste removal
- ore limits and pit limits
- pit terminology, layout and mapping and grade control
- breaking
- loading
- haulage and hoisting

Other Mining Methods

- placer - sluicing, hydraulic mining, alluvial stripping
- solution - types of soluble ores, sulphuric, salt, etc.
- bacterial - introduction

Drilling Methods

- percussion drilling
- rotary percussion drilling
- rotary drilling
- diamond drilling, types of core barrel
- jet peircing

Grade Control in Mines

- in underground operations
- in open pits
- stockpiling
- blending

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Course Objectives

GENERAL:

The student should be able to have an understanding of Underground and Open Pit mining methods and should be familiar with working procedures associated with these methods-

- A. The student should be familiar with all work necessary to develop an underground mine.
1. The student should be able to list and discuss 4 points which have to be considered before developing a mine.
  2. Be able to write definitions of mine development workings and be able to draw a sketch of these workings.
  3. Be able to name the advantages and disadvantages of a vertical and inclined shaft.
  - 4- Be able to select the proper shaft and its location from geologic data given.
  5. Be able to describe shaft sinking techniques for stable formation fractured and unstable rocks and when major underground water flows are encountered,
  6. Be able to name advantages and disadvantages of circular and rectangular shafts,
  7. Be able to describe (write and sketch) a drum and a friction hoist
- B. The student should be familiar with underground mining methods, their layout, the working procedures used and should be able to select the proper mining method from geological data given.
1. The student should be able to name 6 factors influencing the selection of a mining method.
  2. Be able to name 3 requirements which have to be met by any mining method.
  3. Be able to name 4 characteristics of an ore body in which sub-level stoping is used.
  4. Be able to show the layout in sublevel stoping in an end view and side view.
  - 5- Be able to describe and sketch methods of the stope development from the slot raise to the final stope.

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6. Be able to show in sketches drill patterns of blast holes used in this method and to give the length of drill holes.
  7. Be able to describe 2 methods to remove the ore from the sublevel stopes and be able to name the machinery used.
  8. The student should be able to name characteristics of an ore body in which the Room and Pillar method is used.
  9. Be able to name ores which are usually mined by this method, and name applications of this method in Canada,
  10. Be able to show the layout of 2 room and pillar methods in a top view and side view.
  11. Be able to describe the methods used in drilling, blasting and removing of the ore.
  12. He should be able to name the characteristics of an ore body in which shrinkage stoping is used as a mining method.
  - 13- Be able to name 3 factors which determine the size of shrinkage stopes.
  14. Be able to show the layout of a shrinkage stope in side and end view.
  15. Be able to describe the work cycle in shrinkage stopes.
  16. Be able to describe methods of ore removal from the stopes.
  - 17- The student should be able to list characteristics of an ore body in which Cut and Fill mining is used-
  18. Be able to list materials used for fill.
  19. Be able to show the layout of Cut and Fill stopes in side and end view.
  20. Be able to describe the work cycle in Cut and Fill stopes.
  21. He should be able to list the characteristics of an ore body in which sublevel caving is used as a mining method.
  22. Be able to show the layout of sublevel caving methods in side and end view-
  23. Be able to give distances between sublevels and drifts.
  24. Be able to sketch the arrangement of blastholes.
  - 25- Be able to describe procedures used to develop an ore body from, sublevel caving.
  - 26, Be able to describe the work cycle used in sublevel caving.
  27. He should be able to describe the characteristics of an ore body in which Top Slicing is used as a mining method.
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28. Be able to show the layout of Top Slicing in top and side views and give dimensions of the mine workings.
  29. Be able to describe the work cycle used in Top Slicing.
  30. Be able to name the characteristics of an ore body in which Block Caving is used as a mining method.
  31. Be able to show in diagrams, the development of an ore body for Block caving.
  32. Be able to name reasons which determine the block size.
  33. Be able to show the layout of the mine workings in a side view.
  34. Be able to describe methods of draw control for the ore.
  35. He should be able to list the characteristics of an ore body in which square-set-stoping is used as a mining method,
  36. Be able to show in a side view the layout of a stope in which square-set-stoping is used.
  37. Be able to list advantages and disadvantages of this mining method.
  38. Be able to describe the work cycle in square-set-stoping.

**i** C- The student should be familiar with problems associated with developing and operating an Open Pit.

1. Be able to list 7 points which have to be considered when designing an open pit,
2. Name types of open pits.
3. Be able to name waste to ore ratios for different types of ore mined by open pit in Canada-
- 4- Be able to outline methods used to determine an economic pit layout.
5. Be able to apply the proper terminology for parts of the pit and be able to name the common dimensions for these parts,
6. Be able to draw the force diagrams for concave and convex pit walls.
7. Be able to show in sketches 3 common types of pit wall failure.
8. Be able to explain methods to prevent failures of the pit wall.
9. Be able to name the type of equipment and its size used in Canadian Open pits.

**f** D, The student should be familiar with various Blast hole drilling methods and Diamond drilling procedures,

1. Be able to describe with working principle of a percussion drill

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2. Be able to name applications and the limitations of percussion drilling.
  3. Be able to describe the different types of percussion drills.
  4. Be able to describe the working principle of a rotary-percussion drill.
  5. Name applications for rotary-percussion drilling.
  - 6- Be able to describe the working principle of a rotary drill.
  - 7- Be able to name applications for rotary drilling.
  8. Be able to describe the working principle for Jet-Piercing.
  9. Name applications of the Jet-piercing method.
  - 10- Be able to describe procedures for dilling large diameter holes (raises, tunnels).
  11. Be able to describe the working principle of a diamond drill,
  12. Be able to know applications for diamond drilling.
  13. Be able to describe 3 different types of Core-barrels.
  14. Be able to give dimensions of standard drill care.
- E. The student should be familiar with Placer, Strip mining. Solution and Bacterial-leaching-methods-
1. He should be able to describe the equipment used in Placer mininc
  2. To name minerals mined by this method.
  3. He should be able to describe equipment used for Strip mining.
  - 4- Be able to name examples of strip mining.
  5. Be able to describe problems associated with Strip mining.
  - 6- Be able to describe applications of solution mining.
  7. Be able to describe applications of bacterial leaching.
- F, The student should be familiar with necessary services underground and the types and handling of explosives.
1. The student should be able to list servives which are required by an underground mining operation-
  2. The studnet should be able to describe forms of ventilation.
  3. Be able to list dangers associated with gases underground.

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4. Be able to name types of explosives.
- 5, Be able to list the main composition of explosives-
- 6, Be able to describe the procedures used in loading and detonating explosives.
7. Be familiar with safety requirements.