

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BRANCH NAME: Mining Engineering**  
**SUBJECT NAME: Underground Metal Mining**  
**SUBJECT CODE: 2162202**  
**B.E. 6<sup>th</sup> SEMESTER**

**Type of course: Mining**

## **Rationale:**

The course is designed to help the student in understanding the different approaches to reach to the ore body mass below surface, underground metalliferous mine development and comprehend various methods of working for exploitation of ore body. This course is helpful in grasping process of exploration of mineral body and also to gain knowledge about the various safety procedures to be maintained during underground metalliferous mining.

## **Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

## **Content:**

Sr. No.	Content	Total Hrs	% Weightage
1	Present status of Indian metal mining industry.	2	1 %
2	<b>Mine Structures :</b> Construction of mine portals, shaft insets and plats; ore and waste bins; skip-pockets, engine chambers, ore passes, chutes, garages, grizzlies. Underground chambers and sumps and other subsidiary excavations.	8	12 %
3	<b>Secondary Breaking :</b> Conventional, electrical and mechanical methods.	6	12 %
4	<b>Selection of Stoping Methods :</b> Classification of different Stoping methods.	6	12 %
5	<b>Stoping Methods :</b> Open stopping method-Room and Pillar, sub-level, Shrinkage, Blast Hole and Vertical Crater Retreat, Stopping and their variations.	6	12 %
6	Supported stopping methods Timber, Post and Pillar, square set, cut and fill and their variations.	6	12 %

7	Stope layouts and stope preparation work with different stopping methods. Haulage and dumping, ventilation loading, underground crushing.	6	12 %
8	<b>Fill Support :</b> Material of backfill and their procurement; sand gathering plant, theoretical aspects of slurry transportation; preparation, transport and placement of hydraulic backfill with and without cement; rock and concrete fills, surface arrangement for storage and mixing; pneumatic and mechanical methods of backfill. Caving Stopping methods Top slicing, sub-level caving, block caving and their variations. Design and construction of draw points, mechanics of draw and draw control procedures, recovery and dilution.	14	25 %
9	Stopping of super-imposed veins and parallel ore bodies. Combined methods.	2	2 %

**Suggested Specification table with Marks (Theory):**

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
64 %	18 %	12 %	2 %	2 %	2 %

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Reference Books:**

Sr. No.	Author	Title of Books	Publication
1	Hartman, Howard L.	Introductory to Mining Engineering	John Wiley and Sons Publication, New Delhi
2	Deshmukh, D.J.	Elements of mining	Denett and Co, Nagpur
3	Chacharkar, Y.P.	Metalliferous mining methods	Lovely Prakashan, Dhanbad
4	UMS Series	Blue Volume/ Red Volume	Lovely Prakashan, Dhanbad

**Course Outcome:**

After learning the course the students should be able to:

- i. Select and design suitable mode of entry to underground deposits based on site conditions.
- ii. Select suitable mining methods and machineries for mine development.
- iii. Explain various stoping methods used in underground mines
- iv. Follow the safe working procedure for mining activities.

**List of Experiments:**

Sr. No	Practical /Exercise	Approx. Hours Required
1	Observe and record development of Metalliferous ore deposits.	4
2	Observe and record Raise drivage methods. (a) Alimak Raise Climber (b) Drop Raising	2 2
3	Draw simple leveled sketches of following machines and mention their specifications (sizes and operations they can perform) on the drawing sheet. (Explore internet/websites of suppliers of such machines) (i) Single and Double boom drill jumbo, (ii) Jack hammer, (iii) Stoper machine, (iv) Low Profile Dump Truck (LPDT)	8
3	Observe and record various Stoping Methods. (a) Brest Stoping method. (b) Under Hand and Over Hand Stoping method. (c) Sub-level Stoping Method. (d) Shrinkage Stoping Method. (e) Block Caving Method. (f) Square Set Stoping Method.	2 2 2 2 2 2
<b>Total</b>		<b>28</b>

**Major Equipment:**

- i. Various mining models.
- ii. Various charts for ventilation system, transportation system, safety slogan.

**List of Open Source Software/learning website:**

- i. <http://firwin.blogspot.in/2012/02/underground-versus-open-pit-mining.html>
- ii. [http://en.wikipedia.org/wiki/Underground\\_mining\\_\(hard\\_rock\)](http://en.wikipedia.org/wiki/Underground_mining_(hard_rock))
- iii. <http://en.wikipedia.org/wiki/Stoping>
- iv. [http://en.wikipedia.org/wiki/Raise\\_\(mining\)](http://en.wikipedia.org/wiki/Raise_(mining))
- v. <http://miningandblasting.wordpress.com/tag/burn-cut/>
- vi. <http://www.mining.sandvik.com/> (For Drill Jumbo and LPDT)

- vii. <http://www.mindrill.com/jackleg-stopper-drills.html> viii.  
<http://en.wikipedia.org/wiki/Jackhammer>
- ix. <http://www.youtube.com/watch?v=BvhIvi96q0Q> (Cut and Fill Stoping) x.  
[www.novamining.com](http://www.novamining.com)

**ACTIVE LEARNING ASSIGNMENTS:** Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.