

STATE COUNCIL OF TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA
TEACHING AND EVALUATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

DISCIPLINE: MINING ENGINEERING						SEMESTER: 4TH						
SL NO	SUBJECT CODE	SUBJECT	PERIODS			EVALUATION SCHEME						
			L	T	P	SESSIONAL EXAM			END SEM EXAM	TERM WORK	PRACTICAL EXAM	TOTAL MARKS
						TA	CT	Total				
THEORY												
1.	MNT 401	MINING METHOD (UNDERGROUND COAL)	4	-	-	10	20	30	70			100
2.	MNT 402	MINE SURVEY-II	4	-	-	10	20	30	70			100
3.	MNT 403	MINE VENTILATION	4	-	-	10	20	30	70			100
4.	MNT 404	ELECTRICAL EQUIPMENT IN MINES	4	-	-	10	20	30	70			100
5.	MNT 405	MINE LEGISLATION & GENERAL SAFETY-I	4	-	-	10	20	30	70			100
PRACTICAL/TERM WORK												
5.	MNP 401	MINE SURVEY-II LAB.	-	-	6	-	-		-	50	50	100
6.	MNP 402	MINE VENTILATION LAB.	-	-	6	-	-		-	25	25	50
7.	MNP 403	ELECTRICAL EQUIPMENT LAB.	-	-	6	-	-		-	25	25	50
8.	MNP 404	INDUSTRIAL TRAINING REPORT & SEMINAR	-	-	1	-	-		-	25	25	50
GRAND TOTAL			21		18	50	100	150	350	75	175	750

Total Contact hours per week: 39

Abbreviations: L-Lecture, T-Tutorial, P-Practical, TA- Teacher's Assessment, CT- Class test

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

MINING METHOD (UNDERGROUND COAL)

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MNT 401	Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

RATIONALE

As a Mining Engineer, one should have the knowledge of fundamental principles of operation in underground coal mines.

OBJECTIVES

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

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

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topic	Periods:
1.	Introduction to Method of working	02
2.	Bord & Pillar method	11
3.	Long wall Mining Method	06
4.	Thick seam Mining Method	06
5.	Horizon Mining Method	04
6.	Hydraulic & Pneumatic Stowing	03
7.	Support system and roof control	08
8.	Subsidence due to Mining	04
		44

COURSE CONTENTS (Based on specific objectives)

1.0 Introduction to Underground Coal Mining

- 1.1 Classify Underground Coal Mining Methods.

2.0 Bord and Pillar Method

- 2.1. Describe the various application of Bord & Pillar method.

2. 2. Describe various layouts of Bord & Pillar method.
2. 3. Describe depillaring method with stowing and caving.
2. 4. State precautions against fire and water during and after depillaring.
2. 5. State and describe various machineries used in working face.
2. 6. Define contiguous seam.
2. 7. Describe working of contiguous seams.
2. 8. Describe working of seams above and below goaved out area.
2. 9. State advantages and disadvantages of Bord & Pillar method.

3.0 Longwall Method

- 3.1 Describe Longwall advancing and retreatting methods.
- 3.2 Define single unit and double unit face.
- 3.3 Describe cyclic and non-cyclic L/W layouts.
- 3.4 Describe mechanized longwall working with armoured flexible conveyor, shield support and shearer loader.

4.0 Thick seam Mining

4. 1. Define Thick seams.
4. 2. Classify Thick seam Mining.
4. 3. Describe layouts of horizontal slicing, incline slicing, blasting gallery and sublevel caving.

5.0 Horizon Mining

5. 1. State conditions, advantages, disadvantages and limitations of Horizon Mining.
5. 2. Describe the layout of Horizon Mining.

6.0 Hydraulic and Pneumatic stowing

6. 1. Describe hydraulic stowing.
6. 2. Describe Pneumatic stowing.

7.0 Support and roof control in Mines

7. 1. State properties of various types of roof & roof behavior, Pressure arch theory in B&P and longwall working.
7. 2. Describe testing of roof.
7. 3. Classify support system in Mines construction, principle of operation application and load bearing capacity assessment.

8.0 Subsidence due to Mining

8. 1. Define angle of draw
8. 2. State factors of subsidence, critical area of extraction
8. 3. Describe the factors affecting subsidence
8. 4. State & describe precautionary measures against damage due to subsidence
8. 5. Define shaft pillar
8. 6. Determine size of shaft pillars

Learning Resources:[Text Books]			
Sl.No	Name of Authors	Title of the Book	Name of the publisher
1.	R.T.Desmukh & D.J.Desmukh	Winning & Working	
2.	D.J.Desmukh	EMT. Vol I, III	
3.	S.K.Das	Modern Coal Mining	
4.	R.T.Desmukh & B.	Advance Coal Mining	

	Borovjev		
5.	S.S.Peng	Coal Mine Ground Control	
6.	Jermic	Strata Control	
7.	SME Mining Engg. Hand Book		
8.	UMS		

MINE SURVEY-II

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MNT 402	Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

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 :

1. Describe a miner's dial
2. Describe various leveling methods.
3. Calculate cutting of filling from level sections.
4. Define contouring, contour lines, contour gradient, use of contour plan, stratum contour, isopachs and their uses.
5. Describe different methods of calculating ore reserves by materials balance and decline curve methods.
6. Describe the application of theodolites in surveying, micro-optic and seconds theodolite.
7. Explain the basic principle of global positioning systems & total station.

TOPIC WISE DISTRIBUTION OF PERIODS (Theory)

Sl.No.	Topic	Periods:
1.	Miner's Dial	02
2.	Leveling	15
3.	Contouring	06
4.	Calculation of ore reserves	04
5.	Theodolite	08
6.	G.P.S. & Total station	05
7.	Subsidence survey, subsidence Plans & Sections	04
		44

COURSE CONTENTS (Based on specific objectives)

1.0 Miners Dial

- 1.1 Define Dip, Declination, Variation.
- 1.2 Explain loose needle method of survey & calculate bearings

2.0 Levelling

- 2.1 Define benchmark M.S.L. Dumpy level.
- 2.2 Adjust dumpy level, modern levels(Auto Level & etc.), precise staff.
- 2.3 Describe methods of leveling- Rise & Fall method, height of instrument.

- 2.4 Errors in ordinary leveling.
- 2.5 Explain reciprocal leveling, subsidence leveling, setting out gradient, trigonometric leveling, geometrical leveling, physical leveling.
- 3.0 Contouring**
 - 2.1 Explain different methods of contouring, contour lines.
 - 2.2 Describe various characteristics of contours.
 - 2.3 Evaluate contour gradient.
 - 2.4 Describe the use of contour plan.
 - 2.5 Define stratum contour, isopachs.
- 4.0 Calculation of Ore Reserves**
 - 1.1 Classify reserves.
 - 1.2 Evaluate reserves by exploratory mining.
 - 1.3 Calculate primary ore reserve by material balance method & decline curve method.
- 5.0 Theodolite**
 - 5.1 Describe temporary and permanent adjustment of Theodolite.
 - 5.2 Describe the principles of operation & describe different parts.
 - 5.3 Measure Horizontal & Vertical angles.
 - 5.4 Describe setting of the instrument.
 - 5.5 Explain Traversing with Theodolite.
- 6.0 G.P.S. & Total Station**
 - 6.1 Explain the basic principles of global positioning system & total station.
 - 6.2 Introduction to DGPS.

Learning Resources:[Text Books]			
Sl.No	Name of Authors	Title of the Book	Name of the publisher
1.	E. Mason	Surveying Vol.I	
2.	T.P.Kanetkar	Surveying & Levelling	
3.	David Clerk	Geodetic Surveying Vol.I	
4.	Sinha & Sharma	Mineral Economics	

MINE VENTILATION

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MNT 403	Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

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 :

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

TOPIC WISE DISTRIBUTION OF PERIODS (Theory)

Sl.No.	Topic	Periods:	L
1.	Ventilation		06
2.	Air Crossing & Distribution		06
3.	Mechanical Ventilation		10
4.	Booster Fan & its Effect		06
5.	Auxiliary Ventilation		04
6.	Ventilation Survey		09
7.	Leakage of Air in Mines		<u>03</u>
			44

COURSE CONTENTS (Based on specific objectives)

1.0 Ventilation

- 1.1 Calculate the quantity of air.
- 1.2 Describe the different types of Thermometer.
- 1.3 Describe the different types of Barometer.
- 1.4 Describe kata thermometer.

- 1.5 Describe water gauge.
- 1.6 Calculate ventilation pressure by using pitot static tube.
- 1.7 Explain effects of heat & humidity.
- 1.8 Explain natural ventilation motive column, geothermic gradient.
- 1.9 Enumerate laws of mine air friction and solve problems on above.

2.0 Air Crossing and distribution

- 2.1 Describe ventilation stopping, air crossing, ventilation door, bratis partition.
- 2.2 Describe different types of ventilation.
 - a) Accessional & declensional ventilation.
 - b) Homotropical & Antitropical ventilation.
 - c) Boundary ventilation.
 - d) Central & combined ventilation.
- 2.3 Explain splitting of air current & solve numerical problems on splitting.
- 2.4 Describe air locks at pit top.

3.0 Mechanical Ventilation

- 3.1 Explain construction & principle of operation of centrifugal flow fans.
- 3.2 State fan laws & calculate fan efficiency.
- 3.3 Explain installation of mine fan with reversal arrangement.
- 3.4 Describe fan drift, fan drive, evasee and diffusers.
- 3.5 Explain fan characteristics and mine characteristics.
- 3.6 Describe methods for output control fans.

4.0 Booster fan and its Effects

- 4.1 Describe installation and location of booster fan.
- 4.2 Solve problems relating to booster fan.

5.0 Auxiliary Ventilation

- 5.1 Describe systems of auxiliary ventilation & condition of air.
- 5.2 Describe advantages & disadvantages of auxiliary ventilation.

6.0 Ventilation Survey

- 6.1 Describe methods of pressure survey using barometer, gauge and pitot tube with manometer.
- 6.2 Describe the method of measurement of cross-sectional area.

- 1.1 Describe the method of velocity measurements by using anemometer, voltmeter, and pitot- static tube and smoke & cloud method.
- 1.2 Determine percentage of oxygen, methane, carbon monoxide SO₂ & H₂S.

7.0 Leakage of air in Mines

- 7.1 Describe causes and preventive measures of leakage of air in mines.

LEARNING RESOURCES:

- 1. Mine Ventilation – G.B.Mishra
- 2. EMT-H, - D.J.Desmukh.

3. Coal Mine Practices – E. Mason
4. UMS Volume-I
5. SME-Mining Engg. Hand Book- Vol.I & II 1993 edition.
6. A critical study of Indian Mining legislation – Rakesh & Prasad

ELECTRICAL EQUIPMENT IN MINES

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MNT 404	Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

RATIONALE

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

OBJECTIVES

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

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

TOPIC WISE DISTRIBUTION OF PERIODS (Theory)

Sl.No.	Topic	Periods:	L
1.	Electrical cables for Mining use		04
2.	Protective systems including fuses & Circuit Breakers		12
3.	Fundamentals of Transformer (Without numerical Problem)		08
4.	Industrial Drives- Mining Type		04
5.	Electric Braking Used in Mines		05
6.	Flame proof and intrinsically safe apparatus		04
7.	Underground signaling arrangement		02
8.	Sensors & their applications		<u>05</u>
			44

COURSE CONTENTS (Based on specific objectives)

1.0 Electrical cables for Mining use

- 1.1 Classify cables for mining use.
- 1.2 Constructional features of high tension and low-tension cables armored & trailing cables.
 - 1.2.1 State size of cables & their use.
 - 1.2.2 State procedures of cable laying at surface, underground roadway & in shafts.
- 1.3 Describe cable joint box mining type.

2.0 Protective Systems

- 2.1 Fuses.
 - 2.1.1 Fuse Materials
 - 2.1.2 Rewireable Fuse, HRC Fuse.
 - 2.1.3 Uses of Fuse.
- 2.2 Circuit Breakers.
 - 2.2.1 Describe & Explain Air Circuit Breaker.
 - 2.2.2 Describe & Explain Minimum Oil Circuit Breaker (MOCB).
 - 2.2.3 Describe & Explain Bulk Oil Circuit Breaker (BOCB).
 - 2.2.4 Describe & Explain Air Blast Circuit Breaker.
 - 2.2.5 Describe SF₆ Circuit Breaker.
- 2.3 Explain essential qualities of a good protective system.
- 2.4 State & describe types of relays (plunger, induction & direction over current, over loads, no volt and latching relay, frequency relay and Earth leakage relay)
- 2.5. Describe protection of transformer by differential relay.
- 2.6 Describe general principle of working-basis remote control circuit & various protective devices of Gate-End Box.
- 2.7 Describe functions & operation of drill panel.

3.0 Fundamentals of Transformer (without numerical problems)

4.0 Industrial drives- Mining type

- 4.1 Explain starting & running characteristics of D.C. & A.C. Motors.
- 4.2 State selection of motors for mining use.

5.0 Electric braking used in Mines

- 5.1 Describe & explain regenerative braking.
- 5.2 Describe & explain magnetic braking.

6.0 Flame proof & intrinsically safe apparatus

- 6.1 Define flame proof apparatus & intrinsically safe apparatus.
- 6.2 Describe & explain the safety features of flame proof & intrinsically safe apparatus.

7.0 Underground signaling arrangement

- 7.1 Describe signals & shaft signal.
- 7.2 Describe communication system in U/G mines.
 - (a) Point to point communication.
 - (b) Intercom system/Telephone
 - (c) Cordless system.

8.0 Sensors & their applications.

Learning Resources:[Text Books]			
Sl.No	Name of Authors	Title of the Book	Name of the publisher
1.	H. Cotton	Electrical equipment in Mines	
2.	V.K.Mehta	Electrical Power System	
3.	P.S.Bhimra	Power Electronics	

MINE LEGISLATION & GENERAL SAFETY-I

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MNT 405	Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

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 :

1. Describe various aspects of Mines Act 1952.
2. Describe various aspects of Mines Rule 1955.
3. Describe various aspects of Coal Mines Regulations 1957.
4. Describe various aspects of Mines Rescue Rules 1955.
5. Describe various aspects of Indian Explosive Rules 2008.
6. Describe various aspects of Indian Electricity Rules 1956.

TOPIC WISE DISTRIBUTION OF PERIODS (Theory)

Sl.No.	Topic	Periods:	L
1.	Mines Act 1952		06
2.	Mines Rules 1955		06
3.	Coal Mines Regulations 1957		18
4.	Mine Rescue Rules 1955		03
5.	Indian Explosive Rule 2008		06
6.	Indian Electricity Rules 1956		<u>05</u>
			44

COURSE CONTENTS (Based on specific objectives)

1.0 Mines Act 1952

- 1.1 Discuss various provisions of Mines Act 1952.

2.0 Mines Rules 1955

- 2.1 Discuss various provisions of Mines Rule 1955.

3.0 Coal Mines Regulation 1957

- 3.1 Discuss various Provisions of C.M.R. 1957.

4.0 Mines Rescue Rules 1985

4.1 Discuss various provisions of Mines Rescue Rules 1985.

5.0 Indian Explosive Rules 2008

5.1 Discuss various provisions of Indian Explosive Rules 2008.

6.0 Electric breaking used in Mines

6.1 Discuss various provisions of Indian Electricity Rules 1956.

LEARNING RESOURCES:

1. Mines Act 1952
2. Mines Rules 1955
3. CMR-1957
4. Mines Rescue Rules 1985
5. Indian Explosive Rules 1983
6. Indian Electricity Rules 1956

MINE SURVEY-II LAB.

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MNP 401	Semester	4th
Total Period:	90	Examination	4hrs
Lab. periods:	6P/W	Term Work	50
Maximum marks:	100	End Semester Examination:	50

1. Study of different parts of Miner's dial. Finding out least count measurement of horizontal and vertical angle. Measurement of bearing by Traverse survey by Miner's dial.
2. Levels: Temporary and permanent adjustment, sensitivity of bubble tube practice with different types of level(Auto Level & etc.)
3. Preparation of Contour Map.
4. Temporary & permanent adjustment of theodolite.
5. Measurement of horizontal angle by reiteration and repetition methods.
6. Measurement of vertical angle.
7. Measurement of horizontal and vertical distance between two points including inaccessible points with tacheometer.
8. Study of GPS.
9. Study of DGPS.
10. Study of Total Station.

MINE VENTILATION LAB.

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MNP 402	Semester	4th
Total Period:	90	Examination	4hrs
Lab. periods:	6P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

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

ELECTRICAL EQUIPMENT LAB.

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MNP 403	Semester	4th
Total Period:	90	Examination	4hrs
Lab. periods:	6P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

1. Prepare an Electrical switch board to control two light points, one plug point, one fan point and put a required fuse.

2. Study of circuit breakers (Air Circuit Breaker & Oil Circuit Breaker).

3. Study of Gate End Box.

4. Study of Relays (Buchholz Relay , Over Current Relay).

5. Identify the different part of given cable and find fault on the cable.

6. By the use of Megger check the continuity of windings, body to winding, body to earth of an 3-Phase induction Motor.

INDUSTRIAL TRAINING REPORT & SEMINAR

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MNP 404	Semester	4th
Total Period:	15	Examination	4hrs
Lab. periods:	1P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

Students will go to different Mines for practical Training during 3rd, 4th, 5th & 6th semester for a period of 4 weeks (30 days). After returning from training they have to submit training reports touching all aspects of mining & related operations i.e. geology, survey, drilling, blasting methods of work, ventilation, support, transportation & any problem in Mines detected by them. This will be followed as per curriculum. Their report will be evaluated by conducting seminar & viva voce tests. Training report will not be accepted without training certificate from the Mine Manager concerned. During Seminar as per convenience Technical persons will be called from respective fields.