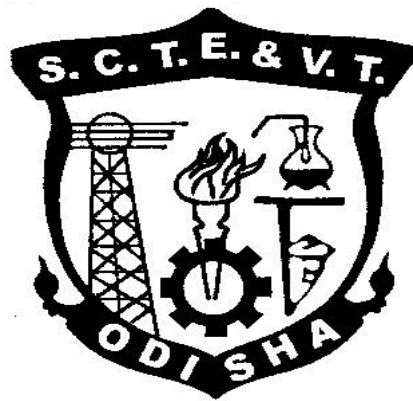


**CURRICULLUM OF 3<sup>RD</sup> SEMESTER**  
**For**  
**DIPLOMA IN MINING ENGINEERING**  
**(Effective FROM 2019-20 Sessions)**



**STATE COUNCIL FOR TECHNICAL  
EDUCATION & VOCATIONAL TRAINING,  
ODISHA, BHUBANESWAR**

**STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING,ORISSA**

**TEACHING AND EVALUTION SCHEME FOR 3rd Semester(Branch Name- Mining)(w e f 2019-20)**

SUBJECT NUMBER	SUBJECT CODE	SUBJECT	Periods/Week			Evaluation Scheme			
			L	T	P	Internal assessment / Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th .1		Surface Mining Technology	4			20	80	3	100
Th .2		Mine Survey -I	4			20	80	3	100
Th .3		Mine Geology -I	4			20	80	3	100
Th .4		Mechanical Operation in Mines	4			20	80	3	100
Th .5		Environmental Studies	4			20	80	3	100
		<b>Total</b>	20			100	400		500
		<b>Practical</b>							
Pr .1		Mine Survey -I LAB			6	50	50		100
Pr .2		Mine Geology -I LAB			6	50	50		100
Pr .3		Mechanical Operation in Mines LAB			6	25	25		50
		Student Centred Activities(SCA)			1				
		<b>Total</b>			19	125	125		250
		<b>Grand Total</b>	20		19	225	525		750

Abbreviations : L-Lecturer, T-Tutorial, P-Practical. Each class is of minimum 55 minutes duration.

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/Personality Development/Environmental issues /Quiz/Hobbies/Field visits/Cultural Activities/Library Studies/Classes on MOOCS/SWAYAM etc. . SCA shall be conducted in a section.

There shall be 1 Internal Assesment done for each of Theory subject .Sessional Marks shall be total of the performance of individual different jobs/experiments in a subject throughout the semester. Industry/Mines Exposure Training can be conducted during semester break after 2<sup>nd</sup> semester and/or 4<sup>th</sup> semester.

## Th.1. SURFACE MINING TECHNOLOGY

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	3rd
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

### A. RATIONALE

As a Mining Engineer, one has to develop the basic concepts and principles of winning and working in mines. Further, he should have basic knowledge of explosives for development of mines.

### B. OBJECTIVES

On completion of the subject, students will be able to :

- Develop the concept of choice of Opencast Mining.
- Determine bench parameters.
- Define slope stability and types, prevention of Slope failure.
- Explain various compositions, properties of Explosives and Blasting accessories.
- State and explain different drilling methods.
- Explain blasting practice in Mines.
- Describe blasting techniques as per statutory provisions.
- Identify basic constructional features and safety provisions of magazine.

### Topic- wise distribution of periods

CHAPTER	TOPICS	PERIODS
1	Choice of opencast Mining	10
2	Benching	5
3	Slope stability	6
4	Explosive and Blasting Accessories	11
5	Drilling	8
6	Blasting practices in Mines	10
7	Control Blasting as per statutory provision	6
8	Magazine	4
	Total	60

## **COURSE CONTENTS** (Based on specific objectives).

### **1. Choice of Opencast Mining**

- State factors affecting choice of Open casting Mining method.
- Define stripping ratio.
- Determine overburden/ore ratio.
- Find out cut off stripping ratio.
- Determine quarriable limit.
- State favorable conditions for mechanized Opencast Mines.
- State limitations of large open pits.
- Define Box cut and determine the location of Box cut.

### **2. Benching**

- Determine bench parameters- height, width & slope.
- Determine length of bench for overburden and ore.

### **3. Slope Stability**

- Define slope stability.
- Factors affecting slope stability.
  - Types of slope stability.
- Causes and prevention of slope stability.

### **4. Explosive and blasting accessories**

- Define explosive, state constituents of explosives , properties & characteristics of explosives.
- Classify explosives, state composition and uses of explosives.
- Explain PMS and SMS.
  - Define permitted explosive and classify permitted explosive.
  - Explain sheathed, equivalent sheathed and ultra safe explosive.
  - State properties of permitted explosives.
- State composition & constructional features of safety fuse, detonating fuse, detonating relay, igniter cord, nonel and raydet..
  - Describe different types of detonators and uses, state advantages of delay detonators.
- State different types of exploder, its construction and safety features, circuit tester.
- Describe stemming rod, crack detector knife, crimper.

### **5. Drilling**

- Explain different principles and methods of exploratory drilling in surface mining.
- State different types of drill used in Opencast mining.
- Describe simple constructional features of churn drill, drills master, wagon drill and jack hammer.
- State D.T.H..
- Describe different types of drill bits in drilling.

**6. Blasting practices in Mines**

- Describe preparation of charge.
- State procedure of firing shots, direct and inverse initiation, stemming materials, water ampoules, cushion firing.
- Define blasting efficiency.
- State and describe plaster shooting and pop shooting, toe blasting.

**7. Controlled Blasting Techniques as per statutory provision**

- State and describe pre-splitting, cushion blasting, muffle blasting, coyote hole blasting, chambered hole blasting, directional blasting, Electronics Blasting System (EBS) .

**8. Magazines**

- Describe layout and arrangement of different types of magazines, state their safety features.

**SYLLABUS COVERAGE UP TO I.A**

Chapter 1,2,3,4.

Learning Resources:		
Sl. No.	Title of the Book	Name of Authors
1	Surface Mining Technology	S.K. DAS
2	Blasting Manuals	Sandhu & Pradhan
3	Blasting Practices in Mines	S.K. DAS
4	EMT VOL I	D.J. DESHMUKH
5	Surface Mining	G.B. Mishra
6	SME Handbook	

## Th .2. MINE SURVEY - I

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	3rd
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

### A. RATIONALE :

Before starting the actual mining operation, it is essential for mining engineer to first survey the piece of land where mining operation is contemplated. This is not possible without the knowledge of mine surveying.

### B. OBJECTIVES:

On completion of the subject, students will be able to :

- Explain different chains and their use in the field.
- Explain prismatic compass and surveyor's compass and determine magnetic meridian. Explain local attraction and make necessary correction.
- Outline knowledge regarding plane table survey in the field.
- Describe general methods of determining areas.
- Describe various leveling methods.
- Describe different methods of calculating ore reserves by materials balance and decline curve way.
- Describe the application of theodolites in surveying, micro-optic and seconds theodolite.

### C. Topic wise distribution of periods

CHAPTER	TOPICS	PERIODS
1	Chain Survey	10
2	Compass Survey	8
3	Plane Table Survey	8
4	Computataion of Areas	8
5	Levelling	10
6	Calculation of ore reserves	8
7	Theodolite	8
	<b>TOTAL</b>	<b>60</b>

## D.COURSE CONTENTS (Based on Specific objectives)

### 1. Chain Survey

- Give survey conventional signs, abbreviation used.
- Give standards of lining, inking and coloring.
- Describe selection of scales used.
- Explain principle of chain surveying.
- Describe instruments used and checking their correctness.
- Explain ranging and chaining of a line.
- Calculate errors in chaining.
- Explain obstruction while chaining.
- Describe chaining along a sloping ground.
- Describe use of optical square and line range and checking optical square for correctness.
- Describe offsets and their measurements.
- Give reference sketches of stations.
- Give procedure of chain surveying.
- Explain field booking and plotting of chain survey.

### 2. Compass Survey

- Describe prismatic compass, its adjustments and use.
- Explain true meridians, magnetic meridian, grid line meridian and arbitrary meridian.
- Explain W.C.B. and Q.B. and conversion from one to other
  - Find out fore and back bearing and their conversion.
  - Compute angles from bearing and bearing angles
- Define local alteration
  - Determine local alteration and necessary correction to the bearing.
- Explain closed and open compass surveying and its plotting.
- Give procedure of field booking in compass and chain traverses.
- Explain adjustment of closing error in compass traversing.
- Describe surveyor compass(miner's dial),its adjustment and use
- Compare prismatic compass with surveyor compass.

### 3. Plane Table Survey.

- Fundamentals of Plane Table Survey.
- Explain two point problems.
- Explain three point problems and its solution by tracing paper method.
- Describe advantages and disadvantages of plane table.

### 4. Computation of areas

- Explain methods of determining areas.
- Find out areas from offset to a base line using
  - Mid ordinate rule
  - Average ordinate rule
  - Trapezoidal rule
  - Simpson's rule
- Compute area by Planimeter and from graph paper.

### 5 Leveling

- Define benchmark M.S.L. Dumpy level.
- Adjust dumpy level, modern levels (Auto Level & etc.), and precise staff.
- Describe methods of leveling- Rise & fall method, height of instrument.
- Errors in ordinary leveling.
- Explain reciprocal leveling, subsidence leveling, setting out gradient, trigonometric leveling, geometrical leveling, and physical leveling.

### 6 Calculation of Ore Reserves

- Classify reserves.
- Evaluate reserves by exploratory .
- Calculate primary ore reserve by material balance method & decline curve method.

7

**Theodolite**

- Describe temporary and permanent adjustment of Theodolite.
- Describe the principles of operation & describe different parts.
- Measure Horizontal & Vertical angles.
- Describe setting of the instrument.
- Explain Traversing with Theodolite.

**SYLLABUS COVERAGE UP TO I.A**

Chapter 1,2,3,4

Learning Resources:		
Sl. No.	Title of the Book	Name of Authors
1	Textbook of Surveying	B.C. Punmia Vol I & II
2	Textbook of Surveying	T.P Kanetkar



## Th.3 MINE GEOLOGY - I

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	3rd
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

### A. RATIONALE :

In majority of the cases, materials that need to be mined in order to reach the hidden treasure are rocks and minerals. It is therefore, essential for a mining engineer to have the basic knowledge of geology.

### B.OBJECTIVES:

On completion of the course, students will be able to:

- Explain the dynamic natural agencies that are constantly moulding the landscape of earth. He will be able to visualize the erosional and depositional landforms created by natural agencies.
- Distinguish between Igneous, Sedimentary and Metamorphic rocks and their texture and structures.
- Distinguish and identify the various structures that one may encounter in the field.
- Underline the importance of crystal structures in the identification and study of minerals.
- Identify minerals based on their physical properties. They will possess a sound knowledge of silicate structures.
- Identify different rocks in the laboratory.

### Topic wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Physical Geology	15
2	Petrology	12
3	Structural Geology	6
4	Elements of Crystallography	12
5	Elements of Mineralogy	15
	Total	60

### C. COURSE CONTENTS (Based on specific objectives)

#### 1. Physical Geology

- Define weathering and erosion.
- Explain with suitable sketches the erosional and depositional land forms produced by wind.
- Explain with neat sketches the erosional and depositional land forms produced by river.
- Differentiate between glacier and iceberg

- Describe the erosional and depositional features produced by glacier.
- Define moraine. Describe the different type of moraine with sketches.

**2. Petrology**

- Define a Rock. Distinguish between a rock and a mineral.
- Define Igneous, Sedimentary and Metamorphic rocks.
- Describe the various textures and structures found in Igneous rocks.
- Describe some important structures of sedimentary rocks along with neat sketches.
- Describe various structure found in metamorphic rocks.

**3. Structural Geology**

- Define Dip. Distinguish between true dip and apparent dip.
- Define strike.
- Define folds. Classify folds and describe them.
- Define faults. Describe the various types of fault.
- Define unconformity. Describe the various type of unconformity with neat sketches.
- Define joints. Describe various joints.

**4. Element of Crystallography**

- Define a crystal.
- Explain Miller's indices.
- Describe the Symmetry elements and forms present in the normal class of isometric system.

**5. Elements of Mineralogy**

- Define a mineral.
- Enumerate and describe the physical properties of minerals.
- Describe various optical properties of minerals.
- Explain briefly the silicate structures along with diagrams.
- Classify minerals.
- Describe mineralogy and physical properties of Olivine, Quartz, Feldspar and Pyroxene group of minerals.

**SYLLABUS COVERAGE UP TO I.A**

Chapter 1,2,3

Learning Resources:		
Sl. No.	Title of the Book	Name of Authors
1	Textbook of Geology	P.K Mukharjee
2	Textbook of Geology	G.B. Mohapatra
3	Ruttley's Elements of Mineralogy	H.H. Reid
4	Petrology	G.W. Tyrrel
5	Structural Geology	M.P. Billings
6	Structural Geology of Rocks at Regions	H.Davids,J Reynolds

## Th. 4 MECHANICAL OPERATIONS IN MINE

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	3rd
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

### A. RATIONALE :

As Mining Engineer it is essential to have the fundamental concept of mechanical engineering specially related to working of machines, which are used in mines.

### : B.OBJECTIVES:

On completion of the subject, students will be able to:

- Describe the concept of stress, strain, bending moment and shear force, torsion with power transmission.
- Explain Fluid static's and dynamics with solution of problems.
- Explain the use of compressed air and different types of air compressor.
- Explain the concept of Internal Combustion engines.

### C. Topic wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Strength of Materials & Power Transmission	20
2	Elements of Hydraulics	15
3	Compressed Air	15
4	Internal Combustion Engines	10
	Total	60

### D. COURSE CONTENTS (Based on Specific Objectives)

#### 1. Strength of Materials and Power Transmission.

- Define
  - Elasticity
  - Hook's Law
  - Limit of Proportionality.
  - Young's Modulus
  - Factor of safety. Lateral strain and Poisson's ratio.
- Explain stress-strain curve for ductile materials.
- Explain the effect of axial load on bar of
  - Uniform section
  - Variable section
- Solve numerical problems on above
- Define bending moment and shear force.
- State types of beam and types of loading.
- Explain shear force diagram and bending moment diagram for
  - Cantilever with concentrated loading.

- Cantilever with U.D.I. over whole span.
    - Simply supported beam with concentration loading.
    - Simply supported beam with U.D.I. over whole span.
  - State bending formula.
  - Define section modules.
    - Find out section modules for beam section of simple cases.
  - Define torsion and state its effects.
  - State application of torsion formula.
  - Explain working of
    - Shaft couplings such as hydraulic and magnetic couplings.
    - Belt, chain and rope Drive.
    - Simple and compound gear train.
    - Torque converters.
  - State function of flywheel and governors.
  - Explain working of watt, purler and proel governors.
- 2. Elements of Hydraulics.**
- State various fluid properties.
  - Define pressure of fluid and pressure head.
  - State and explain working principle of various pressure measuring devices such as:
    - Pieccometer tube.
  - State and explain continuity equation.
  - State and explain Bernoulli's theorem.
  - Explain working of venturimeter.
  - Solve numerical problems on above.
  - Define and classify orifices.
  - State the formula and discharge for rectangular orifices and solve problems.
  - Define and differentiate between orifice and notch.
  - Classify notches.
  - State formula for discharge through notches & solve problem on above.
  - State and explain laws of fluid friction.
  - State and explain loss of head due to friction (Darcy weisbach formula)
  - Explain hydraulic gradient and energy gradient.
  - Solve numerical problems as above.
- 3. Compressed Air**
- Explain introduction of compressed air as a power.
  - Classify Compressor & state working principle.
  - State the various methods of transmission and storage of compressed air.
  - State and explain the advantages of use of compressed air in mines.
  - Explain the working principle of pneumatic machines.
- 4. Internal Combustion Engines**
- Explain various air cycles utilized in I/C Engines such as:
    - OTTO Cycle.
    - Diesel Cycle.
  - Explain working principle of 2 stroke and 4 stroke petrol and diesel engines.
  - Define I.H.P., B.H.P. & Mechanical efficiency of I/C Engine.
  - State various applications of I/C Engines in Mining field.

### **SYLLABUS COVERAGE UP TO I.A**

Chapter 1,2

Learning Resources:		
Sl. No.	Title of the Book	Name of Authors
1	Strength of Materials	Ramrutham
2	Applied Mechanics	Khurmi & Gupta
3	Fluid Mechanics	Ramrutham
4	Thermal Engineering	Rav Saro

# Th5. ENVIRONMENTAL STUDIES

(Common to all Branches)

Name of the Course: Diploma in Electrical Engineering			
Course code:		Semester	3 <sup>rd</sup>
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

## A. RATIONALE:

Due to various aspects of human developments including the demand of different kinds of technological innovations, most people have been forgetting that, the Environment in which they are living is to be maintained under various living standards for the preservation of better health. The degradation of environment due to industrial growth is very much alarming due to environmental pollution beyond permissible limits in respect of air, water industrial waste, noise etc. Therefore, the subject of Environmental Studies to be learnt by every student in order to take care of the environmental aspect in each and every activity in the best possible manner.

## B. OBJECTIVE:

After completion of study of environmental studies, the student will be able to:

1. Gather adequate knowledge of different pollutants, their sources and shall be aware of solid waste management systems and hazardous waste and their effects.
2. Develop awareness towards preservation of environment.

## C. Topic wise distribution of periods:

SI. No.	Topics	Period
1	The Multidisciplinary nature of environmental studies	04
2	Natural Resources	10
3	Systems	08
4	Biodiversity and it' s Conservation	08
5	Environmental Pollution	12
6	Social issues and the Environment	10
7	Human population and the environment	08
	<b>Total:</b>	<b>60</b>

## D. COURSE CONTENTS

### 1. The Multidisciplinary nature of environmental studies:

1.1 Definition, scope and importance.

1.2 Need for public awareness.

### 2. Natural Resources:

**Renewable and non renewable resources:**

- a) Natural resources and associated problems.
  - 2.1.1. Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction mining, dams and their effects on forests and tribal people.
  - 2.1.2. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
  - 2.1.3. Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources.
  - 2.1.4. Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers-pesticides problems, water logging, salinity, .
  - 2.1.5. Energy Resources: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
  - 2.1.6. Land Resources: Land as a resource, land degradation, man induces landslides, soil erosion, and desertification.
- b) Role of individual in conservation of natural resources.
- c) Equitable use of resources for sustainable life styles.

### 3. **Systems:**

- 3.1. Concept of an eco system.
- 3.2. Structure and function of an eco system.
- 3.3. Producers, consumers, decomposers.
- 3.4. Energy flow in the eco systems.
- 3.5. Ecological succession.
- 3.6. Food chains, food webs and ecological pyramids.
- 3.7. Introduction, types, characteristic features, structure and function of the following eco system:
- 3.8. Forest ecosystem:
- 3.9. Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries).

### 4. **Biodiversity and it's Conservation:**

- 4.1. Introduction-Definition: genetics, species and ecosystem diversity.
- 4.2. Biogeographically classification of India.
- 4.3. Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and option values.
- 4.4. Biodiversity at global, national and local level.
- 4.5. Threats to biodiversity: Habitats loss, poaching of wild life, man wildlife conflicts.

### 5. **Environmental Pollution:**

#### 5.1. Definition Causes, effects and control measures of:

- a) Air pollution.
- b) Water pollution.
- c) Soil pollution
- d) Marine pollution
- e) Noise pollution.
- f) Thermal pollution
- g) Nuclear hazards.

#### 5.2. Solid waste Management: Causes, effects and control measures of urban

and industrial wastes.

5.3. Role of an individual in prevention of pollution.

5.4. Disaster management: Floods, earth quake, cyclone and landslides.

**6. Social issues and the Environment:**

6.1. Form unsustainable to sustainable development.

6.2. Urban problems related to energy.

6.3. Water conservation, rain water harvesting, water shed management.

6.4. Resettlement and rehabilitation of people; its problems and concern.

6.5. Environmental ethics: issue and possible solutions.

6.6. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.

6.7. Air (prevention and control of pollution) Act.

6.8. Water (prevention and control of pollution) Act.

6.9. Public awareness.

**7. Human population and the environment:**

7.1. Population growth and variation among nations.

7.2. Population explosion- family welfare program.

7.3. Environment and human health.

7.4. Human rights.

7.5. Value education

7.6. Role of information technology in environment and human health.

**Syllabus coverage up to Internal assessment**

Chapters: 1, 2 and 3.

<b><u>Learning Resources:</u></b>			
<b>Sl.No</b>	<b>Title of the Book</b>	<b>Name of Authors</b>	<b>Name of Publisher</b>
1.	Textbook of Environmental studies	Erach Bharucha	#UGC
2.	Fundamental concepts in Environmental Studies	D.D. Mishra	S.Chand & Co-Ltd
3.	Text book of Environmental Studies	K.Raghavan Nambiar	SCITECH Publication Pvt. Ltd.
4.	Environmental Engineering	V.M.Domkundwar	Dhanpat Rai & Co



## Pr.1. MINE SURVEY – I LAB

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	3rd
Total Periods:	90	Examination	3 hrs
Theory Periods:	6P/week	Internal Assessment	50
Maximum Marks:	100	End Semester Examination	50

### A. RATIONALE:

In the field of mining, it will help in all measurements, calculations & mapping at all stages from prospecting to exploitation and utilizing mineral deposits by both surface & underground working.

### B. OBJECTIVE:

On completion of lab students will able to :

- Develop a clear idea about Chain survey & Compass survey.
- Know various components of Level and Theodolite & their uses.
- Distinguish methods employed for measurement of horizontal and vertical angle.

#### Topic wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Chain Survey	15
2	Compass Survey	15
3	Levels	15
4	Theodolite	15
5	Measurement of Horizontal angle	15
6	Measurement of Vertical angle	15
	Total	90

### C. Course Content

#### 1. Chain Survey

- Ranging a line more than 100 m in length and measuring its correct length applying corrections.
- Taking offsets of objects on both sides of a line.
- Plotting the above details.
- Overcoming obstructions in chaining.
  - Vision free, chaining obstructed (Pond, river)
  - Chaining free, vision obstructed (Raising ground)
  - Both vision and chaining obstructed (Building)
- Measuring on sloping ground.
- Chain surveying and plotting of small plot by triangulation.

#### 2. Compass Survey

- Finding bearing of line and applying check.
- Closed traversing of a small plot with station (without intermediate filling)
- Open traversing of a small length with few station (without offsets)
- Plotting both the above traverses applying correction.

**3 Levels:**

- Temporary and permanent adjustment, sensitivity of bubble tube practice with different types of level(Auto Level & etc.)
4. Temporary & permanent adjustment of theodolite.
5. Measurement of horizontal angle by reiteration and repetition methods.
6. Measurement of vertical angle

## Pr.2. MINE GEOLOGY – I LAB

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	3rd
Total Periods:	90	Examination	3 hrs
Theory Periods:	6P/week	Internal Assessment	50
Maximum Marks:	100	End Semester Examination	50

### A. RATIONALE:

In majority of the cases, materials that need to be explored comprise of rocks & minerals. It is therefore, essential for an engineer to have basic knowledge regarding the composition, structure & texture of both rock and minerals.

### B. OBJECTIVE:

On completion of Lab students will able to:

- Identify ore forming & rock forming minerals.
- Determine specific gravity of minerals by workers steel yard balance.
- Analyze thin section of minerals and rocks under microscope.

### Topic wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Identification of Minerals	30
2	Specific Gravity by Steel yard Balance	30
3	Analysis of Thin section of Minerals and Rocks	30
	Total	90

### C.Course Content:

- Identification of rock forming and ore minerals in hand specimens.
- Determinations of specific gravity by workers steel yard balance.
- Analysis of thin sections of minerals and rocks under the microscopes.

## Pr.3 . MECHANICAL OPERATION IN MINES

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	3rd
Total Periods:	90	Examination	3 hrs
Theory Periods:	6P/week	Internal Assessment	25
Maximum Marks:	50	End Semester Examination	25

### A. RATIONALE

As mechanisation is a common trend now-a-days in mining sector. So as a mining engineer, one should have some fundamental knowledge regarding the machines used in mines.

### B. OBJECTIVE:

On the completion of Lab students will be able to:

- Know application of Bernoulli's Theorem
- Determine velocity of air
- Determine volumetric efficiency of air compressor.
- Distinguish construction and working procedure of 2- stroke and 4 - stroke diesel engine.
- Describe I.C. Engine Test.

### Topic wise Distribution of Periods

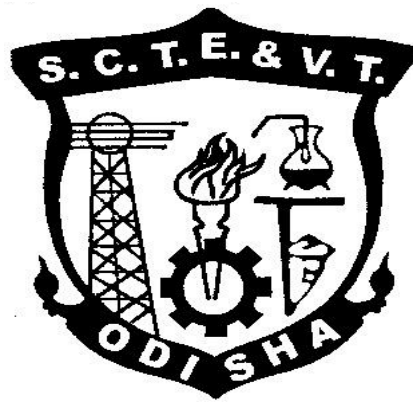
CHAPTER	TOPIC	PERIODS
1	Verify Bernoulli's Theorem	15
2	Determine rate of flow of air	15
3	Conduct Tensile test of a mild steel specimen	15
4	Determine volumetric efficiency of Air compressor	15
5	Study of 2-Stroke and 4-Stroke diesel engines	15
6	Conduct of I.C Engine Test	15
	Total	90

### C. Course Content:

- Bernoulli's Theorem by Bernoulli's Verification Apparatus.
- Determine rate of flow through the venturimeter set-up.

- Conduct tensile test of a mild steel specimen and plot stress-strain curve, show salient points on it.
- Determine volumetric efficiency of air- compressor.
- Study of 2-stroke & 4-stroke diesel engines.
- Conduct I/C engine testing on single cylinder diesel engine & find out I.H.P., B.H.P. & mechanical efficiency.

**CURRICULLUM OF 4<sup>TH</sup> SEMESTER  
For  
DIPLOMA IN MINING ENGINEERING  
(Effective FROM 2019-20 Sessions)**



**STATE COUNCIL FOR TECHNICAL EDUCATION &  
VOCATIONAL TRAINING, ODISHA, BHUBANESWAR**

**STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING,ORISSA**

**TEACHING AND EVALUTION SCHEME FOR 4th Semester Mining Engg.(wef 2019-20)**

SUBJECT NUMBER	SUBJECT CODE	SUBJECT	Periods/Week			Evaluation Scheme			
			L	T	P	Internal assessment/Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th .1		Underground Coal Mining	4			20	80	3	100
Th .2		Mine Survey -II	4			20	80	3	100
Th .3		Mine Ventilation	4			20	80	3	100
Th. 4		Electrical Equipment in Mines	4			20	80	3	100
		<b>Total</b>	<b>16</b>			<b>80</b>	<b>320</b>		<b>400</b>
		Practical							
Pr .1		Mine Survey -II LAB			06	50	50		100
Pr .2		Mine Ventilation LAB			06	50	50		100
Pr .3		Electrical Equipment in Mines LAB			06	50	50		100
Pr .4		Technical Seminar			02	50	-		50
		Student Centered Activities(SCA)			3				
		<b>Total</b>			<b>23</b>	<b>200</b>	<b>150</b>		<b>350</b>
		<b>Grand Total</b>	<b>16</b>		<b>23</b>	<b>280</b>	<b>470</b>		<b>750</b>

**Abbreviations: L-Lecturer ,T-Tutorial ,P-Practical .Each class is of minimum 55 minutes duration.**

**Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%**

**SCA shall comprise of Extension Lectures/Personality Development/Environmental issues/Quiz/Hobbies/Field Visits/cultural activities/Library studies/Classes on MOOCS/SWAYAM etc., Seminar and SCA shall be conducted in a section.**

**There shall be 1 Internal Assessment done for each of the Theory subject. Sessional Marks shall be total of the performance of individual different jobs/experiments in a subject throughout the semester. Industry/Mines Exposure Training can be conducted during semester break after 4<sup>th</sup> semester.**

# Th .1. UNDERGROUND COAL MINING

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	4th
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

## Topic- wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Introduction to Method of working	4
2	Bord & Pillar Method	15
3	Long wall Mining Method	10
4	Thick seam Mining Method	8
5	Horizon Mining Method	3
6	Hydraulic & Pneumatic Stowing Method	3
7	Support system & Roof control	10
8	Subsidence due to Mining	3
9	Shaft sinking	4
	Total	60

## RATIONALE

As a Mining Engineer, one should know different methods of underground working in coal mining and operational principles.

## OBJECTIVES

On completion of the course, students will be able to :

- Explain different mining methods and their selection.
- Describe details working of B.P. method and its development & depillaring, precautions against fire and water and B.P. layout.
- Explain long wall working.
- Describe elementary idea about thick seam mining.
- Describe horizon mining.
- Explain various practices of filling of goaf and their layout.
- Describe roof behaviors and support required in Mines.
- Identify causes of subsidence and its prevention.
- Describe various methods of shaft sinking.



## COURSE CONTENTS

1. Introduction to Underground Coal Mining
  - Define mine and different methods of mining.
  - Classify Underground Coal Mining Methods.
2. Bord and Pillar Method
  - Describe the various application of Bord & Pillar method.
  - Describe various layouts of Bord & Pillar method.
  - Describe depillaring method with stowing and caving.
  - State precautions against fire and water during and after depillaring.
  - State and describe various machineries used in working face.
  - Define contigeous seam.
  - Describe working of contiguous seams.
  - Describe working of seams above and below goaved out area.
  - State advantages and disadvantages of Bord & Pillar method.
3. Longwall Method
  - Describe Longwall advancing and retreating methods.
  - Define single unit and double unit face.
  - Describe cyclic and non-cyclic L/W layouts.
  - Describe mechanized longwall working with armoured flexible conveyor, shield support and shearer loader.
4. Thick seam Mining
  - Define Thick seams.
  - Classify Thick seam Mining.
  - Describe layouts of horizontal slicing, incline slicing, blasting gallery and sublevel caving.
5. Horizon Mining
  - State conditions, advantages, disadvantages and limitations of Horizon Mining.
    - Describe the layout of Horizon Mining.
6. Hydraulic and Pneumatic stowing
  - Describe hydraulic stowing.
  - Describe Pneumatic stowing.
7. Support and roof control in Mines
  - State properties of various types of roof & roof behavior, Pressure arch theory in B&P and longwall working.
  - Describe testing of roof.
  - Classify support system in Mines construction, principle of operation application and load bearing capacity assessment.
8. Subsidence due to Mining
  - Define angle of draw
  - State factors of subsidence, critical area of extraction
  - Describe the factors affecting subsidence
  - State & describe precautionary measures against damage due to subsidence
  - Define shaft pillar.
9. Shaft Sinking
  - Describe vertical shaft and inclined shaft; determine shape and size of shaft, location of shaft. Describe sinking through normal ground. State shaft plumbing.
  - Describe sinking through difficult ground, cementation, freezing, mechanized shaft sinking, sinking upward, widening and deepening of shafts.

**SYLLABUS COVERAGE UP TO I.A.**

Chapter 1,2,3,4.

**BOOKS RECOMMENDED :**

Sl. No.	Title of the Book	Name of Authors
1	Coal Mining	S. Mathur
2	EMT VOL I,III	D.J. Deshmukh
3	Modern Coal Mining	S.K. Das
4	Advanced Coal Mining	RT Deshmukh & B.Borovjev
5	UMS	
6	Coal Mine Ground Control	S S Peng
7	SME Mining Engg. Handbook	
8	Strata Control	Jermic

## Th. 2 . MINE SURVEY – II

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	4th
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

### Topic- wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Tacheometry	10
2	Triangulation & Trilateration	12
3	Co-relation of Surface & Underground Survey	10
4	Setting out curves	10
5	Stope Surveying	10
6	G.P.S & Total Station	8
	Total	60

### RATIONALE

Before starting the actual mining operation, it is essential for mining engineer to first survey the piece of land where mining operation is contemplated. This is not possible without the knowledge of mine surveying.

### OBJECTIVES

On completion of the subject, students will be able to :

- Comprehend principle of tachometry & its application in measurement of distance.
- Explain principle of triangulation & trilateration.
- Explain principles of correlations by different methods.  
Define various terms in connection with curve setting, laying out of curves by different methods.
- Explain different methods of stope surveying, transfer of stope faces to mine Plan.
- Explain the basic principle of global positioning systems & total station.

## COURSE CONTENTS

1. Tacheometry
  - Define stadia & its principle.
  - Explain diaphragm, reticules, tacheometer, instruments constants.
  - Find out height & distance from stadia intercepts, tangential systems, movable hair method.
2. Triangulation and Trilateration.
  - State purpose & principle involved in triangulation & trilateration method.
  - Classify various methods of triangulation survey primary, secondary & tertiary collieri triangulation.
  - Develop concept about reconnaissance survey. Describe methods of measuring angle, types of theodolite used in triangulation survey.
  - Describe the methods of base line measurement using E.D.M.
  - Define tape correction.
  - State construction of triangulation station of permanent nature.
3. Correlation of surface and underground survey
  - State direct correlation by traversing & optical methods.
  - Describe orientation by wires in two shafts.
  - Explain correlation by mines in vertical shafts.
  - State co-planning/ alignment, weissbach triangle weis-quadrilateral methods, precise magnetic correlation.
4. Setting out curves
  - State elements of curves.
  - Define designation of curves, simple, compound & reverse curves.
  - Explain setting out of surface & underground curves by chords & offsets, chords and angle, tangent and offset, plate layers method.
  - Describe various setting out by chain & one theodolite, two theodolites.
  - Define super elevation, transition and vertical curves.
5. Stope Surveying
  - Explain tape triangulation, instrumental survey.
  - Determine stope face.
  - State preparation of stope planes, plotting the stope station, plotting of stope face to the mine plan.
  - Find out area of extraction by Planimeter and calculation of triangle thereof.
6. G.P.S. & Total Station
  - Explain the basic principles of global positioning system & total station.
  - Introduction to DGPS.

### **SYLLABUS COVERAGE UP TO I.A.**

Chapter 1,2,3

### **RECOMMENDED BOOKS**

Sl. No.	Title of the Book	Name of Authors
1	Surveying Vol I	E.Mason
2	Surveying and Levelling	T.P. Kanetkar
3	Geodetic Surveying Vol I	David Clerk
4	Mineral Economics	Sinha & Sharma

## Th. 3. MINE VENTILATION

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	4th
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

### Topic wise distribution of Periods

CHAPTER	TOPIC	PERIODS
1	Natural Ventilation	8
2	Air Crossing & Distribution	10
3	Mechanical Ventilation	9
4	Booster Fan & Its Effect	10
5	Auxiliary Ventilation	7
6	Ventilation Survey	10
7	Leakage of air in Mines	6
	Total	60

### RATIONALE

The provision of proper ventilation is very essential for any underground mining operation. As a mining Engineer, one should have the thorough knowledge of types of ventilation, methods of air crossing, types of fans etc

### OBJECTIVES

On completion of the course, students will be able to :

- Describe different instruments measuring temperature, pressure and humidity and have idea on natural ventilation and laws of mine air friction.
- Describe different types of ventilation and methods of air crossings and distribution.
- Illustrate different types of fans, fan characteristics, Mine characteristics and selection of fans.
- Identify different locations of booster fan and solve simple problems relating to this.
- Explain different systems of auxiliary ventilation and its advantages and disadvantages.
- Explain different ways of pressure survey, quantity survey & quality survey.
- Explain causes & preventives measure of leakage of air in mines.

### COURSE CONTENTS

#### 1. Natural Ventilation

- Definition of natural ventilation and factors affecting natural ventilation.
- Describe the different types of Thermometer.
- Describe the different types of Barometer.
- Describe kata thermometer.
- Describe water gauge.
- Calculate ventilation pressure by using piton static tube.

- Explain effects of heat & humidity.
  - Explain natural ventilation motive column, geothermic gradient.
  - Enumerate laws of mine air friction and solve problems on above.
  - Statutory provision as per CMR 2017,MMR 1961.
2. Air Crossing and distribution
- Describe ventilation stopping, air crossing, ventilation door, brattice partition.
  - Describe different types of ventilation.
  - Accessional & declensional ventilation.
  - Homotropical & Antitropical ventilation.
  - Boundary ventilation.
  - Central & combined ventilation.
  - Explain splitting of air current & solve numerical problems on splitting.
  - Describe air locks at pit top.
3. Mechanical Ventilation
- Explain construction & principle of operation of centrifugal flow fans.
  - State fan laws & calculate fan efficiency and capacity.
  - Explain installation of mine fan with reversal arrangement.
  - Describe fan drift, fan drive, evasee and diffusers.
- Explain fan characteristics and mine characteristics.
- Describe methods of output of mine fans.
4. Booster fan and its Effects
- Describe installation, location and purpose of booster fan.
  - Solve problems relating to booster fan.
5. Auxiliary Ventilation
- Describe systems of auxiliary ventilation.
  - Describe advantages & disadvantages of auxiliary ventilation.
6. Ventilation Survey
- Describe methods of pressure survey using barometer, gauge and pitot tube with manometer.
  - Describe the method of measurement of cross-sectional area.
  - Describe the method of velocity measurements by using anemometer, voltmeter, and pitot- static tube and smoke & cloud method.
  - Determine percentage of oxygen, methane, carbon monoxide SO<sub>2</sub> & H<sub>2</sub>S.
7. Leakage of air in Mines
- Describe causes and preventive measures of leakage of air in mines.

**SYLLABUS COVERAGE UP TO I.A.**

Chapter 1,2,3

**RECOMMENDED BOOKS**

Sl. No.	Title of the Books	Name of Authors
1	Mine Ventilation	G B Mishra
2	EMT II	D J Deshmukh
3	Coal Mine Practices	E. Mason
4	Mine Ventilation	L C KAKU
5	UMS Volume -I	
6	SME HANDBOOK VOL-I & III	

## Th. 4. ELECTRICAL EQUIPMENT IN MINES

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	4th
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

### Topic- wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Electrical cables for Mining use	5
2	Protective systems including Fuses & Circuit Breakers	14
3	Fundamentals of Transformer	10
4	Industrial drives-Mining Type	4
5	Electric Braking Used in Mines	8
6	Flame proof and intrinsically safe apparatus	5
7	Underground signaling arrangement	4
8	Sensors & their applications	5
9	Describe Battery locomotive and Electric LHD	5
	Total	60

### RATIONALE

For a Mining Engineer, it is essential to have the fundamental concepts of electrical engineering and its applications in mining operation.

### OBJECTIVES

On completion of the course, students will be able to :

- Describe various types of electrical cables used in Mines.
- State & explain the purposes of uses.
- Describe and explain circuit breakers and draw circuit diagram of gate-end box and drill panel.
- Describe different types of protective system.
- Select electric drives for mining use.
- Describe & explain different types of electric braking.
- Describe proof apparatus and intrinsically safe apparatus.
- Explain underground signaling arrangement.

### COURSE CONTENTS

1. Electrical cables for Mining use
  - Classify cables for mining use.
  - Constructional features of high tension and low-tension cables armored & trailing cables.
    - State size of cables & their use.

- State procedures of cable laying at surface, underground roadway & in shafts.
  - Describe cable joint box mining type.
- 2. Protective Systems
  - Fuses.
    - Fuse Materials
    - Rewireable Fuse, HRC Fuse.
    - Uses of Fuse.
  - Circuit Breakers.
    - Describe & Explain Air Circuit Breaker.
    - Describe & Explain Minimum Oil Circuit Breaker (MOCB).
    - Describe & Explain Bulk Oil Circuit Breaker (BOCB).
    - Describe & Explain Air Blast Circuit Breaker.
    - Describe SF6 Circuit Breaker.
  - Explain essential qualities of a good protective system.
  - State & describe types of relays (plunger, induction & direction over current, over loads, no volt and latching relay, frequency relay and Earth leakage relay)
  - Describe protection of transformer by differential relay.
  - Describe general principle of working-basis remote control circuit & various protective devices of Gate-End Box.
  - Describe functions & operation of drill panel.
  - Earthing system in mines.
  - Voltage limit.
- 3. Fundamentals of Transformer (without numerical problems)
- 4. Industrial drives- Mining type
  - Explain starting & running characteristics of D.C. & A.C. Motors.
  - State selection of motors for mining use.
- 5. Electric braking used in Mines
  - Describe & explain regenerative braking.
  - Describe & explain magnetic braking.
- 6. Flame proof & intrinsically safe apparatus
  - Define flame proof apparatus & intrinsically safe apparatus.
  - Describe & explain the safety features of flame proof & intrinsically safe apparatus.
- 7. Underground signaling arrangement
  - Describe signals & shaft signal.
  - Describe communication system in U/G mines.
  - Point to point communication.
  - Intercom system/Telephone
  - Cordless system.
- 8. Sensors & their applications.
- 9. Battery locomotive, Automation with Thyroster control, Elecrical LHD, Electric mine phone.

### **SYLLABUS COVERAGE UP TO I.A.**

Chapter 1,2,3.4.

### **RECOMMENDED BOOKS**

Sl. No.	Title of the Books	Name of Authors
1	Electrical Equipment in Mines	H.Cotton
2	Electrical Power System	V K Mehta
3	Power Electronics	P S Punmia



## Pr.1 . MINE SURVEY – II LAB

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	4th
Total Periods:	90	Examination	3 hrs
Practical Periods:	6P/week	Sessional Exam	50
Maximum Marks:	100	End Semester Examination	50

### Topic wise Distribution of Periods

CHAPTER	TOPIC	PERIODS
1	Study of Tacheometer	15
2	Study of GPS	15
3	Study of DGPS	15
4	Study of Total Station	15
5	Uses of Autocad in survey	15
6	Software based Mine planning	15
	Total	90

#### A. RATIONALE:

In the field of mining, it will help in all measurements, calculations & mapping at all stages from prospecting to exploitation and utilizing mineral deposits by both surface & underground working.

#### B. OBJECTIVE:

On completion of lab students will able to :

- Develop a clear idea about Tacheometer and Tacheometry.
- Know various components of GPS and DGPS & their uses.
- Use Total station in calculations of various components in mining field.
- Learn uses of Autocad and software in Mine planning.

#### C. Course Contents

- Fix triangulation and measurement of peripheral and hub angles. Base line measurement applying all corrections and plotting by co-ordinates.
- Determine the north.
- Set out curves by Total Station and Theodolites.
- Correlate underground and surface survey during survey camp.
- Measurement of Horizontal & Vertical angles, measurement of distance by Total Station.
- Mining lease boundary survey using Total Station .
- Base line fixation using Total Station.
- Coordinate point shifting and reference point shifting by Total Station .

- Fixation of control point by 02 traversing (both Horizontal and Vertical control points) with Total Station and auto level.
- Topographic survey & existing features.
- Area calculation using software.
- Volume calculation using software
- GPS Survey.
- Preparation of plan and section using AUTOCAD.
- DGPS Survey.
- Reserve calculation of Ore.

## Pr.2 .MINE VENTILATION LAB

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	4th
Total Periods:	90	Examination	3 hrs
Practical Periods:	6P/week	Sessional Examination	50
Maximum Marks:	100	End Semester Examination	50

### Topic wise distribution of Periods

CHAPTER	TOPIC	PERIODS
1	Calculation of relative humidity by stationary hygrometer	8
2	Study of relative humidity by storrows hygrometer	7
3	Calculation of cooling power of mine air using Kata thermometer.	8
4	Study of air crossing, ventilation doors at pit-top	8
5	Study & use of Vane Anemometer, Digital Anemometer, Velometer	9
6	Determination of duct characteristic.	9
7	Study of constructional features of axial flow and centrifugal fans.	9
8	Determination of fan characteristic curve.	8
9	Study and sketching of regulator, airlocks	8
10	Study and use of digital anemometer.	8
11	Measurement of quantity of air flow by digital anemometer.	8
	Total	90

### A. RATIONALE

The provision of proper ventilation is very essential for any underground mining operation. As a mining Engineer, one should have the thorough knowledge about types of mechanical ventilators, different measuring instruments & air leakage protecting devices used in mines.

### B. OBJECTIVES

On completion of the lab, students will be able to :

- Know uses of stationary & storrows hygrometer in calculation of relative humidity.
- Calculate cooling power of air with help of kata thermometer.
- Illustrate different types of fans, fan characteristics and selection of fans.
- Explain the uses of Regulators and Air locks in different parts of mine.
- Calculate velocity of air with the help of vane anemometer.
- Explain different ways of pressure survey, quantity survey & quality survey.

### **C. Course Contents**

- Determine the relative humidity by stationary hygrometer.
- Determine the relative humidity by storrow's hygrometer.
- Determine the cooling power of mine air using Kata thermometer.
- Study and sketching of air crossing, ventilation doors at pit-top & different types of explosive proof fire stopping.
- Study & use of Vane Anemometer, Digital Anemometer, Velometer, Pitot static-tube measurement of quantity of air flow. Study of digital pressure meter.
- Determination of duct characteristic.
- Study of constructional features of axial flow and centrifugal fans.
- Determination of fan characteristic curve.
- Study and sketching of regulator, airlocks.
- Study and use of digital anemometer.
- Measurement of quantity of air flow by digital anemometer.

## Pr .3 . ELECTRICAL EQUIPMENT IN MINE LAB

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	4th
Total Periods:	90	Examination	3 hrs
Practical Periods:	6P/week	Sessional Examination	50
Maximum Marks:	100	End Semester Examination	50

### Topic wise Distribution of Periods

CHAPTER	TOPIC	PERIODS
1	Preparation of Electrical switch board to control two light points, one plug point	15
2	Study of circuit breakers	15
3	Study of Gate End Box	15
4	Study of Relays	15
5	Identify the different part of given cable	15
6	Use of Megger check and the continuity of windings	15
	Total	90

### A. RATIONALE

For a Mining Engineer, it is essential to have the fundamental concepts of electrical engineering and its applications in mining operation.

### B. OBJECTIVES

On completion of the lab, students will be able to :

- Prepare an electrical switch board to control 2 light points & 1 plug points.
- Describe and explain circuit breakers and draw circuit diagram of gate-end box and drill panel.
- Describe different types of protective system and Relays.
- Distinguish different types of cables used for mining purpose
- Explain the uses of Megger check and continuity of windings.

### C. **Course Contents**

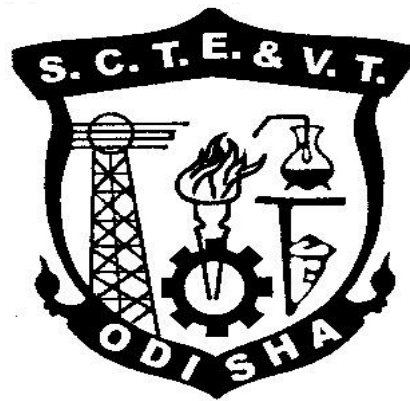
- Prepare an Electrical switch board to control two light points, one plug point, one fan point and put a required fuse.
- Study of circuit breakers (Air Circuit Breaker & Oil Circuit Breaker).
- Study of Gate End Box.
- Study of Relays (Buchholz Relay , Over Current Relay).
- Identify the different part of given cable and find fault on the cable.
- By the use of Megger check the continuity of windings, body to winding, body to earth of an 3-Phase induction Motor.

## Pr. 4. Technical Seminar

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	4th
Total Periods:	30	Examination	-
Practical Periods:	2P/week	Sessional Examination	50
Maximum Marks:	50		

Each student has to select a recent topic of latest technology in the area of Mining Engineering and present a seminar in front of all students of the class. He/She has to prepare a PowerPoint presentation of the selected topic of minimum 10 slides and the total presentation will be approximately 10 minutes duration. There will be an interactive session between the presenter and the rest of the students including the faculty members of the dept at the end of presentation. A student has to present at least 2 nos. of seminar during a semester and to submit the report for evaluation.

**CURRICULLUM OF 5<sup>TH</sup> SEMESTER**  
**For**  
**DIPLOMA IN MINING ENGINEERING**  
**(Effective FROM 2020-21 Sessions)**



**STATE COUNCIL FOR TECHNICAL  
EDUCATION & VOCATIONAL TRAINING,  
ODISHA, BHUBANESWAR**



## STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING,ORISSA

### TEACHING AND EVALUTION SCHEME FOR 5th Semester Mining Engg. (w e f 2020-21)

SUBJECT NUMBER	SUBJECT CODE	SUBJECT	Periods/Week			Evaluation Scheme			
			L	T	P	Internal assessment /Sessional	End Sem Exam	Exams (Hours)	Total
		Theory							
Th .1		Entrepreneurship and Management & Smart Technology	4	-	-	20	80	3	100
Th .2		Mine Hazard and Safety	4	-	-	20	80	3	100
Th .3		Mine Legislation and General Safety -I	4	-	-	20	80	3	100
Th .4		Mine Machinery -I	4	-	-	20	80	3	100
Th .5		Underground Metal Mining	4	-	-	20	80	3	100
		<b>Total</b>	20			100	400		500
		Practical							
Pr .1		Mine Hazard and Safety Lab	-	-	6	50	50	3	100
Pr .2		Mine Machinery -I Lab	-	-	6	50	50	3	100
Pr .3		Project Phase - I	-	-	4	50	-		50
		Student Centred Activities(SCA)	-	-	3	-	-		
		Total			19	150	100		250
		Grand Total	20		19	250	500		750

Abbreviations : L-Lecturer ,T-Tutorial ,P-Practical .Each class is of minimum 55 minutes duration.

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/Personality Development/Environmental issues /Quiz/Hobbies/Field visits/Cultural Activities/Library Studies/Classes on MOOCS/SWAYAM etc. ,Seminar and SCA shall be conducted in a section.

There shall be 1 Internal Assesment done for each of Theory subject .Sessional Marks shall be total of the performance of individual different jobs/experiments in a subject throughout the semester

**Th1. ENTREPRENEURSHIP and MANAGEMENT & SMART TECHNOLOGY**  
(Common to All Branches)

<b>Theory</b>	<b>4 Periods per week</b>	<b>Internal Assessment</b>	<b>20 Marks</b>
<b>Total Periods</b>	<b>60 Periods</b>	<b>End Sem Exam</b>	<b>80 Marks</b>
<b>Examination</b>	<b>3hours</b>	<b>Total Marks</b>	<b>100Marks</b>

**Topic Wise Distribution of Periods**

Sl No.	Topic	Periods
1	Entrepreneurship	10
2	Market Survey and Opportunity Identification(Business Planning)	8
3	Project report Preparation	4
4	Management Principles	5
5	Functional Areas of Management	10
6	Leadership and Motivation	6
7	Work Culture, TQM & Safety	5
8	Legislation	6
9	Smart Technology	6
	<b>TOTAL</b>	<b>60</b>

**RATIONALE**

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students, so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mind set with managerial skill helps the student in the job market. The students can also be introduced with Startup and Smart Technology concept, which shall radically change the working environment in the coming days in the face of Industry 4.0

*In this subject, the Students shall be introduced/ exposed to different concepts and Terminologies in brief only, so that he/she can have broad idea about different concepts/items taught in this subject. Solving numerical problem on any topic/item is beyond the scope of this subject.*

**OBJECTIVES**

After undergoing this course, the students will be able to :

- Know about Entrepreneurship, Types of Industries and Startups
- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- know the management Principles and functional areas of management
- Inculcate leadership qualities to motivate self and others.
- Maintain and be a part of healthy work culture in an organisation.
- Use modern concepts like TQM
- Know the General Safety Rules
- Know about IOT and its Application in SMART Environment.

**DETAILED CONTENTS**

**1. Entrepreneurship**

- Concept /Meaning of Entrepreneurship
- Need of Entrepreneurship
- Characteristics, Qualities and Types of entrepreneur, Functions
- Barriers in entrepreneurship

- Entrepreneurs vrs. Manager
- Forms of Business Ownership: Sole proprietorship, partnership forms and others
- Types of Industries, Concept of Start-ups
- Entrepreneurial support agencies at National, State, District Level( Sources): DIC, NSIC,OSIC, SIDBI, NABARD, Commercial Banks, KVIC etc.
- Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

## 2. **Market Survey and Opportunity Identification (Business Planning)**

- Business Planning
- SSI, Ancillary Units, Tiny Units, Service sector Units
- Time schedule Plan, Agencies to be contacted for Project Implementation
- Assessment of Demand and supply and Potential areas of Growth
- Identifying Business Opportunity
- Final Product selection

## 3. **Project report Preparation**

- Preliminary project report
- Detailed project report, Techno economic Feasibility
- Project Viability

## 4. **Management Principles**

- Definitions of management
- Principles of management
- Functions of management (planning, organising, staffing, directing and controlling etc.)
- Level of Management in an Organisation

## 5. **Functional Areas of Management**

- a) Production management
  - Functions, Activities
  - Productivity
  - Quality control
  - Production Planning and control
- b) Inventory Management
  - Need for Inventory management
  - Models/Techniques of Inventory management
- c) Financial Management
  - Functions of Financial management
  - Management of Working capital
  - Costing (only concept)
  - Break even Analysis
  - Brief idea about Accounting Terminologies: Book Keeping, Journal entry, Petty Cash book, P&L Accounts, Balance Sheets(only Concepts)
- d) Marketing Management
  - Concept of Marketing and Marketing Management
  - Marketing Techniques (only concepts)
  - Concept of 4P s (Price, Place, Product, Promotion)
- e) Human Resource Management
  - Functions of Personnel Management

- Manpower Planning, Recruitment, Sources of manpower, Selection process, Method of Testing, Methods of Training & Development, Payment of Wages
6. **Leadership and Motivation**
- a) Leadership
- Definition and Need/Importance
  - Qualities and functions of a leader
  - Manager Vs Leader
  - Style of Leadership (Autocratic, Democratic, Participative)
- b) Motivation
- Definition and characteristics
  - Importance of motivation
  - Factors affecting motivation
  - Theories of motivation (Maslow)
  - Methods of Improving Motivation
  - Importance of Communication in Business
  - Types and Barriers of Communication
7. **Work Culture, TQM & Safety**
- Human relationship and Performance in Organization
  - Relations with Peers, Superiors and Subordinates
  - TQM concepts: Quality Policy, Quality Management, Quality system
  - Accidents and Safety, Cause, preventive measures, General Safety Rules , Personal Protection Equipment(PPE)
8. **Legislation**
- a) Intellectual Property Rights(IPR), Patents, Trademarks, Copyrights
- b) Features of Factories Act 1948 with Amendment (only salient points)
- c) Features of Payment of Wages Act 1936 (only salient points)
9. **Smart Technology**
- Concept of IOT, How IOT works
  - Components of IOT, Characteristics of IOT, Categories of IOT
  - Applications of IOT- Smart Cities, Smart Transportation, Smart Home, Smart Healthcare, Smart Industry, Smart Agriculture, Smart Energy Management etc.

**Syllabus to be covered before IA:** Chapter 1,2,3,4

### **RECOMMENDED BOOKS**

1. Entrepreneurship Development and Management by R.K Singhal, Katson Books., New Delhi
2. Entrepreneurship Development and Management by U Saroj and V Mahendiratta, Abhishek Publications, Chandigarh
3. Entrepreneurship Development and Management by Vasant Desai, Himalaya Pub.House
4. Industrial Engineering and Management by O.P Khanna ,Dhanpat Rai and Sons
5. Industrial Engineering and Management by Banga and Sharma, Khanna Publications
6. Internet of Things by Jeeva Jose, Khanna Publications, New Delhi
7. Online Resource on Startups and other concepts
8. <https://www.fundable.com/learn/resources/guides/startup>

## **Th.2. MINE HAZARD AND SAFETY**

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	5th
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

### **RATIONALE**

As a Mining Engineer, one must be thoroughly conversant with various sources of mining hazards as also the remedial measures needed to be undertaken to avoid any mishap and able to understand total operation of rescue and recovery.

### **OBJECTIVES**

After completion of the subject, students will be able to:

- Testing of different mine gases. Physiological effect on miners, detection of fire damp by flame safety lamp, explains the method of gas testing by CO-detectors & methanometer.
- Explain how firedamp is emitted in mines.
- Explain causes of mine fires & spontaneous heating.
- Define explosion, explain causes & elaborate necessary steps required for prevention of coal dust & firedamp explosion.
- Define mine inundation, explain causes & elaborate necessary preventive measures required.
- Describe lighting arrangement, lighting standards explain glare & its effect
- Explain the effect of noise & vibration on miners & mine structures & other surface structure.
- Explain rescue and recovery work when mine hazard occurs.

### **Topic- wise distribution of periods**

<b>CHAPTER</b>	<b>TOPIC</b>	<b>PERIODS</b>
1	Mine gases & gas testing	6
2	Emission of firedamp in U/g coal mines	6
3	Mine fires & spontaneous heating	10
4	Mine Explosion	10
5	Mine Inundation	8
6	Mine lighting & Illumination	5
7	Noises & Vibration	5
8	Mine Rescue and Recovery	10
	Total	60

### **COURSE CONTENTS**

- 1. Mine gases & gas testing**
  - Composition of atmospheric air. Different mine gases, their properties and physical effects .
  - State fire damp, black damp, stink damp, white damp and after damp in mines.
  - Describe flame safety lamp & its working principle.
  - Explain gas testing by flame safety lamp by accumulation test & percentage test.
  - State precaution for gas testing.
  - Describe various parts of flame safety lamp, special features.
  - State limitations of flame safety lamp.
- 2. Emission of firedamp in U/g workings**
  - Describe gradual exudation, blower & outbursts of firedamp in U/g workings.
- 3. Define fires & spontaneous heating**
  - Define incubation period
  - Define spontaneous heating and its causes and effects.
  - State preventive measures against spontaneous heating.
  - Explain CO/O<sub>2</sub> ratio & CO<sub>2</sub>/O<sub>2</sub> ratio.
- 4. Mine Explosion**
  - Describe coal dust explosion & fire damp explosion with their causes & prevention.
  - State inflammability of coal dust & fire damp.
  - Explain Coward's diagram.
  - State prevention, suppression & treatment of dust.
  - Describe sampling of dust in Mines.
  - Stone dust barrier.
- 5. Mine Inundation**
  - State sources of water in mines & its danger.
  - State precaution against inundation.
  - Describe burnside safety boring apparatus.
  - State precaution while approaching water logged area.
  - Describe water dams- its construction & design. (Without derivation of formula)
  - Explain water danger plan.
  - Statutory provision for working near water body.
- 6. Mine lighting & illumination**
  - Define illumination and its units.
  - Standards of lighting at different parts of mine as per mine regulation.
- 7. Noise and Vibration .**
  - Explain the effect of noise & vibration on miners & mine structures & other surface structure with respect to statutory provision.
- 8. Mine Rescue and Recovery**
  - Proto-IV, Proto-V, Drager BG-174, Self rescuer, Smoke helmet, Gas mask.
  - Construction of Rescue brigade and their role in rescue and recovery operation.
  - Mine Rescue rules 1985 Annexure I,II,III.

**SYLLABUS COVERAGE UP TO I.A**

Chapter 1,2,3,4

Learning Resources:		
Sl. No.	Title of the Book	Name of Authors
1	Mine Ventilation	G B Mishra
2	EMT - II	D J Deshmukh
3	Coal Mine Practices	E Mason
4	UMS Vol - I	
5	Coal mine Regulations - 2017	
6	Mine Rescue	M A Ramlu

## **Th. 3. MINE LEGISLATION & GENERAL SAFETY-I**

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	5th
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

### **RATIONALE**

Since Mining operations involve frequent accidents, it is very important for a mining engineer to be thoroughly conversant with various acts & rules framed for providing safety to workers.

### **OBJECTIVES**

On completion of the course, students will be able to :

- Describe various aspects of Mines Act 1952.
- Describe various aspects of Mines Rule 1955.
- Describe various aspects of Coal Mines Regulations 2017.
- Describe various aspects of Mines Rescue Rules 1985.
- Describe various aspects of Indian Explosive Rules 2008.
- Describe various aspects of Central Electricity Authority 2010.

### **Topic- wise distribution of periods**

<b>CHAPTER</b>	<b>TOPIC</b>	<b>PERIODS</b>
1	Mines Act 1952	14
2	Mines Rules 1955	10
3	Coal Mines Regulations 2017	18
4	Mine Rescue Rules 1985	5
5	Indian Explosive Rule 2008	7
6	Central Electricity Authority 2010	6
	Total	60



## **COURSE CONTENTS**

- 1. Mines Act 1952**
  - Discuss various provisions of Mines Act 1952.
  
- 2. Mines Rules 1955**
  - Discuss various provisions of Mines Rule 1955.
  
- 3. Coal Mines Regulation 2017**
  - Discuss various Provisions of C.M.R. 2017.
  
- 4. Mines Rescue Rules 1985**
  - Discuss various provisions of Mines Rescue Rules 1985.
  
- 5. Indian Explosive Rules 2008**
  - Discuss various provisions of Indian Explosive Rules 2008.
  
- 6. Central Electricity Authority 2010**
  - Discuss various provisions of Central Electricity Authority 2010.

### **SYLLABUS COVERAGE UP TO I.A**

Chapter 1,2

Learning Resources		
Sl. No.	Title of the Book	Name of Authors
1	Mines Act - 1952	
2	Mines Rules - 1955	
3	Coal Mine Regulations - 2017	
4	Mines Rescue Rules - 1985	
5	Indian Explosive Rules - 2008	
6	Central Electricity Authority - 2010	

## Th.4. MINE MACHINERY – I

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	5th
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

### **RATIONALE**

It is imperative that a Mining Engineer should be thoroughly conversant with various types of machine used in mining operations.

### **OBJECTIVES**

On completion of the subject, students will be able to:

- Describe type & construction of wire, their uses, maintenance & related calculation.
- Describe different types of transportation methods in mines.
- Explain headgear's functions & its design factors.
- Describe constructional & safety features of cage and shaft.
- Describe different profiles of winding drum, various safety devices & related calculations.
- Describe different types of friction winding & its function.
- Explain skip-winding arrangements.
- Draw various arrangements at pit top & pit bottom layouts.

### **Topic- wise distribution of periods**

<b>CHAPTER</b>	<b>TOPIC</b>	<b>PERIODS</b>
1	Wire ropes	12
2	Rope Haulage	14
3	Headgear	5
4	Cage & shaft fittings	6
5	Winding drum	6
6	Friction Winding	5
7	Skip Winding	6
8	Pit top & Bottom Layout	6
	Total	60

## **COURSE CONTENTS**

### **1. Wire Ropes**

- State the types of wire ropes used in Mines.
  - Describe constructional features of wire ropes & lay of wire ropes.
- Define factor of safety to wire ropes nominal & actual factor of safety of wire ropes.
  - State factors influencing the F.O.S.
- State efficiency of rope construction, space factor & cross sectional area rope.
- State factors affecting deterioration of ropes.
- Describe care & maintenance of ropes.
- State & describe testing & examination of wire ropes.
- Give the procedure of splicing of wire rope
- Describe rope capel for haulage winding & recapping.

### **2. Rope Haulage**

- Transportation in mines by rope haulage.
  - State type of rope haulage.
  - Describe various types of rope haulage with simple sketches.
  - State & describe different type of safety devices on rope haulage roadways.
  - State & describe different types of clips & couplings.

### **3. Headgear**

- State function of headgear.
- Describe constructional features of headgear pulley.
- Define angle of fleet.

### **4. Cage and shaft fittings**

- Describe cage, cage suspension gear, detaching hooks & its function, safety catch at headgear & keps.
- State types of guide.
- State & describe rigid guide, flexible shoes, guide rope suspension & tensioning arrangement.

### **5. Winding drum**

- State different profiles of winding Drum.
- Describe different types of winding brake.
- Describe various types of safety devices on winding system.

### **6. Friction Winding**

- State & describe principle & constructional features of ground-mounted & tower-mounted koepe winder.
- State advantages & disadvantages of koepe winding.
- Describe multirope system of koepe winding.

### **7. Skip winding**

- Describe constructional features bottom discharge skip, Top discharge skip.
- Compare skip winding cage winding.

### **8. Pit top & Pit bottom circuit layout**

- State factors affecting pit top & pit bottom layouts.
- Describe different types of pit top & pit bottom car/tub circuit layouts.

**SYLLABUS COVERAGE UP TO I.A.**

Chapter 1,2.3.4

Learning Resources		
Sl. No.	Title of the Book	Name of Authors
1	Mine Hoisting	M A Ramulu
2	SME Mining Engg Handbook	
3	Material Handling in Mines,IIT KGP	
4	EMT III	D.J.Desmukh
5	Mine Transport	N.T Kerlin
6	UMS Volume	

## Th. 5. UNDERGROUND METAL MINING

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	5th
Total Periods:	60	Examination	3 hrs
Theory Periods:	4P/week	Internal Assessment	20
Maximum Marks:	100	End Semester Examination	80

### RATIONALE

As Mining Engineer, one should have the knowledge in fundamental principles of generation in underground metal mines.

### OBJECTIVES

On completion of the subject, students will be able to :

- Describe various methods to access an ore body.
- Explain various methods of development used in underground metal mines.
- Compare between coal & metal mining.
- Explain various stopping methods used in u/g metal mines.
- Stone Drifting.
- Explain causes & prevention of rock burst.
- Describe about face mechanization.

### Topic- wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Access to ore body	5
2	Development in underground metal mines	12
3	Comparative study between Coal & Metal Mining	3
4	Stoping Method	18
5	Stone Drifting.	7
6	Rock burst.	5
7	Face mechanization	10
	Total	60

### COURSE CONTENTS (Based on specific objectives)

- 1. Access to ore body**
  - Classify modes of entries – Adits , inclines and shafts ,applicability of entries.
- 2. Development in underground Metal Mine.**
  - Explain formation of blocks of mineral deposit.

- Explain level interval
- Describe
- Open raising method
- Two compartment method
- Jora raise lift
- Long hole drilling method./Vertical Crater retreat (VCR) method.
- Alimak raise climber
- Raise borer.
- Development of Ore passe system.

**3. Give a comparative study between coal and metal Mining.**

**4. Stopping methods.**

- Classify stopping methods with application and factors affecting methods of stopping.
- Preparatory arrangement for stopping.
- Describe the following methods with layout including drilling, blasting, transportation and supports.
  - Open stopping.
  - Open stopping with pillar support.
  - Shrinkage stopping.
  - Cut & fill stopping.
  - Square set stopping.
  - Block caving.
  - Sub-level caving.
  - Top slicing.

**5. Stone Drifting**

- Describe conventional methods of drifting. Find out direction gradient of drift. Describe drilling and blasting, support, transportation, drainage, ventilation and lighting arrangements, organization and supervision in mechanised method of drifting.

**6. Rock Burst**

- Explain causes and prevention of rock burst.

**7. Face mechanization**

- Describe use of jumbo drill with air leg.
- Describe various Loading & Transportation System like
  - L.H.D., L.P.D.T.(Low Profile Dump Truck), rocker shovel, spiral chutes and draw points, Scraper etc.

**SYLLABUS COVERAGE UP TO I.A.**

Chapter 1,2,3

Learning Resources		
Sl. No.	Title of the Book	Name of Authors
1	SME Mining Engineering Hand Book Vol.I & II-1993 edition.	
2	Metal Mining	Chacharker
3	Mining Engineering Hand Book	Peele
4	EMT Vol.II	D.J.Desmukh
5	Mining Ground control	Prof. B.S. Verma
6	Rock Mechanics	Jermic
7	Rock Mechanics	Jugger & Cook
8	Metalliferous Mining	Higam
9	Underground Mining Method	Bullock.

## Pr.1 MINING HAZARDS & SAFETY LAB

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	5th
Total Periods:	90	End Examination	50
Practical Periods:	6P/week	Sessional	50
		Total	100

### A. RATIONALE:

As a Mining Engineer, one must be thoroughly conversant with various sources of mining hazards as also the remedial measures needed to be undertaken to avoid any mishap and able to understand total operation of rescue and recovery.

### B. OBJECTIVES:

On completion of lab students will able to :

- Develop a clear idea about Methanometer & CO detector.
- Know details about procedure of analysis of gases by halden & Orsat apparatus.
- Sample the dust particles by using Gravimetric dust Sampler.

### Topic wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Estimation of CH <sub>4</sub> in air sample using flame safety lamp and methanometer.	18
2	Study & use of different types of methonometer.	10
3	Determination of CO by using CO-dectector.	6
4	Determination of CO <sub>2</sub> in air sampling by CO <sub>2</sub> detectors	10
5	Gas analysis by (I) Orsat apparatus.	8
6	Haldane apparatus for gas analysis.	8
7	Study & uses of Konimeter.	6
8	Sampling of dust by gravimetric dust sampler.	10
9	Study of Rescue Apparatus	6
10	Multi gas Detector (NO <sub>x</sub> , H <sub>2</sub> S, CO, CO <sub>2</sub> )	8
	Total	90

### C. COURSE CONTENT.

- Estimation of CH<sub>4</sub> in air sample using flame safety lamp and detection by a methanometer.
  - Accumulation & percentage test of CH<sub>4</sub> by flame safety lamp.



- Study & use of different types of methonometer.
- Determination of CO by using CO-dectector.
- Determination of CO<sub>2</sub> in air sampling by CO<sub>2</sub> detectors.
- Gas analysis by (I) Orsat apparatus.
- Haldane apparatus for gas analysis.
- Study & uses of Konimeter.
- Sampling of dust by gravimetric dust sampler.
- Study of Rescue Apparatus.
- Multi gas Detector (NO<sub>x</sub>, H<sub>2</sub>S, CO, CO<sub>2</sub>)

## Pr.2. MINE MACHINERY – I LAB.

Name of the Course : Diploma in Mining Engineering			
Course code:		Semester	5th
Total Periods:	90	End Examination	50
Practical Periods:	6P/week	Sessional	50
		Total	100

### RATIONALE

It is imperative that a Mining Engineer should be thoroughly conversant with various types of machine used in mining operations.

### OBJECTIVES:

On completion of lab students will able to :

- Develop a clear idea about Wire rope, rope splicing & capeling.
- Know details about Safety hook, keps & rope guides.
- Generate a clear idea about head gear structure, suspension gear & winding drum.

### Topic wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Study of Wire rope.	8
2	Study of rope splicing.	8
3	Study of rope capel.	8
4	Study of safety hook.	10
5	Study of keps.	8
6	Study of guide in shaft.	8
7	Study of clips used in endless rope haulage.	8
8	Model Development of Headgear Structure.	8
9	Model Development of Suspension Gear.	8
10	Model Development of different types of winding drum.	8
11	Model development of different types of safety devices used in haulage.	8
Total		90

### COURSE CONTENT.

- Study of Wire rope.
- Study of rope splicing.

- Study of rope cappel.
- Study of safety hook.
- Study of keps.
- Study of guide in shaft.
- Study of clips used in endless rope haulage.
- Model Development of Headgear Structure.
- Model Development of Suspension Gear.
- Model Development of different types of winding drum.
- Model development of different types of safety devices used in haulage roadways.

## Pr 3. PROJECT WORK (Phase-I)

Name of the Course: Diploma in Mining			
Course code:		Semester	5 <sup>th</sup>
Total Period:	60	Examination :	-
Theory periods:	4P / week	Sessional Marks	50
		TOTAL Marks	50

### RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Mining Engineering and practices in real life situations, so as to participate and manage a Mining projects in future.

Entire Project shall spread over 5<sup>th</sup> and 6<sup>th</sup> Semester. Part of the Project covered in 5<sup>th</sup> Semester shall be named as *Project Phase-I* and balance portion to be covered in 6<sup>th</sup> Semester shall be named as *Project Phase-II*.

### OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- To achieve real life experience in Mines operation and management.
- To develop the skill of writing Project Report

### General Guidelines

The individual students have different aptitudes and strengths and also areas of interest. Project work, therefore, should match the strengths and interest of the students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (right from beginning of 5<sup>th</sup> semester). Students should be allotted a problem of interest to him/her as a project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. Preferably there should not be more than 5 students, if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	Performance Criteria
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

#### **Project Phase-I and Phase-II**

The Project work duration shall cover 2 semesters(5<sup>th</sup> and 6<sup>th</sup> sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5<sup>th</sup> sem under Project Phase-I. The students may be allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work including Design of the system have to be complete in Phase-I. Project Milestones are to be set so that progress can be tracked . In Phase-II detailed work, Testing, Documentation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-I in 5<sup>th</sup> semester there shall be one presentation by each group to mark to progress and also to judge whether the Project is moving in right direction as per the objective of the Project.

# Equipment List

## **MINE HAZARD AND SAFETY LAB**

- (a) GL50 and GL60 flame safety lamp.
- (b) MSA D6 Methanometer.
- (c) CO detector.
- (d) CO2 detector.
- (e) Orsat apparatus
- (f) Konometer.
- (g) GDS dust sampler.
- (h) Multigas detector
- (i) Hygrometer.
- (j) Haldane apparatus.
- (k) DRAGER BG174 self-contained breathing apparatus.
- (l) Self-contained open circuit breathing apparatus.
- (m) Face mask for rescue apparatus.

## **MINE MACHINERY –I LAB**

- (a) Pieces of standard and non standard Rope.
- (b) Model of rope splicing.
- (c) Rope splicing tools.
- (d) King detaching safety hook.
- (e) Ormoured safety hook.
- (f) Model of Keps.
- (g) Models of rope guide and rigid guide.
- (h) Rope guide and rigid guide shoe.
- (i) Model of different types of clips such as cam clip, small man clip, lashing chain, Screw clip.
- (j) Model of headgear structure.
- (k) Models of cylindrical drum, conical drum, bi cylindro conical drum.
- (l) Models of different types of safety devices used in haulage rode way such as Back stay, Drop warrick, Runaway switches, Stop block, Monkey Catches.

**STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA**

**TEACHING AND EVALUATION SCHEME FOR 6<sup>TH</sup> SEMESTER MINING ENGINEERING(wef 2020-21)**

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
<b>Theory</b>									
Th.1		Mine Machinery -II	4			20	80	3	100
Th.2		Mine Geology -II	4			20	80	3	100
Th.3		Mine Legislation & General Safety - II	4			20	80	3	100
Th.4 Elective (Any One)		(a)Mineral Dressing (b)Advanced Mine Survey (c) Material handling & Logistics	4			20	80	3	100
		<i>Total</i>	16			80	320		400
<b>Practical</b>									
Pr.1		Mine Geology -II Lab			6	25	50	3	75
Pr.2		Mine Machinery -II Lab			6	50	50	3	100
Pr.3		Project Phase -II			6	50	100	3	150
Pr.4		Life Skill			2	25	-	-	25
		Student Centred Activities(SCA)			3				
		<i>Total</i>			23	150	200		350
		<b>Grand Total</b>	<b>16</b>		<b>23</b>	<b>230</b>	<b>520</b>		<b>750</b>

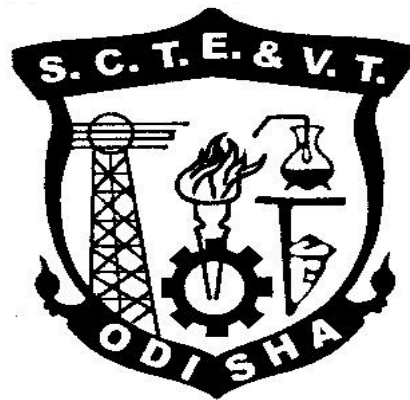
Abbreviations: L-Lecturer, T-Tutorial, P-Practical. Each class is of minimum 55 minutes duration

**Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%**

**SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM/Idea Tinkering and Innovation Lab Practice etc., Seminar and SCA shall be conducted in a section.**

**There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester**

**CURRICULLUM OF 6<sup>TH</sup> SEMESTER**  
**For**  
**DIPLOMA IN MINING ENGINEERING**  
**(Effective FROM 2020-21 Sessions)**



**STATE COUNCIL FOR TECHNICAL  
EDUCATION & VOCATIONAL TRAINING,  
ODISHA, BHUBANESWAR**



## Th.1. MINE MACHINERY – II

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Theory Periods	: 4 Periods/week	Internal Assessment	: 20
Total Periods	: 60	End Semester Examination	: 80
Examination	: 3 Hours	Maximum Marks	: 100

### RATIONALE

It is imperative that a Mining Engineer should be thoroughly conversant with various types of machine used in mining operations.

### OBJECTIVES

On completion of the subject, students will be able to:

- Describe various underground face machineries & its applicability.
- Describe various opencast machineries & its applicability.
- Describe various types of pump & its applicability.
- Describe various types of Bore hole pumps & its application.
- Elaborate details about pipes and valves used in mine.

### Topic- wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Underground face machineries	15
2	Opencast machineries	15
3	Mine Pumps	20
4	Bore hole pump	5
5	Pipes and valves	5
	Total	60

## **COURSE CONTENTS (Based on specific objectives)**

### **1. Underground face machineries.**

- Electric coal drill
  - Describe constructional features, operation, principle & use of electric coal drill.
  - State types of drill rods & drill bits used in electric coal drill.
  - Describe basic constructional features of gathering arm loader, scraper loader, side discharge loader & load & haul loader.
- Describe basic constructional features & operation principle of jack hammer drill & air leg rock drill.
- Describe basic constructional features & operation principle of road header & Shearer loader.

### **2. Opencast machineries**

- Describe basic constructional features of surface miner, dragline, shovel & backhoe, bucket wheel excavator.
- Describe basic constructional features of dumper, dozer, scraper & road grader.

### **3. Mine Pumps.**

- Classify mine pumps.
- Describe constructional features, working & use of ram pumps.
- Centrifugal & turbine pumps.
- Describe constructional features of centrifugal & turbine pumps.
- State principle of centrifugal & turbine pumps & its applicability.
- Explain balancing the axial thrust of turbine pumps.
- Draw characteristic curves for turbine pumps.
- Solve numerical problems on centrifugal & turbine pumps.
- Describe constructional features and working principle & use of roto pump (screw pump)
- Describe constructional features & working principle of sinking pump.
- State procedure of suspension in shaft.

### **4. Bore hole pump**

- Describe constructional features & working of bore hole pump.
- State installation of bore hole pump.

### **5. Pipes and valves**

- State types of pipe & valves used in Mines.
- Describe constructional features of various type of valves.
- State & describe different types of pipe joints.
- Describe support of laying main pipe in shaft.
- Discuss the Pipe line layout.

## **SYLLABUS COVERAGE UP TO I.A.**

Chapter 1,2,3

## **RECOMMENDED BOOKS**

- Electrical equipment in Mine – H. Cotton
- Winning and Working of Iron Ore – Desmukh & Desmukh
- E.M.T. Vol.-III – D.J.Desmukh

## Th.2. MINING GEOLOGY-II

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Theory Periods	: 4 Periods/week	Internal Assessment	: 20
Total Periods	: 60	End Semester Examination	: 80
Examination	: 3 Hours	Maximum Marks	: 100

### RATIONALE

In majority of the cases, materials that need to be explored comprise rocks & minerals. It is therefore, essential for an engineer to have basic knowledge of mining geology.

### OBJECTIVES

On completion of the paper, students will be able to:

- Outline the importance of Stratigraphy & Geological time Scale in the study of geology.
- The major Groups & economic minerals associated with them that form the basis for the study of stratigraphy.
- Describe the use, origin mode of occurrence & distribution of fossil fuels & where to look for them.
- Explain the fundamental principles that underline the search for economic minerals. He will achieve a certain amount of clarity in using geological, geophysical & geochemical methods for looking for important mineral deposits.
- Develop a comprehensive idea regarding mineralogy mode of occurrence, uses & distribution of ores.
- Undertake sampling work according to BIS specification.

### Topic- wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Stratigraphy	12
2	Fossil Fuels	12
3	Prospecting & Exploration	12
4	Economic Geology	12
5	Sampling	12
	Total	60

## **COURSE CONTENTS (Based on specific objectives)**

### **1. Stratigraphy**

- Describe the principles of stratigraphy.
- Describe the geological time Scale.
- Describe the stratigraphic sequence, lithology, distribution & economic mineral deposits of Iron Ore series, Cuddpah Supergroup, Vindhyan super group & gondwana super group.

### **2. Fossil fuels**

- Coal
  - Describe the different ranks of coal.
  - Describe different grades of coal like A,B,C,D.
  - Describe the various theories accounting for the origin of coal.
  - Describe various important lower gondwana Coalfields of India.
- Petroleum
  - Describe the organic & inorganic theories accounting for the origin of petroleum.
  - Define oil pool & oil trap.
  - Describe process of accumulation of oil.
  - Describe favorable conditions for accumulation of oil.
  - Describe different important oil fields in India.

### **3. Prospecting & exploration.**

- Define prospecting.
- Differentiate between prospecting & exploration.
- Use of multi shot camera for borehole direction test.
- Enumerate & describe various criteria for geological exploration.
- Describe various methods of Geophysical prospecting.
- Explain Geochemical prospecting.
- Differentiate between biogeochemical & geo botanical prospecting.

### **4. Economic Geology**

- Define ore & gangue.
- Define tenor & grade.
- Describe the mineralogy, mode of occurrence, distribution & use of iron ore deposits in India.
- Describe the mineralogy, mode of occurrence, & description of Chromites deposits in India & its uses.
- Describe the mineralogy, mode of occurrence & distribution of copper deposits in India & uses of this metal.
- Describe the mineralogy, mode of occurrence, distribution of lead & zinc deposits in India & the uses of these metals.
- UNFC (United Nation Framework of Classification) code of classification of reserves.

### **5. Sampling**

- Define sampling, outline the method of preparation of samples for assay.
- Explain sampling
- Describe the different methods of sampling as outlined by Bureau of Indian Standards. (BIS)
-

## **SYLLABUS COVERAGE UP TO I.A.**

Chapter 1,2,3.

### **RECOMMENDED BOOKS**

- Geology of India & Burma – M.S. Krishnan
- An Introduction to geology of Coal & coalfields of India – N.L.Sharma, K.S.V.Ram
- Geology of petroleum – A.I.Levorsen
- Geological prospecting & Exploration – V.K.Kreiter
- A Hand Book of economic geology – A.K.Sen, P.K.Guha
- Mineral Economics – R.K. Sinha, N.L.Sharma

### Th.3. MINE LEGISLATION & GENERAL SAFETY-II

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Theory Periods	: 4 Periods/week	Internal Assessment	: 20
Total Periods	: 60	End Semester Examination	: 80
Examination	: 3 Hours	Maximum Marks	: 100

CHAPTER	TOPIC	PERIODS
1	M.M.R. 1961	15
2	Mines V.T.Rules 1966	4
3	Mines Creche Rules	4
4	Maternity Benefit Act	4
5	Mines Accident & Safety	15
6	Forest Conservation Act (FCA) 1980	3
7	Environmental Protection Act 1986	5
8	MMRD & MCR	5
9	Classified circulars (DGMS)	5
	Total	60

#### RATIONALE

Since Mining operations involve frequent accidents, it is very important for a mining engineer to be thoroughly conversant with various acts & rules framed for providing safety to workers.

#### OBJECTIVES

On completion of the above topics, students will be able to :

- Describe various aspects of M.M.R. 1961.
- Describe various aspects of Mines Vocational Training Rules 1966.
- Describe various aspects of Mines Creche Rules 1966.
- Describe various aspects of Maternity Benefit Act.
- Describe various aspects of Mines Accident & Safety.
- Describe various aspects of Forest Conservation Act (FCA) 1980.
- Describe various aspects of Environmental Protection Act 1986.

## **COURSE CONTENTS** (Based on specific objectives)

- 1. Metalliferous Mines Regulations 1961**
  - Discuss various provisions of Metalliferous Mines Regulations 1961.
- 2. Mines V.T. Rules 1966**
  - Discuss various provisions of Mines V.T. Rules 1966.
- 3. Mines Creche Rules 1966**
  - Discuss various provisions of Mines Creche Rules 1966.
- 4. Maternity Benefit Act**
  - Discuss various provisions of Maternity Benefit Act.
- 5. Mines Accident & Safety**
  - Discuss their classification, causes & prevention.
  - Develop concept about accident cost, accident report, procedure for conducting an enquiry to ascertain the causes of accidents.
  - Discuss procedure for investigation & reporting Mine accident, accident proneness, fatality rate, frequency rate & severity rate.
  - Explain role of supervision in accident prevention, accident due to opencast workings, statistical analysis of accidents, accident statistics, its head & method of data processing.
  - Develop basis concepts of safety, safety & productivity, safety consciousness & safety campaign, safety organization, safety audit.
  - Describe rules of safety committee.
  - Explain the role of workmen inspectors.
  - Discuss terms like industrial fatigue, preventive maintenance, productive equipments & duties of Safety Officer.
- 6. Forest Conservation Act (FCA) 1980.**
  - Discuss various provisions of Forest Conservation Act (FCA) 1980.
- 7. Environmental Protection Act 1986**
  - Discuss various provisions of Environmental Protection Act 1986.
- 8. MMRD Act & MCR Rules**
  - Various provisions of Mineral conservation & exploitation.
  - National Mineral policy.
- 9. Classified Circulars (DGMS)**
  - As amended up-to-date.

## **SYLLABUS COVERAGE UP TO I.A.**

Chapter 1,2,3,4.

### **RECOMMENDED BOOKS**

- M.M.R.- 1961
- Mines V.T.Rules- 1966
- Mines Creche Rules- 1966
- Maternity Benefit Act
- Pit Head bath Rules
- Worker's compassion Act
- Environmental Protection Act-1986
- DGMS Circulars



## Th.4 (a). MINERAL DRESSING (ELECTIVE)

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Theory Periods	: 4 Periods/week	Internal Assessment	: 20
Total Periods	: 60	End Semester Examination	: 80
Examination	: 3 Hours	Maximum Marks	: 100

CHAPTER	TOPIC	PERIODS
1	Introduction	2
2	Unit Operations	6
3	Grinding	6
4	Lab. Sizing	6
5	Industrial Screening	6
6	Gravity Concentration	6
7	Heavy Media Separation	8
8	Floatation	10
9	Magnetic & Electrostatic Separators	10
	Total	60

### RATIONALE

In case of metalliferous mines, the ultimate goal is the extraction of metals. Prior to sending ores into the process of extraction, it requires dressing for removal of desirable gangue minerals as far as possible. So a Mining Engineer, specially attached to metalliferous mines should have some basic concepts about mineral dressing.

### OBJECTIVES

On completion of the subject, students will be able to:

- Comprehend physical & chemical properties of ores, know the application in mineral dressing.
- Explain the principle of operation of Blake & Dodge jaw crushers, Gyratory Cone crushers, roll crushers.
- Explain the principle of ball mill, open circuit & close circuit Grinding.
- Explain the principle of lab.sizing.
- Explain the principle of operation of industrial screening. Comprehend the principle of operation of classifiers & their application in the field.
- Comprehend elementary idea about gravity concentration.
- Explain the principle of operation of heavy media separation.
- Comprehend elementary principle of floatation process.
- Explain the principle & application of magnetic separators.

## **COURSE CONTENTS (Based on specific objectives)**

- 1. Introduction**
  - Describe the objective & scope of application of mineral dressing in surface & u/g mines.
- 2. Unit operations**
  - Explain the principle of Blake & dodge jaw crushers, gyratory & cone crushers, roll crusher.
- 3. Grinding**
  - Explain the principle of ball mill operation, open circuit grinding, close circuit grinding, dry & wet grinding.
- 4. Explain the procedure for size analysis & use of standard screen as also screening techniques employed.**
- 5. Industrial screening**
  - Explain the principle of industrial screening, type of screening ( without calculation)
  - Explain the operation of classifier & their application.
- 6. Gravity concentration**
  - Explain the general principles of wilfly table & its operation.
  - Develop elementary idea regarding the operation jigs.
- 7. Heavy media separation**
  - Explain the fundamental principle of heavy media separation – Chance process.
- 8. Flotation**
  - Comprehend elementary principle of froth floatation, practical utility of frother, collection, modifiers & depressants.
  - Describe & illustrate floatation cell.
- 9. Magnetic & Electrostatic Separators**
  - Explain the principle of operation of magnetic & electrostatic separators.
  - Describe the application of separators in mineral dressing.

### **SYLLABUS COVERAGE UP TO I.A.**

Chapter 1,2,3,4.

### **RECOMMENDED BOOKS**

- Principles of Mineral Dressing- Gaudin A.M.
- Hand Book of Mineral Dressing Ores & Minerals – A.E.Taggart
- Mineral Processing Technology – B.A.Wills.

## Th.4. (b). ADVANCED MINES SURVEY (ELECTIVE)

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Theory Periods	: 4 Periods/week	Internal Assessment	: 20
Total Periods	: 60	End Semester Examination	: 80
Examination	: 3 Hours	Maximum Marks	: 100

### Topic wise distribution of periods

CHAPTER	TOPIC	PERIODS
1	Spherical Trigonometry	15
2	Field Astronomy	12
3	Elements of Photogrametry	12
4	Global Positioning System	11
5	Total Station	10
	Total	60

### RATIONALE

A Mining engineer entrusted with the responsibility of supervising mine survey works should be through conversant with the latest developments techniques employed in mine surveying.

### OBJECTIVES

After the completion of the subject, students will develop the fundamental concepts about

:

- Spherical Trigonometry.
- File Astronomy.
- Elements of Photogrametry.
- Global Positioning System.
- Total Station

## **COURSE CONTENTS (Based on specific objectives)**

### **1. Spherical Trigonometry.**

- Define some common terms used in Spherical Trigonometry like Sphere. Great circle, Small circle, Side of a triangle, Angle of a Triangle, Spherical axes, Spherical Triangle, Right Angled Triangle.
- Convert rectangular to Spherical coordinates.
- Define convergence of meridian and parallel of latitude.

### **2. Field Astronomy.**

- Define some terms used in field astronomy like, Celestial Sphere, Celestial Latitude, Celestial Longitude, Azimuth, Hour angle, Declination, Altitude, Zenith, Nadir, Right Ascension, Celestial Meridian, Celestial Equator, Zenith Distance, Vertical Circle, Celestial Horizon.
- Astronomical Triangle etc. Discuss different astronomical coordinates for heavenly bodies.
- Determine apparent time, Meantime, Sidereal time, Standard Time, Relation between different types of time.
- Determine latitude, Longitude, Time and azimuth of a place.

### **3. Element of Photogrammetry.**

- Know the Photo theodolite.
- Define camera axis, Picture Plane, Principal points, Focal Length, Nodal Point, Prospective centre, Principal Distance, Principal Plane, Print, Isocentre in terrestrial Photogrammetry.
- Explain fundamental principles behind stereo photogrammetry.
- Define vertical photograph, Tilted Photograph, Oblique photograph, Prospective projection, Exposure station, Flying height focal length, Principal Point, Nadir Point, Ground Nadir Point, Tilt, Principle plane, Principle Line, Isocentre, Azimuth of Principle Plane, Horizontal Point. Find out the scale of Photography.

### **4. Global Positioning System.**

- Define Global Positioning System. Explain the Principle of working of the system in brief.
- Outline the application of GPS in Mining Engineering.

### **5. Total Station.**

- Identify different components of Total Station.
- Describe the applications of Total Station in Mines.

## **SYLLABUS COVERAGE UP TO I.A.**

Chapter 1,2.

## **RECOMMENDED BOOKS**

- Surveying VOL.-III by Dr. B. C. Punmia
- Modern concept of Mine Surveying by Prof. Alam Chand.

## Th.4. (c). MATERIAL HANDLING AND LOGISTICS (ELECTIVE)

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Theory Periods	: 4 Periods/week	Internal Assessment	: 20
Total Periods	: 60	End Semester Examination	: 80
Examination	: 3 Hours	Maximum Marks	: 100

CHAPTER	TOPIC	PERIODS
1	Introduction to surface & Underground haulage system	10
2	Conveyors	8
3	Locomotive haulage	12
4	Aerial ropeways	5
5	Introduction of hydraulic transportation	10
6	Man riding haulage	5
7	Spiral chutes	5
8	Flow of materials in bins, bunkers	5
	Total	60

### RATIONALE

A Mining Engineer entrusted with the responsibility of supervising material handling in a mine should have specialized knowledge in this area including transportation in mines.

### OBJECTIVES

On completion of the subject, students will be able to:

- Classify underground & surface transportation system in mines.
- Describe various types of conveyor & its design.
- Explain various types of locomotive haulage used in underground mines.
- Describe aerial ropeway & its applicability.
- Describe hydraulic transportation in mines.
- Explain man riding haulage system.
- Explain spiral chute.
- Describe flow of materials in bins & bunkers.

## **COURSE CONTENTS (Based on specific objectives)**

- 1. Introduction to surface & underground haulage system**
  - Classify underground & surface haulage system.
  - State factors affecting design of a haulage system.
  - Find out the capacity of a haulage system in a given production.
- 2. Conveyors**
  - Classification of Conveyors.
  - State factors affecting design of belt conveyor, cable belt conveyor and steel cord conveyors.
  - Find out carrying capacity of belt conveyor, cable belt conveyor & steel cord conveyor.
  - Describe constructional features of belt conveyor & cable belt conveyor.
  - Describe formula to calculate drive capacity of belt conveyor & cable belt conveyor.
- 3. Locomotive haulage**
  - State different types of locomotive haulage.
  - Describe basic constructional features of trolley wire, compressed air , diesel & battery locomotives.
  - State applicability, merits & demerits of locomotives.
  - Describe safety devices of diesel locomotive including flame trap around exhaust conditioner box.
  - Solve numerical problems.
- 4. Aerial ropeways**
  - Classify aerial ropeways.
  - State applicability of aerial ropeways.
  - Describe constructional features of bicable and twin cable ropeways.
  - Describe loading, unloading & angle stations bicable & thin cable ropeways.
- 5. Hydraulic transportation of solids**
  - Define hydraulic transportation.
  - Discuss theory of hydraulic transportation of solids in mines (without derivation)
  - Design the hydraulic transportation system.
  - State applicability, advantages & disadvantages of hydraulic transportation in Mines.
- 6. Man riding haulage**
  - State different types of man riding system.
  - Describe constructional features of monorail, deorail & flight chairs & conveyor system.
- 7. Spiral Chutes**
  - State capability of spiral chutes.
  - Explain working principle of spiral chutes.
  - Describe constructional features of spiral chutes.
- 8. Flow of materials in bins, bunkers**
  - Describe bins & bunkers.
  - Explain flow of materials in bins & bunkers.
  - Design bunkers & bins for a given production.

**SYLLABUS COVERAGE UP TO I.A.**

Chapter 1,2,3,4.

**RECOMMENDED BOOKS**

- Mining Machinery – T. Bryson
- Material Handling in Mines IIT Kharagpur journal
- Mine Transport – N.T.Kerlin
- EMT Vol.-III – D.J.Desmukh
- S.M.E. Mining Engineering Hand Book

## Pr.1 . MINING GEOLOGY-II LAB

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Lab Periods	: 6 Periods/week	Sessional	: 25
Total Periods	: 90	End Semester Examination	: 50
Examination	: 3 Hours	Maximum Marks	: 75

### Topic wise Distribution of Periods

CHAPTER	TOPIC	PERIODS
1	Megascope identification of Igneous rocks	15
2	Megascope identification of Sedimentary rocks	15
3	Megascope identification of Metamorphic rocks	15
4	Interpretation of contour maps	15
5	Interpretation of geological maps	15
6	Describe the specific gravity of small specimen	15
	Total	90

- Megascope identification of Igneous rocks in hand specimens.
- Megascope identification of Sedimentary rocks in hand specimens.
- Megascope identification of Metamorphic rocks in hand specimens.
- Interpretation of contour maps and preparation of the profile section for it.
- Interpretation of geological maps and preparation of the profile Section for it.
- Describe the specific gravity of small specimen by Joley's spring balance.



## Pr.2. MINE MACHINERY – II LAB.

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Lab Periods	: 6 Periods/week	Sessional	: 50
Total Periods	: 90	End Semester Examination	: 50
Examination	: 3 Hours	Maximum Marks	: 100

### Topic wise Distribution of Periods

CHAPTER	TOPIC	PERIODS
1	Study of Centrifugal Pumps.	9
2	Study of Turbine Pumps.	9
3	Study of Roto Pump.	9
4	Study of Sinking Pump.	9
5	Study of electric coal drills & its accessories.	9
6	Study of Jack Hammer Drill with air leg.	9
7	Study of scrapper & shaker conveyor	9
8	Study of scrapper loader.	9
9	Model Development of Gathering arm loader.	9
10	Study of Electric Coal Drill.	9
	Total	90

- Study of Centrifugal Pumps.
- Study of Turbine Pumps.
- Study of Roto Pump.
- Study of Sinking Pump.
- Study of electric coal drills & its accessories.
- Study of Jack Hammer Drill with air leg.
- Study of scrapper & shaker conveyor.
- Study of scrapper loader.
- Model Development of Gathering arm loader.
- Study of Electric Coal Drill.

## Pr3. PROJECT PHASE - II

Name of the Course: Diploma in Mining Engineering			
Course Code	:	Semester	: 6th
Lab Periods	: 6 Periods/week	Sessional	: 50
Total Periods	: 90	End Semester Examination	: 100
Examination	: 3Hours	Maximum Marks	: 150

### RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Mechanical engineering and practices in real life situations, so as to participate and manage a large Mechanical engineering projects, in future. Entire Project spreads over 5<sup>th</sup> and 6<sup>th</sup> Semester. Part of the Project covered in 5<sup>th</sup> Semester was named as *Project Phase-I* and balance portion to be covered in 6<sup>th</sup> Semester shall be named as *Project Phase-II*.

### OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop software packages or applications and implement these for the actual needs of the community/industry.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- To achieve real life experience in Project design.
- To develop the skill of writing Project Report

### Project Phase-I and Phase-II

The Project work duration covers 2 semesters(5<sup>th</sup> and 6<sup>th</sup> sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group was done in the beginning of

5<sup>th</sup> semester under Project Phase-I. The students were allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work and Design of the system also have to be complete in Phase-I. Development may also begin in this phase. Project Milestones are to be set so that progress can be tracked .

In Phase-II Development, Testing, Documentation and Implementation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-II in 6<sup>th</sup> semester there shall be one presentation by each group on whole Project work undertaken by them.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	Performance Criteria
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

The Project Report need to be prepared as per standard format and following is the indicative format. The Teacher Guide may make minor alteration keeping the sense in tact.

### Organization of Project Report

#### 1. Cover page:

It should contain the following ( in order)

- (i) Title of the Project
- (ii) "Submitted in partial fulfillment of the requirements for the Diploma in

<Branch Name>”

- (iii) By Name of the Student(s)
- (iv) Logo of the Institution
- (v) Branch Name/Depart Name and Institution Name with Address
- (vi) Academic Year

2. 1<sup>st</sup> Inner page

Certificate:

It should contain he following

“This is to certify that the work in this Project Report entitled <Project Title> by <Name of student(s)> has been carried out under my supervision in partial fulfillment of the requirements for the Diploma in <Branch Name>” during session <session > in <Branch /Department Name> of <Institute name> and this work is the original work of the above student(s).

Seal and signature of the Supervisor/Guide with date

3. 2<sup>nd</sup> Inner Page

Acknowledgement by the Student(s)

- 4. Contents.
- 5. Chapter wise arrangement of Reports
- 6. Last Chapter: Conclusion

It should contain

- (i) Conclusion
- (ii) Limitations
- (iii) Scope for further Improvement

7. References

**Pr-4 LIFE SKILL**  
(Common to All Branches)

<b>Practical</b>	<b>2 Periods per week</b>	<b>Sessional</b>	<b>25 Marks</b>
<b>Total Periods</b>	<b>30 Periods</b>	<b>Total Marks</b>	<b>25 Marks</b>

**Objective:** After completion of this course the student will be able to:

- Develop team spirit i.e. concept of working in team
- Apply problem solving skills for a given situation
- Use effective presentation techniques
- Apply task management techniques for given projects
- Enhance leadership traits
- Resolve conflict by appropriate method
- Survive self in today's competitive world
- Face interview without fear

**DETAIL CONTENTS:**

**1. SOCIAL SKILL**

Society, Social Structure, Develop Sympathy and Empathy  
Swot Analysis – Concept, How to make use of SWOT  
Inter personal Relation: Sources of conflict, Resolution of conflict ,  
Ways to enhance interpersonal relation

**2. PROBLEM SOLVING**

Steps of Problem solving:

- Identify and clarify the problem,
- Information gathering related to problem,
- Evaluate the evidence,
- Consider alternative solutions and their implications,
- Choose and implement the best alternative,
- Review
- Problem solving techniques:

1) Trial and error, 2) Brain storming, 3) Lateral (Out of Box) thinking

**3. PRESENTATION SKILL**

Body language , Dress like the audience  
Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT,  
Voice and language – Volume, Pitch, Inflection, Speed, Pause  
Pronunciation, Articulation, Language, Practice of speech.  
Use of AV aids such as Laptop with LCD projector, white board etc.

**4. GROUP DISCUSSION AND INTERVIEW TECHNIQUES**

*Group Discussion:*

Introduction to group discussion, Ways to carry out group discussion,  
Parameters— Contact, body language, analytical and logical thinking,  
decision making

*Interview Technique :*

Dress, Posture, Gestures, facial expression, Approach

Tips for handling common questions.

### **5. WORKING IN TEAM**

Understand and work within the dynamics of a groups.

Tips to work effectively in teams,

Establish good rapport, interest with others and work effectively with them to meet common objectives,

Tips to provide and accept feedback in a constructive and considerate way ,

Leadership in teams, Handling frustrations in group.

### **6. TASK MANAGEMENT**

Introduction, Task identification, Task planning ,  
organizing and execution, Closing the task

## **PRACTICAL**

**List of Assignment:** *(Any Five to be performed including Mock Interview)*

#### **a. SWOT analysis:-**

Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT.

- a) Your past experiences,
- b) Achievements,
- c) Failures,
- d) Feedback from others etc.

#### **b. Solve the True life problem assigned by the Teacher.**

### **3. Working in a Team**

Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slum area, social activities like giving cloths to poor etc.( One activity per group where Team work shall be exhibited)

### **4. Mock Interview**

### **5. Discuss a topic in a group and prepare minutes of discussion.**

### **6. Deliver a seminar for 5 minutes using presentation aids on the topic given by your teacher.**

### **7. Task Management**

Decide any task to be completed in a stipulated time with the help of teacher. Write a report considering various steps in task management (with Break up into sub tasks and their interdependencies and Time)

**Note:** -1. Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic.

**Note:** -2. The following Topics may be considered for Seminar/GD in addition to other Topics at the discretion of the Teacher.

(Comparison with developed countries, Occupational Safety, Health Hazard, Accident & Safety, First-Aid, Traffic Rules, Global Warming, Pollution, Environment, Labour Welfare Legislation, Labour Welfare Acts, Child Labour Issues, Gender Sensitisation ,Harassment of Women at Workplace)

## **METHODOLOGY:**

*The Teacher is to explain the concepts prescribed in the contents of the syllabus and then assign different Exercises under Practical to the students to perform.*

**Books Recommended:-**

<b>Sl.No</b>	<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Name of the Publisher</b>
01	E.H. Mc Grath , S.J	Basic Managerial Skills for All	PHI
02	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
03	Adair, J	Decision making & Problem Solving	Orient Longman
04	Bishop , Sue	Develop Your Assertiveness	Kogan Page India
05	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.

## EQUIPMENT LIST

### DETAILS OF INSTRUMENTS / SAMPLES/ SPECIMENS - GEOLOGY LABORATORY

#### SUBJECT NO / SUBJECT CODE -PR.1. MINING GEOLOGY-II LAB

The following instruments / samples/ specimens are required for Geology laboratory based on the 6<sup>th</sup> Semester Mining Engineering Syllabus.

CHAPTER	TOPIC	ITEM	SPECIFICATION	QUANTITY
1	Megascopic identification of Igneous rocks	Igneous rocks in hand specimen	Common Igneous Rocks in hand specimen along with specimen tray and primary information about the rock specimen.	30 Nos of different Igneous rock specimen
2	Megascopic identification of Sedimentary rocks	Sedimentary rocks in hand specimen	Common Sedimentary Rocks in hand specimen along with specimen tray and primary information about the rock specimen.	30 Nos of different Sedimentary rock specimen
3	Megascopic identification of Metamorphic rocks	Metamorphic rocks in hand specimen	Common Metamorphic Rocks in hand specimen along with specimen tray and primary information about the rock specimen.	30 Nos of different Metamorphic rock specimen
4	Interpretation of contour maps	Contour maps	Different topographic map worksheet with scale for Interpretation and preparation of the profile section for it.	10 nos of different topographic/contour map
5	Interpretation of geological maps	Geological Maps	Different geological map worksheet with scale for Interpretation and preparation of the profile section for it.	10 nos of different geological map
6	Describe the specific gravity of small specimen	Joley's spring balance	The Jolly balance consists essentially of a spring fastened at the top to a movable arm. At the lower end, the spring is provided with two small pans, one suspended beneath the other. The lower pan is kept always immersed to the same depth in water, while the other one hangs in the air. On the upright standard behind the spiral is a mirror on which is engraved or painted a scale of equal parts. The specific gravity of an object, typically a solid, is determined by noting the amount of lengthening of the spring when the object is resting	01 no



			<p>in the upper pan in air (w), and the amount when it is in the lower pan and immersed in water (w'). The specific gravity is then <math>w / (w - w')</math>.</p>	
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## Pr.2. MINE MACHINERY – II LAB.

SL NO.	EQUIPMENT	NO. OF EQUIPMENT/15 STUDENTS
1	Centrifugal Pump.	1
2	Turbine Pump.	1
3	Roto Pump./Screw pump	1
4	Sinking Pump./Submersible pump	1
5	electric coal drills & its accessories.	1
6	Jack Hammer Drill with air leg.	1
7	Working model of scrapper & shaker conveyer	1
8	Working model of scrapper loader.	1
9	Working model of Gathering arm loader.	1
10	Electric Coal Drill.	1