SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title	MINING METHODS
Code No.:	MNG 121-3
Program:	GEOLOGICAL ENGINEERING TECHNICIAN
Semester:	TWO
Date:	4M.
Author:	M. ENGEL

New: Revision;

APPROVED:   ///f9.

Chairperson Date

CALENDAR DESCRIPTION

MINING METHODS	MNG 121-3
Course Name	Course Number

PHILOSOPHY/GOALS:

The course provides an introduction to underground and surface mining methods. Special emphasis is given to geological considerations when selecting a particular method and during the operation of the mine. The student will gain knowledge on drilling, especially diamond drilling methods. Sampling methods are studied and problems with grade control in mines are highlighted.

METHOD OF ASSESSMENT (GRADING METHOD):

Three written tests of equal value (30% each) 3 X 30%	= 90%
Report on a visit to a mine	= 10%
(Attendance is compulsory)	
	100%

A = 80% or better
B = 70 - 79%
C = 60 - 69%
I = 45 - 59%

TEXTBGQK(S):

Guide to Underground Mining Methods and Application, Published by Atlas Copco.

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Guide to Underground Mining Methods and Applications,
Published by Atlas Copco.

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 Division - Dept. of Mines & Technical Surveys, Ottawa) - Amil Dubnie

TOPIC	PERIODS	TOPIC DESCRIPTION

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
- shrinkage
- other underground stoping
- summary of applications related to nature of the ore body

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

Other Mining Methods
- placer - sluicing, hydraulic mining, alluvial stripping
- solution - types of soluble ores, sulpheric, salt, etc.
- bacterial - introduction

Drilling Methods
- percussion drilling
- rotary percussion drilling
- rotary drilling
- diamond drilling, types of core barrels
- jet piercing

Grade Control in Mines
- in underground operations
- in open pits
- stockpiling
- blending

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 four 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 geological 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 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 six factors Influencing the selection of a mining method.

   2. Be able to name three requirements which have to be met by any mining method.

   3. Be able to name four characteristics of an ore body in which sublevel 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.

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 two 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 two 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 three 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.

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.

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.

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

1. Be able to list seven 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 three 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.

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.

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 drilling 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 three 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 mining.

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.

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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 students should be familiar with sampling theory and its applications to mining operations.

1. Be able to write a definition of sampling.

2. To know the relationship between particle mine and sample mine.

3. Be able to describe two methods of reducing a large sample to a small amount.

4. Be able to describe methods of chip and sludge sampling.

5. To describe methods of sample preparation.

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