

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Mining Engineering
SUBJECT NAME: ROCK FRAGMENTATION
SUBJECT CODE: 2172207
B.E. 7th SEMESTER

Type of course: Mining

Rationale:

The course is designed to help the student in understanding the different approaches to design a perfect blast design in surface and underground mines depending upon different geotechnical properties of rock and explosives, and to select a suitable methods of working for exploitation of ore body economically and safely. This course is helpful in grasping process of mine production and also to gain knowledge about the various technical and economical and safety issues to be considered in mine designing.

Teaching and Examination Scheme:

Teaching Scheme			Credits	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 drilling and blasting practices in India and abroad: Methods of drilling for production of minerals from surface and underground mines, rotary, percussive and rotary –percussive drilling, different types of bits, bit wear, different types of machines, hydraulic drills, long hole drilling.	12	20 %
2	Variables in drilling: Optimisation of drilling parameters, mechanics of drilling, drillability of rock, boring in rocks.	6	15 %
3	Recent developments in explosives and blasting techniques: Explosives and Blasting Systems, Monitoring Blasting Results: Borehole pressure, transducer, V.O.D. Probe, vibration monitor, high speed video camera, blast design, mechanics of blasting. Computational models of blasting. Influence techniques, Overcasting with explosives. Nuclear blasting, Safety.	14	20 %
4	Explosives : Classification and comparative properties of explosives, blasting devices, general application and uses; safety considerations.	6	10 %

5	Blasting damages: Ground vibrations and air blast. Impact of ground vibration and air blast on the neighboring structures and communities and mitigative measures, reinforcement and design alternatives.	6	15 %
6	Blasting Systems : Electric and non-eletric methods, delay blasting techniques, priming, charge distribution, Mechanism of rock blasting.	7	10 %
7	Alternative methods of rock fragmentation: Novel methods of drilling, choice of drills.	5	10%

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	D.J.Deshmukh	Elements oif Mining Technology, Vol.I	Denett & Co., Nagpur.
2	B.V. Gokhale	Blasthole drilling Technology	MultiFields, Bombay
3	Dr G..K.Pradhan	Explosives & Blasting Techniques	Mintech Publications, Bhubaneswar.
4	Dr.Sushil Bhandari	Engineering Rock Blasting Operations	A.A.Balkema Publisher Old post Road, Brook field, TO5036, USA.
5	Dr S.K.Das	Explosive & Blasting Practices in Mines	Lovely Prakashan, Dhanbad.
6	NA	Explosive manufacturers' technical literature	NA
7	K.A.Pant,	Visfotak - Ek Parichay, Anamika Publishers, (in Hindi)	Anamika Publishers, (in Hindi)
8	NA	DGMS Circulars	NA

Course Outcome:

After learning the course the students should be able to:

- i. Prepare and design a blasting pattern depending upon various geotechnical conditions of rock.
- ii. Select suitable blasting methods depending upon the economical and safe conditions.
- iii. Explain various technical parameters related with mine designing.
- iv. Follow the safe and economic working procedure for mining.

List of Experiments:

Sr. No	Practical /Exercise	Approx. Hours Required
1	Study of various methods of drilling used for production of mineral from surface and underground mines.	4
2	Determination of drill ability of rock.	4
3	Analysis of various blast design and their effect on Powder Factor.	4
4	Designing a blast hole pattern for a surface mine bench for various conditions.	4
5	Analyzing controlled blasting and secondary blasting.	4
6	Performing a Time study of drilling and blasting operation of a mine with optimization suggestions.	4
7	Measurement of VOD By VOD mate and its analysis.	4
Total		28

Major Equipment:

- i. Various mining models.
- ii. Various charts of Blast Geometry.
- iii. Rock plane Software.
- iv. Slide Software.

List of Open Source Software/learning website:

- i. www.researchgate.net
- ii. www.min.eng.com
- iii. www.journal.elsevier.com
- iv. www.mdpi.com/journal/mineral

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.