



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mining Engineering

Subject Code: DI04022051

Subject Name: Mining Hazards and Safety

w. e. f. Academic Year:	2025-26
Semester:	4 th
Category of the Course:	Professional Elective - I

Prerequisite:	Nil
Rationale:	<p>Due to the nature of work in mines, it may sometimes create hazardous situations which are directly linked with the safety of miners as well as the economy of the industry. Sometimes, the situations become so critical that they will affect the nearby society or livelihoods. Some known hazards that have been reported in many mines in the past are mine fires, inundation, and explosions.</p> <p>Mining laws also emphasize the provisions regarding safe practices in mines to avoid any circumstances that may create hazardous situations. However, due to varying geological and mining conditions, sometimes a judgmental decision taken by the mining engineer will ensure the safety of the mine as well as society.</p> <p>A mining diploma holder must acquire a deep knowledge and understanding of the post-effects of any hazard which may arise along with the mitigation safety measures. They must be competent in selecting suitable materials, methods, and technology in varying situations. This course will improve the skill to adopt suitable measures and techniques promptly at any emergency situation that may arise in a mine.</p>

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes	RBT Level
01	Analyze and apply the principles of fire and control of fires and spontaneous heating hazards in mines.	R, U, A
02	Apply appropriate fire-fighting operations and recovery techniques in mines.	R, U, A
03	Analyze the causes and preventive measures of explosions in mines to ensure safe mining operations.	R, U
04	Analyze safety and dewatering techniques to manage inundation risks in mine.	R, U, A
05	Apply mine rescue principles for executing safe recovery and survival operations.	R, U, A

*Revised Bloom's Taxonomy (RBT)



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Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR		C	Theory		Tutorial / Practical	
			ESE (E)		PA (M)	PA (I)	ESE (V)	
4	0	0	4	70	30	0	0	100

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Mine Fires and Spontaneous Heating of Coal: 1.1 Essential conditions required to start a fire (Concept of Fire Triangle). 1.2 Classifications of fires with suitable fire extinguishers. 1.3 Fire prone areas in surface & underground mines. 1.4 Causes of surface and underground fire with preventive measures. 1.5 Governing factors, detection, prevention and control. 1.6 Spontaneous Heating of Coal: Different Stages and Symptoms. 1.7 Factors governing proneness of spontaneous heating of coal, determination by crossing point temperature method. 1.8 Preventive measures including panel system layout working, Adequate ventilation provision, Regular Inspection.	14	24
2.	Fire Fighting Operations in Mines: 2.1 Fire-fighting on surface and below ground methods applied for: Approachable fires: Direct Attack Methods), for Not Approachable Fires: Sealing of Fire Area: Preparatory, Temporary, Permanent Stopping, Flooding the Area with water or inert gas. 2.2 Pressure balancing to control air leakage into sealed off fire areas. 2.3 Methods of collection of air samples from sealed off fire - areas and from mine atmosphere. 2.4 Recovery of sealed off mine working on account of fire by reopening.	10	16
3.	Mine Explosion: 3.1 Firedamp explosion: Causes, limits of explosibility of fire damp, factor affecting the limit of explosibility, source of initiation of fire damp explosion, Causes, Mechanism of Firedamp explosion, Preventive measures for firedamp explosion. 3.2 Coal dust explosion: Factor affecting the limit of explosibility of	12	20



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	<p>Coaldust, Mechanism of Coaldust explosion.</p> <p>3.3 Preventive Measures for Coaldust Explosion:</p> <ol style="list-style-type: none"> 1. Stone dusting 2. Suppression of Dust 3. Various Stone dust, Types and Efficiency of Stone dusting 4. Stone dust Barriers 5. Water Barriers 6. Triggered Barriers 7. Inspection and Maintenance of Stone dust barriers <p>3.4 Water Gas explosion – causes and safety measures.</p>		
4.	<p>Mine Inundation:</p> <p>4.1 Causes of inundation by surface & underground water both in opencast & underground mines.</p> <p>4.2 Design and construction of Boundary Barriers, Panel barriers, Water dams.</p> <p>4.3 Precautions while approaching water-logged workings, by means of long boreholes patterns by burn side boring apparatus, Safety & statutory aspects.</p> <p>4.4 Dewatering of old working. Water blast dangers and precautions</p>	12	20
5.	<p>Mine Rescue & Recovery Work:</p> <p>5.1 Scope of mine Rescue & Recovery. Rescue organization, Rescue stations, Rescue teams- Selection Initial & refresher trainings.</p> <p>5.2 Rescue apparatus self-contained portable breathing apparatus, Gasmasks, Smoke helmets, Self-Rescuers, Reviving apparatus. With actual rescue operations.</p> <p>5.3 Fresh air base, Life lines & communication. Actual operations survival technique use of bore holes in rescue operations.</p>	12	20
	Total	60	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
35	45	20	0	0	0

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)



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References/Suggested Learning Resources:

(a) Books:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Elements of Mining Technology	D. J. Deshmukh	Central techno Publication Latest edition
2	Mine Disasters and Mine Rescue	M.A.Ramlu	Oxford & IBH New Delhi
3	Mine Fire, Prevention, Recovery & Inundation	M.A.Ramlu	Dhanbad Publication
4	Mine Safety & Legislation	S.K.Das	Lovely Prakashan

(b) Open-source software and website:

1. <https://nptel.ac.in>
2. www.gmdcltd.com
3. <https://coalindia.in>
4. www.mining-technology.com
5. www.researchgate.net
6. www.miningreview.com
7. <https://link.springer.com>
8. www.slideshare.net
9. www.miningglobal.com
10. www.youtube.com

Suggested Project List:

1. Prepare a poster showing various classes of fire with material involve and suitable fire extinguishers
2. Prepare an illustration banner related to fire safety in mines.
3. Presentation on any case study related with mine disaster.
4. Prepare a poster showing human respiratory system.
5. Make slides showing artificial respiration technique.
6. Design a fresh air base layout for an underground mine.

Suggested Activities for Students:

1. Visit nearby firefighting station.
2. Visit a mining site and make a report on magazine.
3. Visit a mine and write a report on safety measures planned by them against various hazards.
4. Undertake micro-project.
5. Give presentation on any relevant topic.
