



Course Specification

Diploma

Course Title: Surface and underground mining operations

Course Code: APMQ2211

Program: Mining and Quarrying

Department: Diploma Department

College: The Applied College

Institution: Umm Al-Qura University

Version: 1

Last Revision Date: 20 February 2025

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A. General information about the course:

1. Course Identification

1. Credit hours: (2)

2. Course type

A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others
B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (1 St. Level)

4. Course General Description:

All generic mining methods will be reviewed and analyzed to identify the fundamental drivers which influence the performance of a mining operation based on each method. Mining operations are made up of a complex and inter-related number of key processes and systems. Appropriate and efficient mine design, planning and operations are dependent on understanding and optimizing these processes and systems. Components of a generic mining operation to be considered will include rock breakage, materials transport, grade/quality control and economic sensitivity, ground stability, mine environment and environmental impact. In each component, process and/or system, the critical economic sensitivities will be identified, together with the safety implications and management strategies. Introduction to open pit mining: mining methods (hard rock, gravel, dimension stone), geometric design, winning, loading and hauling, quality control, auxiliary services such as water control, road maintenance, etc. Principles of the development of underground mines, basic stopping systems, underground mine transport infrastructure, mine ventilation, water reticulation.

5. Pre-requirements for this course (if any):

None

6. Co-requisites for this course (if any):

None

7. Course Main Objective(s):



1. Classify and differentiate between major surface and underground mining methods.
2. Select appropriate mining methods based on orebody geometry, geology, and economic viability.
3. Understand and describe the full production cycle, including drilling, blasting, loading, hauling, and ventilation.
4. Analyze and design basic layouts for both open pit and underground mining operations.
5. Identify and evaluate mining equipment used in different mining environments.
6. Apply safety standards and recognize hazards associated with mining operations.
7. Explain the principles of ground control and select suitable support systems for underground excavations.
8. Assess environmental impacts and outline strategies for sustainable mining and mine closure.
9. Interpret real-world mining case studies and relate them to theoretical principles.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		



No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	0
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		30

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

1.0	Knowledge and understanding			
1.1	Classify and differentiate between major surface and underground mining methods.	K1	Lectures and Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes.
1.2	Understand and describe the full production cycle, including drilling, blasting, loading, hauling, and ventilation.	K2	Lectures and Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes.
1.3	Select appropriate mining methods based on orebody geometry, geology, and economic viability.	K4	Lectures and Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes.
2.0	Skills			
2.1	Analyze and design basic layouts for both open pit and underground mining operations.	S1	Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes
2.2	Identify and evaluate mining equipment used in different mining environments.	S2	Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes
3.2	Apply safety standards and recognize hazards associated with mining operations.	S3	Interactive Discussions	Written Exams (Mid-Term and Final Exams),



	Explain the principles of ground control and select suitable support systems for underground excavations.			
3.0	Values, autonomy, and responsibility			
3.1	Assess environmental impacts and outline strategies for sustainable mining and mine closure. Interpret real-world mining case studies and relate them to theoretical principles.	V1	Individual and Group Presentations	Presentations

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Mining & Classification of Mining Methods	2
2.	Overview of Surface Mining vs. Underground Mining	2
3.	Surface Mining Methods: Open Pit, Strip Mining, Quarrying	2
4.	Surface Mining Equipment & Production Cycle	2
5.	Haulage Systems & Material Handling in Surface Mines	2
6.	Underground Mining Methods: Room & Pillar, Cut & Fill, Sublevel Stopping	2
7.	Underground Methods (cont.): Block Caving, Shrinkage, Longwall	2
8.	Mine Design Principles: Pit Slope, Access, Stopping Geometry	2
9.	Ventilation Systems in Underground Mines	2
10.	Drilling and Blasting: Techniques and Design	2
11.	Ground Control & Rock Support Systems	2
12.	Mine Safety, Hazards, and Emergency Protocols	2
13.	Mine Equipment: Loaders, Trucks, Conveyors, Drills	2
14.	Environmental Considerations & Mine Closure Planning	2
15.		2



Total

30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	5	10
2.	Mid-Term Exam	8	20
3.	Presentations	12	10
4.	Homework	All weeks	10
5.	Final Exam	16	50

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	<p>Hartman, H.L. & Mutmanský, J.M. (2002) Introductory Mining Engineering – Wiley</p> <p>Foundational text covering principles, methods, and practices for both surface and underground mining.</p> <p>Society for Mining, Metallurgy, and Exploration (SME) (2008) SME Mining Engineering Handbook (3rd Edition), Ed. Peter Darling Industry-standard reference for in-depth technical mining practices.</p> <p>Deshmukh, D.J. Elements of Mining Technology (Volumes 1–3) Very useful for method details, especially in drilling, blasting, and coal mining operations.</p>
	<p>McPherson, M.J. (1993) Subsurface Ventilation and Environmental Engineering</p> <ul style="list-style-type: none"> In-depth coverage of mine ventilation and underground air control. <p>Kenneth M. Mutmanský et al. Mine Ventilation and Air Conditioning (3rd Edition)</p> <ul style="list-style-type: none"> Practical and theoretical guide to airflow, ventilation planning, and safety.



Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	Data show
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty	Direct (project, HW, Quiz, midterm and final exam)
Effectiveness of Students assessment	Students	Indirect (Student Survey)
Quality of learning resources	Program Coordinator	Direct analysis
The extent to which CLOs have been achieved	Program Coordinator	Direct analysis
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Umm Al-Qura University Council
REFERENCE NO.	851110214476/195605
DATE	18/2/1447

