GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Mining Engineering

Course / Subject Code: DI03022031

Course / Subject Name: Surface Mining Technology

w. e. f. Academic Year:	2024-25
Semester:	3rd
Category of the Course:	PCC

Prerequisite:	Nil
Rationale:	The mining engineers are involved in the mine development, supervision of mining operations, etc. Being mining diploma graduate, he/she should be able to select suitable method of working starting from feasibility study, development, production, reclamation and post mining rehabilitation techniques for the socio – economic sustainability of surface mining projects. After completing this course, the student will select suitable machines and design a perfect layout with high degree of accuracy as intended in this course.

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes	RBT Level
01	Describe various points to be considered for selection of applicability, feasibility, planning and designing of a suitable surface mining method.	R
02	Explain all geotechnical and economical parameters considered during development operation of a surface mine.	U
03	Design a suitable pattern of blast holes to achieve the required blasting result.	U/A
04	Justify a sustainable mode of excavation and transportation system suitable for a particular condition.	U
05	Describe various environmental impact parameters considered for a surface mine.	R

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	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.	**Surface Mining:** 1.1Introduction of surface mining – 1.1.1 Applicable conditions for surface mining methods (i) Stripping ratio (ii) Break even stripping ratio 1.1.2 Types of Surface mining methods (i) Strip mining (ii) Open-pit mining (iii) Mountain top removal (iv) Dredging (v) High wall mining 1.1.3 Advantages & disadvantages of surface mining methods 1.2 Preliminary investigation of surface mining – Feasibility study – Various points considered in feasibility report (i) Type of reserve (ii) Market value and cost (iii) Transport facilities (iv) Power supplying facilities (v) Availability of water resources (vi) Environmental conditions (vii) Presence of nearby township (viii) Availability of skilled labor (ix) Local Topography (x) Geotechnical parameters	10	17

	(xi) Control of environmental pollution (xii) Aspect of giving compensation due to damage (xiii) Raising funds (xiv) Government policies for investment/taxation (xv) Socio-economic and political situation (xvi) Communication system 1.3 Factors considered for designing and planning a surface mine: - (i) Dip of the deposit (ii) Form of the deposit (iii) Size of the deposit (iv) Depth of the deposit (v) Surface topography (vi) Geo-technical parameter of rock (vii) Production target, Degree of mechanization, Availability of capital (viii) Environmental condition and town sheep (ix) Land reclamation, Sub-soil management, Environmental management (x) Availability of power (xi) Cost economic analysis		
2.	**Mine Development:** 2.1 Opening out surface deposits by box cut – it's location, geometry & technical parameters. 2.2 Overburden removal 2.2.1 Main factors considered (i) Thickness (ii) Dip and depth of the overburden (iii) Manner of occurrence of deposit (iv) Surface topography (v) Ground conditions (vi) Environmental conditions (vii) Production requirement (viii) Geo-technical parameters (ix) Geological disturbance (x) Watery conditions (xi) Stability of overburden benches 2.2.2 Selection of Machines for overburden removal (i) Geotechnical parameters of rock like compressive strength, shear strength, tensile strength and modulus of elasticity (ii) Geophysical characteristics like thickness, stratification,	12	20

	massiveness, scattered condition, friability, hardness, looseness, watery condition, and floor condition 2.2.3 Methods of overburden removal (i) Over Casting or Side casting by dragline (ii) Shovel and conveyer combination (iii) By bucket wheel excavator and bridge conveyer 2.3 Design of haul road – Factors considered for deciding numbers and location of entries/ramps to enter and exit from the mine 2.4 Bench designing parameters - bench, bench height & width, bank width, berm, toe, crest, face angle, overall pit slope angle & ultimate pit slope angle.		
3.	**Drilling & Blasting:** 3.1 Various drilling patterns used for bench blasting 3.2 Various technical parameters of blast hole design - Hole diameter, Charging length, Stemming length, Sub grade drilling, Spacing, Burden, Free face etc. 3.3 Charging and blasting of holes- (i) Various blast hole charging techniques (ii) Calculation of quantity of explosiverequired for blasting. (iii) Calculation of volume of broken rock.	14	23
4.	**Excavation & Transportation:** 4.1 Type of excavation machines used in surface mines - Constructional and Working principles of surface machines - single bucket and multi-bucket excavators, pay loader, Drag line, Ripper, Scrapper and Surface miner. 4.2 Mode of transportation used in surface mines- Constructional and Working principles of transportation machines – Truck/Dumper, Belt Conveyer, Aerial Ropeway, Railway System. 4.3 Optimization of transportation system in surface mines - Optimization of shovel-dumper combination – calculation of appropriate number of shovel and dumper to match with required production capacity.	14	23
5.	**Environmental Impacts of Surface Mining:** 5.1 Concept of environment – Main constituents consider for analyzing mine environment (i) Land (ii) Water (iii) Air (iv) Flora & Fauna	10	17

	5.2 Various effects on these environmental components due to surface mining activities. (i) Land degradation – Non fertile land (ii) Acid mine drainage – Ground/river water pollution (iii) Air born dust pollution – Various Health issues (iv) Deforestation issues		
	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**
40	**50**	**10**	**0**	**0**	**0**

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

References/Suggested Learning Resources:

(a) Books:

Sr. No.	Title of Books	Author	Publication
1.	Elements of Mining Technology	D. J. Deshmukh	Central techno publication
2.	Surface Mining Technology	Samir kumar Das	Lovely prakashan
3.	U.M.S.		Lovely prakashan
4.	Engineering Rock Blasting Operations	Sushil Bhandari	A.A.Balkema/Rotterdam/Brook Field

(b) Open-source software and website:

1. Commissioner of Geology and Mining, Gujarat (CMG, Gujarat)
   https://cgm.gujarat.gov.in/introduction
2. Directorate General of Mines Safety (DGMS)
   https://www.dgms.gov.in/
3. Surface Mining Technology (NPTEL)
   https://nptel.ac.in/courses/123/105/123105007/

Suggested Project List:-

a) Prepare a report on working method of Surface mine visited by you.
b) Design a flow sheet of mining activities conducted on surface mine with equipment/machines involved.
c) Calculate number of excavator machines required for a given targeted production.
d) Design a blasting layout for bench blasting.
e) Prepare a chart showing applicable condition with transportation method.
f) Prepare a flowchart showing various impacts of surface mining on environment.

Suggested Activities for Students:

1. Prepare posters on any relevant topic.

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