

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MINING ENGINEERING

TEACHING SCHEME (w.e.f. 18th July '2011)

SEMESTER- V

SR. NO	SUB. CODE	SUBJECT	TEACHING SCHEME (HOURS)			CREDITS
			THEORY	TUTORIAL	PRACTICAL	
1	2352201	Mining – II	3	0	2	5
2	2352202	Mine Ventilation	4	0	2	6
3	2352203	Rock Mechanics	3	0	2	5
4	2352204	Mining Hazards & Safety	4	0	2	6
5	2352205	Mine Electrical Engineering	3	0	0	3
6	2352206	Mining & Processing of Dimensional Stone	3	0	0	3
7	2352207	Project - I	0	0	4	4
		Total	20	0	12	32

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MINING ENGINEERING

Semester – V

Subject Code : 2352201

Subject Name : Mining - II

Sr. No.	Subject Content	Hrs.
1.	Shaft Sinking: 1.1 Introduction Vertical stapling inclined shafts, Shapes & size of a shaft, Selection of site for shafts. 1.2 Sinking operation: Through normal/coal measures strata, Bore hole patterns of blasting, rock/ muck Disposal methods from underground & surface, Transport of men - material & rock/muck. Dealing with water during sinking, bucketing, pumping, etc, Providing ventilation in sinking shafts to remove explosive fumes & strata - gases. 1.3 Support of shaft sides: Support of shaft sides, Temporary and permanent lining, Scaffolding, etc. 1.4 Safety in shaft sinking: Safety aspects of shaft sinking. 1.5 Special methods of shaft sinking: Pilling, Drop shaft caission, Cementation, Freezing, etc. 1.6 Misellanious: Mechanised sinking, Sinking upwards, Widening & deepening of shafts, Shaft centering for vertical shafts, Directions & gradient maintenance of inclined shafts.	18
2.	Drift Driving/Tunneling: 2.1 Connecting different levels, Horizons, mineral bodies, Crossing fault, Dykes folds, washouts to establish continuity connections for purpose of transport, Traveling, Ventilation, etc., Blasting hole patters, Rock disposal transport, ventilation, pumping, etc., During, Tunnelling. 2.2 Support of drift/Tunnels. 2.3 Safety aspects. 2.4 Mechanised tunneling.	10
3.	Support of Roof, Sides & Floor Control in Mines: 3.1 Properties of various types of roof, testing of roof, Materials used for support in mines, Classification of supports. 3.2 Seasoning of timber, preservation of timer, setting of prop Bars, cogs,	14

	side support, fore polling, Roof bolts. 3.3 Support of roadway, roadway junction, Clearing up of heavy roof fall, Withdrawal of support. 3.4 Yielding type of support and Hydraulic supports 3.5 Roof bolting practice, Different types of rock bolts. 3.6 Face advancing supports.	
	Total	42

Laboratory Experiences:

1. Study and sketches of temporary lining during shaft sinking.
2. Study and sketches of permanent lining during shaft sinking.
3. Study of drilling & blasting pattern for shaft sinking.
4. Study of different types of special methods of shaft sinking.
5. Sketch and study of different types of blast hole patterns in drift drivage/tunnelling.
6. Study of hydraulic, friction, screw types props and chock release mechanisms.
7. Study of different ways of supporting road way junctions, Masonary, steel, etc.
8. Study of safety supports, Roof stitching etc.
9. Study of different types of face advancing supports.

Reference Books:

1. Elements of Mining Technology, D.J. Deshmukh.
2. U/G metalliferous Mining Methods, Y. P. Chacherkar.
3. U.M.S.

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MINING ENGINEERING

Semester – V

Subject Code : 2352202

Subject Name : Mine Ventilation

Sr. No.	Subject Content	Hrs.
1.	<p>Mine Atmosphere: Mine atmosphere V/s surface atmosphere, Composition of the two, In brief, fresh surface air sent down the mine gets polluted, On account of various mining activities, Properties & Effects on human being, various mine gases Methane CO₂, CO, H₂S, SO₂ Nitrous oxides, etc., Humidity & temperature.</p> <p>1.1 Fire Damp FIRE DAMP (Methane chiefly).Emission in U/G workings, Gradual oxidation, out bursts, blowers. How firedamp is locked up in coal mass, e.g. particle surface occlusion intermolecular spaces, cavities, pockets, etc. Methane layering in mine workings. Methane drainage from coal deposits and advance safety measures.</p> <p>1.2 Detection of fire damp & other mine gases during inspections & precautions when detected beyond safe levels.</p>	23
2.	<p>Mine Ventilation:</p> <p>2.1 Brief information about Natural ventilation of Mines.</p> <p>2.2 Mechanical ventilation of mines. Main & auxilliary fan. Mine Ventilation By Fans Installed On Surface At Mine Heads: Types of fans, Exhaust & forcing systems of mine ventilations, Fan installation, fan drives, Evasee Chimney & fan houses air Lock at mine top, Instruments permanently installed in fan house for continuous monitoring of operation, Auxilliary underground, Ventilation for districts by booster fans & forlong heading drivages by portable/shiftable fans, Steel tubes, Canvass tubes, etc., advantages & disadvantages of auxilliary systems of ventilation, Neutral-line.</p> <p>2.3 Fan characteristic curves, laws of fan ventilation, quantity pressure & H.P. relations, mine circuit resistance.</p> <p>2.4 ventilation surveys in mines: Quantity surveys pressure surveys, Instruments & Method used.</p> <p>2.5 Simple numerical problems on mechanical/ fan ventilation Laws: Safety and statutory aspects of mine ventilation.</p>	23
3.	<p>Mine Lighting: Problems of mine lighting by cap lamps, etc., Individual portable personnel lighting, General road way lighting, work stations lighting pit</p>	10

	bottom loading points, etc., Flame proof lighting, Caplamp room, Layout, Organisation & operation, Maintenance, etc.	
	Total	56

Laboratory Experiences:

1. Determination of relative humidity by whirling hygrometer.
2. Study of self contained breathing apparatus Proto-Mark IV.
3. Study & layout of Cap Lamp room.
4. Determination of cooling power of the mine air by using kata thermometer.
5. Measurement of air velocity, quantity and pressure in a duct by using a pitot tube.
6. Study and sketch of air crossing, regulator, Ventilating door, air lock at pit top etc.
7. Study of different types of flame safety lamps and their use for determining CH₄% in a gassy mine.
8. Mine Gas analysis by (a) Haldan's app. (b) orsat's app.
9. Determination of CO gas in mine working.

Reference Books:

1. Elements of Mining Technology Vol-2, D. J. Deshmukh
2. Mine Ventilation, G.B. Mishra
3. U.M.S.

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MINING ENGINEERING

Semester – V

Subject Code : 2352203

Subject Name : **Rock Mechanics**

Sr. No.	Subject Content	Hrs.
1.	Rock Mechanics 1.1 Physico-Mechanical properties of rocks & soil. 1.2 Different stresses & strains. 1.3 Engineering Classification of rock masses. 1.4 Failure Mechanics & theories. 1.5 Rock of structural features & discontinuities in failures.	7
2.	Rock Pressure & Subsidence Due To Mining 2.1 Distribution of forces around narrow excavations. 2.2 Pressure Arch theory: Pressure arch in long wall workings. 2.3 Angle of draw, Subsidence factor: Critical area of extraction, Factors affecting subsidence & controlled subsidence. 2.4 Precautionary measures against damage due to subsidence :shaft pillar, Size of pillars in mine workings, Determination of their size, stability, of open pit slopes. 2.5 Subsidence survey plan & section.	7
3.	Rock Excavation Engineering 3.1 Methods of assessing cuttability of rocks index tests and abrasivity, Determination of shear strength by (a)double shear methods (b)Punch Methods, Test hammers for in situ strengths. 3.2 Mechanics of rock breakage & fractures, Rock fragmentation by explosive action, Cutting zipping & impacts. 3.3 Rock cutting by rocks, discs & roller cutters water-jet cutting. 3.4 Principles of rock cutting machines, road-headers, TBMs, coal- face machines, & bucket-wheel excavators. 3.5 Rock cutting tool materials.	7
4.	Rock Testing: 4.1 Introduction 4.2 Sampling and Sample preparation 4.3 Specimen 4.4 Universal compressive strength test 4.5 Tensile strength 4.6 Flexural strength test? 4.7 Shear strength test	7

5.	Rock Exploration: 5.1 Introduction 5.2 Object of exploration 5.3 Methods of rock exploration 5.4 Rock exploration by direct penetration - Core boring - Core recovery - Rock quality designation - Fracture frequency 5.5 Large diameter calyx hole 5.6 Logging of core	7
6.	Drifting / Tunneling 6.1 Operational system & use of machines. 6.2 Mechanics of rock cutting blasting 6.3 Vibration & damages criteria. 6.4 Application and Methods of drift driving 6.5 Size & shape of drivage 6.6 Hole pattern & depth for maximum pull current 6.7 Unseived problems and approach to solution.	7
	Total	42

Laboratory Experiences:

1. To determine the Impact strength Index of coad.
2. To determine the PROTODYKONOV Strength Index (PSI) of given, specimen.
3. To Determine the TRI. AXIAL compressive strength of rock specimen
4. Study of Rock Quality Designation.
5. To determine the uniaxial compressive strength of a given specimen
6. To determine the Shear strength of the given specimen by punch shear
7. Determination of shear strength by shear box method
8. Determination of In-situ compressive stresses by Flate Jack test
9. Determination of Tensile strength of a rock sample by direct Method.
10. Determination of Tensile Strength of a rock specimen by Brazilian Method.

Reference Books:

1. Rock mechanics, B. P. Verma
2. The elements & Mechanics of Mining Ground (vol I & II) Dr, B. S. Verma.
3. Design Criteria for drill rigs equipments of drilling techniques, C. P. chugh
4. Ground control in Mining, S. K. Sarkar.

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN MINING ENGINEERING
Semester – V

Subject Code : 2352204

Subject Name : **Mining Hazards & Safety**

Sr. No.	Subject Content	Hrs.
1.	<p>Mine Fires: Spontaneous Heating, Different stages: Determination of proneness of coal by crossing point, Factors governing proneness to spontaneous combustion, Detection of spontaneous heating symptoms, Preventive measures, Including pannel system layout, Adequate ventilation provisions in design stages, Regular inspections etc.</p>	10
2.	<p>(i) Fires: Underground & quarry fires: Causes of mine fires, Dealing with mine fires, Sealing off, different types of stopping, construction & purposes, Pressure balancing to control air leakage into sealed off fire-areas, Methods of collection of air samples from sealed off fire - areas and from mine atmosphere, Recovery of sealed off mine working on account of fire by reopening.</p> <p>(ii) Dealing With Fires In Quarry: Debris, Coal pillars & coal stocks different types of fire extinguishers safety & statutory aspects.</p>	10
3.	<p>Mine-Explosions:</p> <p>Fire Damp Explosions: limits of inflammability & various factors influencing the same, Causes of fire damp explosions, Preventive measures.</p> <p>Coal Dust Explosions Causes: Factors affecting inflammability of coal dust, Causes of & preventive measures against coal dust explosions, Various stone dust, Types & efficiency, Stone dusting, Stone dust barriers water barriers & triggered barriers, Organization for stone dust treatment of coal dust, Sampling procedures of roadways mine dusts apparatus & organization, Safety & statutory aspects.</p>	10
4.	<p>Mine Inundation: Causes of inundation by surface & underground water both in opencast & underground mines.</p>	10

	Preventive Measures: Boundary arriers, Panel barriers, Waterdams, Calculation of dam size & construction, Approaching water-logged workings, Precautions, Long - bore- hole patterns by burnside boring apparatus, Safety & statutory aspects.	
5.	Mine Rescue & Recovery Work: Search for survivors & their rescue, clearing dead bodies re-establishing systems connected with immediate rescue operation, What is Rescue & Recovery, Its scope, Rescue organisation at coalfield & mine levels, Rescue stations, Rescue teams, Selection, Initial & refresher trainings, Rescue apparatus self contained portable breathing apparatus, Gasmasks, Smoke helmets, Self rescuers, Reviving apparatus, With actual rescue operations, Fresh air base & surface, Fresh, Air bases, Life lines & communication, Actual operations survival techniques use of bore holes in rescue operations.	16
	Total	56

Laboratory Experiences:

- 1 Study of constructional features & working of self contained breathing apparatus.
- 2 Study of various types of Fire Extinguishers used in Mines.
- 3 Study of constructional features & working of self Rescuer.
- 4 Study of constructional features & working of Gas Mask.
- 5 Study of constructional features & working of Reviving apparatus.
- 6 Study of working of Burn Side Safety Boring Machine.
- 7 Study of constructional features & working of Stone Dust Barriers.

Reference Books:

1. Elements of Mining Technology Vol-2, D. J. Deshmukh
2. Mine Disasters and Mine Rescue – M.A. Ramlu
3. U.M.S
4. Mine Rescue Rules

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MINING ENGINEERING

Semester – V

Subject Code : 2352205

Subject Name : Mine Electrical Engineering

Sr. No.	Subject Content	Hrs.
1.	Surface Sub-Station: 1.1 Transmission lines from power company, their performances, Distribution on surface. 1.2 General surface substation for underground mine/quarries.	6
2.	Underground Power Installation: 2.1 Distribution of power in quarries and mines. 2.2 Underground distribution. 2.3 Sub-station planning.	6
3.	Mining Switch Gears: 3.1 Gate and box. 3.2 Pillar switch. 3.3 Drill panel.	6
4.	Mining Cables: 4.1 Types of cables. 4.2 Construction and applicability, safety features.	6
5.	Earthing Practice: 5.1 Type of earthing used in mines 5.2 Main features, applicability and construction.	6
6.	Miscellaneous: 6.1 Flame proof enclosure. 6.2 Intrinsic safety. 6.3 Haulage and shaft signaling. 6.4 Symmetrical faults and circuit breaker equipment, Calculations. 6.5 Principle of thyristors and their application to mines device. 6.6 Load factor, diversity factor, Principle of tariffs as applied to mines.	6
7.	Indian Electricity Rules: 7.1 Terms and definitions. 7.2 Voltage limits, etc.	6

	Total	42
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Reference Books:

1. U.M.S.
2. Mine Electrical Engg., Dash
3. Indian Electricity Rules.
4. Mine Electrical, Nil K Dutta.

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DIPLOMA IN MINING ENGINEERING

Semester – V

Subject Code : 2352206

Subject Name : **Mining & Processing of Dimensional Stone**

Sr. No	Subject Content	Hrs.
1	Resources of Marble, Granite, Slate, Sandstone and Limestone as Dimensional stones in India, uses, marketing export. Geological, Mineralogical and physico mechanical properties of dimensional stones, Criteria for selection of dimensional stone deposit.	10
2	Mining: Convention mining of sandstone, Limestone, Marble and Granite, Wire saw, Chain saw, hydraulic splitting flam jet cutting, water channeling, etc., Blasting in dimensional stone mines, Development of mine, Mine layout, Block yield.	8
3	Processing: Dressing, Sawing, Gangs saw, Circular saws, Preparation and mounting of blade/discs and segments, Polishing Manual Mechanical, Various types of polishing machine.	8
4	Abrasive: Type, use and selection, shaping.	8
5	Tile preparation, Automatic tiling plant, Environmental impact of mining and processing of dimensional stones, Secondary use of quarried land and waste of the industry.	8
	Total	42

References:

1. Dimensional Stone Technology-S.S.Rathod,G.S.Bhardwas,S.C.Jain
2. Gems & Jewelry, Hand Book.
3. Reports on Marble Mining.

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DIPLOMA IN MINING ENGINEERING

Semester – V

Subject Code : **2352207**

Subject Name : **Project - I**

- All the Vth semester students in different group have to identify the problems related to the industries by visiting the industries with their project guide who is the faculty member of their department.
- After selecting a genuine problem from the industry they should decide the project title under the guidelines of project guide.
- Fill up the specified form as specified by GTU and get it signed by the project guide of their institute.
- Submit the forms within the time limit given by GTU.
- In Vth semester collect all the details related with the project from various sources like industries, library, web sites, guide's notes etc.
- Prepare a frame work for completing the task of finding the solution of the selected problem or at least reach up to the genuine conclusion under the guide lines of the industrial expert and project guide.
- The students have to prepare and submit a report of Industry Defined Problem to the Head of the Department as instructed by their project guide.