

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Mining Engineering
SUBJECT NAME: ROCK ENGINEERING
SUBJECT CODE: 2172206
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 bench geometry in surface mine as well as support structure in underground mines Layout depending upon different geotechnical properties of rock and conditions 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 planning and also to gain knowledge about the various technical and economical issues to be considered in mine designing.

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	Design and Stability of Structures in Rock: Initial rock pressure due to narrow and wide excavations. Theories of ground movement, criteria for design and support of underground excavations; design of single and multiple openings in massive, stratified and jointed rock mass; mine pillars and their classification, pillar stresses, pillar design, stability analysis of pillars.	12	20 %
2	Subsidence: Causes and impacts of subsidence; mechanics of surface subsidence, Vertical and lateral movements and their estimation; angle of fracture, angle of draw; factors affecting subsidence, discontinuous and continuous subsidence; monitoring, prediction.	12	20 %
3	Caving of Rock mass: Caving characteristics of rocks; capability index, subsidence control protection of surface structures, design of protection pillars including shafts pillars.	10	10 %
4	Rock burst: Phenomenology of rock bursts; prediction and control of rockroses; bumps and gas outbursts.	4	10 %

5	Introduction to Methods of Stress Analysis: Predictive methods for mine design; principles of classical stress analysis closed form solutions for simple excavation shapes; introduction to computational methods of stress analysis finite element, boundary element, distinct element methods and hybrid computational schemes.	10	20 %
6	Monitoring Rock mass Performance: Purpose and nature, monitoring systems including seismic and microseismic methods.	4	10 %
7	Mechanics of Fragmentation: Mechanism of rock cutting by picks, disc and roller-cutters; water-jet cutting; mechanics of blasting; methods of assessing cutability.	4	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.Biswas	Rock Mechanics & Ground Control	Lovely Prakashan, Dhanbad.
2	R D Singh	Principles & Practices of Modern Coal Mining	New Age International Pvt.Ltd., New Delhi.
3	S K Das	A Handbook on Surface Mining Technology,	Lovely Prakashan, Dhanbad
4	Obert abd Duvall	Rock Mechanics	Wiley
5	By Goodman	Rock Mechanics	Wiley
6	B.S. Verma	Rock Mechanics	Khanna Publikation

Course Outcome:

After learning the course the students should be able to:

- i. Prepare and design a mine layout depending upon various geotechnical conditions of rock.
- ii. Select suitable mining 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	Determination of factor of Safety of pillars of varying sizes at different depth using various strength formulas.	4
2	Determination of Impact of W/H ratio on pillar stability and mode of failure.	4
3	Determination of height of Caving and Bulking factor.	4
4	Study of various Subsidence monitoring techniques.	4
5	Prediction of Rock Burst Potential in Rock masses.	4
6	Study of FEM and FDM.	4
7	Determination of various module using P and S waves.	4
Total		28

Major Equipment:

- i. Various mining models.
- ii. Various charts of Bench 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.