

**CURRICULAR STRUCTURE FOR PART – III (3rd YEAR) OF THE FULL--TIME DIPLOMA COURSES IN
ENGINEERING & TECHNOLOGY**

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION											
TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES											
COURSE NAME: DIPLOMA IN MINING											
DURATION OF COURSE: 6 SEMESTERS											
SEMESTER: FIFTH											
BRANCH: MINING											
SR. NO	SUBJECT	CREDITS	PERIODS			EVALUATION SCHEME					
			L	TU	PR	INTERNAL SCHEME			ESE	PR	Total Marks
						TA	CT	Total			
1.	MINE MANAGEMENT, LEGISLATION & GENERAL SAFETY - I	5	5			10	20	30	70		100
2.	MINE VENTILATION - I	5	3	1	2	5	10	15	35	50	100
3.	MINE SURVEYING - I	6	4	1	3	10	20	30	70	100	200
4.	ELECTRICAL ENGINEERING & MECHANICAL ENGINEERING	5	3	1	3	10	20	30	70	100	200
5.	INDUSTRIAL TRAINING *	4			7					300	300
Total:		25	15	3	15	35	70	105	245	550	900
STUDENT CONTACT HOURS PER WEEK:33 hrs Theory and Practical Period of 60 Minutes each. L- Lecture, TU- Tutorials, PR- Practical, TA- Teachers Assessment, CT- Class Test, ESE- End Semester Exam. * Students will undergo of Practical training during this semester. Weightage on PR & Credit points is allotted on the basis of Practical training.											

Syllabus for: MINE MANAGEMENT, LEGISLATION & GENERAL SAFETY - I

Name of the Course: MINE MANAGEMENT, LEGISLATION & GENERAL SAFETY - I (Part III - Ist semester, Mining Engineering)	
Course Code:	Semester: FIFTH
Duration: : 05 weeks	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 5 hrs./week	Class Test.:20 Marks
Tutorial: NIL	Teacher's Assessment : 10 Marks
Practical: Nil	End Semester Exam.:70 Marks
Credit: 5	
Aim:	
Sl. No.	
1.	To make familiar with the basic management concept.
2.	To Impart basic knowledge about Govt. rules and Regulations related to Mining Industry.
3.	To make familiar with general safety aspects in the field of Mining.
Objective:	
Sl. No.	The Students will be able to:
1.	Learn about different Management style and functions practised in Mining Industry.
2.	Learn about different Mining activities in compliance with the Mine's Act, Rules, Regulations and orders there under.
Pre-Requisite:	
Sl. No.	
	Knowledge in general Mining practices ,Mathematics and Engg. Drawing.

MODULAR DIVISION OF THE SYLLABUS

MODULE	TOPIC	LECTURE PERIODS	TUTORIAL PERIODS
1 & 2	BASIC MANAGEMENT, WAGE & INCENTIVE	7	0
3	LEGISLATION	8	0
4	GENERAL SAFETY	8	0

LECTURE PERIODS: 23

TUTORIAL PERIODS: 0

INTERNAL ASSESSMENT: 2

25

EXAMINATION SCHEME

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1 & 2	8	ANY TWENTY	1	1 x 20 = 20	THREE	FIVE, TAKING AT LEAST ONE FROM EACH GROUP	10	10X 5 = 50
B	3	9				FOUR			
C	4	6				THREE			

DETAIL COURSE CONTENT

GROUP - A

1. Basic Management concepts.
Basic management concept & functions of management, Scientific management - Main Principles, F.W. Taylor;s contribution towards scientific management, Management principles by Henry Fayol (Elementary concepts only) – brief discussion on planning , organising, Co-ordinating, Motivating, Directing & Controlling.

Organisation – different structure ; merit and de-merits of each type – characteristics of a good organisation. Structure of organisation for Mining enterprises.

Inventory – basic concepts – need & objectives of inventory control- meaning of the terms FIFO & LIFO
2. Wages and Incentives.
wages – definition essential of good wage system- different types of wages – different methods of wage payments – merits and demerits of each system.
Incentives – basic concept – advantages , factors influencing success of incentive schemes. Different types of incentive schemes, merit and de-merit of each type.

GROUP - B

3. Legislation:

3.1 Mines Act'52 & Mines Rules'55

Definitions & main provisions, hours & Limitation of employment, leave with wages.

3.2 Coal Mines Regulation '57, Metalliferous Mines Regulations'61 :

Definitions, Notice of accidents, Regulations on plans sections, Means of access & Egress, winding in shafts, Haulage.

GROUP - C

4. General safety

Mine accidents : Basic concept and their classification , accident costs, accident report, procedure for conducting an enquiry to ascertain the causes of accidents, procedure for investigating and reporting mine accidents, accident proneness, Industrial fatigue, fatality rate, frequency rate, severity rate, role of supervisor in accident prevention, statistical analysis of accidents, accident statistics- its need and method of data processing , Effect of accidents in productivity.

Syllabus for: MINE VENTILATION - I

Name of the Course: MINE VENTILATION - I (Part III - Ist semester, Mining Engineering)	
Course Code:	Semester: FIFTH
Duration: : 05 weeks	Maximum Marks: 50 + 50 (Practical)
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Class Test.:10 Marks Teacher's Assessment : 05 Marks End Semester Exam.:35 Marks
Tutorial: 1 hrs./week	
Practical: 2 hrs./week	
	Continuous Internal Assessment: 25 marks.
	External Assessment: 25 marks.
Credit: 5	
Sl. No.	Aim:
1.	To make familiar with the system of ventilation in underground Mines.
2.	To Impart elementary knowledge regarding Natural ventilation.
3.	To make familiar with the distribution of air to ventilate underground Mines.
Objective:	
Sl. No.	The Students will be able to:
1.	Learn in details to make provision of ventilation in any underground Mine by Natural and/ or Artificial means.
2.	Learn about the distribution of air and its control on Mine air under different situations.
Pre-Requisite:	
Sl. No.	
	Basic knowledge in general Mining practices, Physics and Chemistry.

MODULAR DIVISION OF THE SYLLABUS

MODULE	TOPIC	LECTURE PERIODS	TUTORIAL PERIODS
1 & 2	CONCEPT OF VENTILATION & NATURAL VENTILATION	7	2
3 & 4	LAWS OF MINE AIR FRICTION & SPLITTING OF VENTILATION	6	3

LECTURE PERIODS: 13

TUTORIAL PERIODS: 5

INTERNAL ASSESSMENT: 2

20

EXAMINATION SCHEME

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1&2	7	ANY ELEVEN	1	1 x 11 = 11	THREE	THREE, TAKING AT LEAST ONE FROM EACH GROUP	8	8X 3 = 24
B	3&4	7				THREE			

MINE VENTILATION -I

DETAIL COURSE CONTENT

GROUP - A

1. Objective of Mine Ventilation , Quantity of air required for ventilation of a mine, Standard of ventilation ,Instruments used to measure the adequacy of ventilation - Thermometer, Barometer, Hygrometer, Kata- thermometer, Anemometer & Water guage. pitot tube.
2. Natural ventilation - factors affecting Natural Ventilation, motive column, Natural Ventilation pressure. Numerical Problems - Calculation of motive column and N.V.P. with given shaft depth, shaft temperature and Average barometric Pressure.

GROUP - B

3. Laws of mine air friction, numerical problems.
4. Distribution of air and its control - Ventilation stoppings, air crossings, Ventilation door regulators, Brattice partitions, Ascensional and Descensional ventilation, Homotropical & Antitropical ventilation, splitting of air current, problems on splitting, Ventilating district, sources of leakage of air, boundary ventilation, airlocks at pit-top.

MINE VENTILATION -I LAB

DETAIL COURSE CONTENT

1. Determination of the cooling power of the air using Kata thermometer.
2. Mason's dry & wet bulb hygrometer, storrow's whirling hygrometer.
3. Measurement of air velocities, quantities & pressure in a duct by using Pitot tube.
4. Study & sketch of air crossings, regulators, ventilation doors, Air-locks at pit top.

Syllabus for: MINE SURVEYING - I

Name of the Course: MINE SURVEYING - I (Part III - Ist semester, Mining Engineering)	
Course Code:	Semester: FIFTH
Duration: : 05 weeks	Maximum Marks: 100 + 100 (Practical)
Teaching Scheme	Examination Scheme
Theory: 4 hrs./week	Class Test.:20 Marks Teacher's Assessment : 10 Marks End Semester Exam.:70 Marks
Tutorial: 1 hrs./week	
Practical: 3 hrs./week	
	Continuous Internal Assessment: 50 marks.
	External Assessment: 50 marks.
Credit: 6	
Sl. No.	Aim:
1.	To give introductory idea about general Surveying.
2.	To Impart elementary knowledge regarding Chain Surveying.
3.	To make familiar with the method of Levelling & Contouring.
Objective:	
Sl. No.	The Students will be able to:
1.	Learn about procedures of Chain Surveying in actual field in details.
2.	Learn the method of Dial & Plane table surveying, Levelling and Conturing and their applications in Industry.
3.	Prepare Mine Plan efficiently.
Pre-Requisite:	
Sl. No.	
	Basic knowledge in Mathematics, Physics and Engg. Drawing.

MODULAR DIVISION OF THE SYLLABUS

MODULE	TOPIC	LECTURE PERIODS	TUTORIAL PERIODS
1,2 & 3	INTRODUCTION, DISTANCE MEASUREMENT & CHAIN SURVEYING	6	0
4	DIAL AND PLANE TABLE SURVEYING	6	2
5 & 6	LEVELLING, CONTOURING, MINE PLAN & BUILDING MATERIALS.	6	3

LECTURE
PERIODS: 18

TUTORIAL PERIODS: 5

INTERNAL
ASSESSMENT: 2

25

EXAMINATION SCHEME

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1,2 & 3	8	ANY TWENTY	1	1 x 20 = 20	FOUR	FIVE, TAKING AT LEAST ONE FROM EACH GROUP	10	10X 5 = 50
B	4	7				THREE			
C	5&6	8				THREE			

MINE SURVEYING – I

DETAIL COURSE CONTENT

GROUP - A

1. Introductory and linear measurement:
Definitions , basic concepts and purpose of Geodetic and plain survey.

Classification of surveying methods and linear and angular measurements.
2. Measurement of distance
Different methods for measuring linear distances by chains and tapes.

Equipment for linear measurement.

Ranging, Chaining on flat ground and sloping ground.

Sources of errors in ordinary chaining.
3. Chain Surveying
Principles of chain surveying with straight and irregular boundary.

Basic figures of chain triangulation, check line, tie line etc.

Off-sets methods of taking off-sets etc.

Field work- field party, Reconnaissance, equipment for field work, selection of stations, well- conditioned triangles,

Marking stations, chaining distance, field book writing, plotting of the map, conventional signs.

Survey of pond, standing crop, small wood, coal heap in the middle, and survey of narrow strip.

To select a perpendicular to a chain line from a point on it.

To drop a perpendicular to a chain line from a point outside it.

To run a parallel to a chain line through a given oint.

Obstacles to ranging, obstacles to chaining and to both.

Error & correction in chain survey, accuracy and plotting

Numerical problems.

GROUP - B

4. Dial and Plane table surveying.

Meridians, magnetic needle, magnetic dip, isogenic lines, Agonic lines, Isoclinic & Aclinic lines, Variations of magnetic declination.

Whole circle bearing, Quadrant bearing, Magnetic bearing, True bearing, Azimuth, Fore bearing, Back bearing.

Converting magnetic bearing to true bearing and vice versa, laying down magnetic meridian on an old plan, computations of angles from bearings and bearings from angles and related problems.

Traversing by dial , closed traveres , open traverse.

Loose needle surveying with a miner's dial in presence of local attraction.

Fixed needle traversing - continuous azimuth method or meridian baseline method, double fore sight method, back and fore sight method.

Advantages and disadvantages of different methods.

Method of booking, plotting by protector, sources of error in dial survey traversing- limits of errors.

Differnt types of verniers, verniers used in dial.

Miner's Dial: difference between prismatic compass and miner's dial.

Prismatic compass- difference between prismatic compass and miners dial.

Plane Table surveying

Plane table, its parts and accessories, advantages and disadvantages of plane table surveying setting and table- levelling, orienting, centering, method of plane tabling - radiation, traversing, intersection.

GROUP - C

5. Levelling.

Definitions of terms used in leveling. Leveling instruments and staffs, parts and function of dumpy level, tilting level and automatic level. Sensitivity of a spirit level.

Tests and adjustment of dumpy level.

Test and adjustment of tilting level.

Methods of levelling.

Principles and methods of spirit levelling. Details of differential levelling. Longitudinal sectioning. Cross- sectioning, reciprocal levelling, methods of booking, calculation of reduced levels and plotting level sections.

Levelling problems.

Effect of curvature & refraction in levelling. Sources of errors, precautions and permissible errors in levelling, establishing Bench mark underground.

Contouring

Purpose of contouring , contour lines, contour intervals, factors governing contour intervals.

Characteristics of contour. Method of contouring. Interpolation of contours, contour gradient.

Stratum contour, Isopachytes. Use of contour, plans & maps.

6. Mine plans & building materials.

Types of statutory mine plans and storage of mine plans. Duties and responsibilities of a surveyor.

Building materials:

General description and uses of various types of common and important building materials used in mines, such as stone, sand, lime, cement, timber, bricks, aggregate and concrete.

MINE SURVEYING-I LAB

DETAIL COURSE CONTENT

1. Surface closed traverse by continuous Azimuth method by dial.
2. Protector plotting of the dial traverse.
3. Handling of Dumpy Level, Tilting level, & automatic levels.
4. Levelling across a roadway and plotting of level section.
5. Contouring of a given area by method of gridding.
6. Plotting of the contour.

Syllabus for: ELECTRICAL ENGINEERING & MECHANICAL ENGINEERING

Name of the Course: ELECTRICAL ENGINEERING & MECHANICAL ENGINEERING (Part III - Ist semester, Mining Engineering)	
Course Code:	Semester: FIFTH
Duration: : 05 weeks	Maximum Marks: 100 + 100 (Practical)
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Class Test.:(10 + 10) Marks Teacher's Assessment :(5 + 5)Marks End Semester Exam.:(35 + 35) Marks
Tutorial: 1 hrs./week	
Practical: 3 hrs./week	Continuous Internal Assessment: (25 + 25) marks.
	External Assessment: (25 + 25) marks.
Credit: 5	
Sl. No.	Aim:
1.	To make familiar with the working principle of DC motor, DC generator and AC generator.
2.	To Impart knowledge regarding Transformer and its operation.
3.	To give idea about stress, strain, fluid mechanics and compressed air and their applications in Mining machinery.
Objective:	
Sl. No.	The Students will be able to:
1.	Understand the operation on Mining machinery from the point of view Electrical Engineering and Mechanical Engineering.
2.	Learn operating principle of Boiler, Transformer, Compressor etc .
Pre-Requisite:	
Sl. No.	
	Basic knowledge in Physics, Chemistry and Drawing.

MODULAR DIVISION OF THE SYLLABUS

MODULE	TOPIC	LECTURE PERIODS	TUTORIAL PERIODS
Electrical Engineering 1,2,3 & 4	DC MOTOR, DCGENERATOR, AC GENERATOR & AC 3 PHASE SYSTEM	4	1
Electrical Engineering 5,6 & 7	TRANSFORMER, INDUCTION MOTOR & STORAGE BATTERIES	3	1
Mechanical Engineering 1 & 2	STRESS & STRAIN and STEAM & BOILER	3	1
Mechanical Engineering 3 & 4	FLUID MECHANICS and COMPRESSED AIR	3	2

LECTURE PERIODS: 13

TUTORIAL PERIODS: 5

INTERNAL ASSESSMENT: 2

20

EXAMINATION SCHEME (Electrical Engineering)

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1,2, 3&4	7	ANY ELEVEN	1	1 x 11 = 11	THREE	THREE, TAKING AT LEAST ONE FROM EACH GROUP	8	8X 3 = 24
B	5,6 &7	7				THREE			

EXAMINATION SCHEME (Mechanical Engineering)

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1 & 2	7	ANY ELEVEN	1	1 x 11 = 11	THREE	THREE, TAKING AT LEAST ONE FROM EACH GROUP	8	8X 3 = 24
B	3 & 4	7				THREE			

ELECTRICAL ENGINEERING & MECHANICAL ENGINEERING

DETAIL COURSE CONTENT

Electrical Engineering

GROUP - A

1.D.C. Generators

Construction - main parts, materials their made of, function of the parts.

Field and armature connection diagrams and classification of the genetaors, on the basis of these connections.

Deduction of emf equation and simple problem

Application of D.C. genetors.

2. D.C. Motors

Principle of operation and classification.

Back emf ; deduction of expression for torque, simple problem.

Speed equations and speed control of shunt and series motor-armature resistance control and field control only-reversal of direction of rotation.

Starters - 3 point face plate type- sketch, functions of different parts.

Application of D.C. motors.

3. A.C. Generators/ Alternators

Construction - main parts-rotor, stator, slip ring and brushes, excitors and their function.

Principle of operation , classification and uses

4. A.C. - 3 phase systems

Connections

a) Star connection- 3 phase, 3 wire and 4 wire systems.

b) Delta connection - 3 phase 3 wire systems.

Relation between line & phase values of voltage & current - in each case and expression for power.

Advantages of 3 phase system over single phase system.

GROUP - B

5. Transformers

Construction & principle of operation of single phase transformers.

E.M.F. equation and deduction of the relations -

$$N_1/N_2 = E_1/E_2 = I_1/I_2$$

Connections of 3 phase transformers

a) Star / Star. b) Delta/Delta c) Star/ Delta d) Delta / Star.
(connections only)

Applications of Transformers.

6. Three phase Induction motors.

Construction, principle of operation and classification (squirrel cage, slipring motors)

Definition and relationship of syn. Speed, actual speed, slip and frequency of rotor current, solve simple problems.

Starters

a) D.O.L & star/delta starter for squirrel cage motors.

b) Rotor- Rheostat starter for slipring motor.

Reversal of direction of rotation & uses of 3 phase induction motor.

7. Storage Batteries (Lead acid cell)

construction - different parts, materials they are made of and their functions.

Charging - different methods, conditions of full charge.

Defects, maintenance & uses.

Mechanical Engineering

GROUP - A

1. Stress & Strain.

Simple stress and strain, Hook's law, poisson's ratio, stress-strain diagram (Mild steel only) - Elastic limit, yeild point, ultimate strength, working stress, factor of safety, elastic constants & relationship among them (deduction not required).

2. Steam & Boiler.

Heat and temperature, absolute pressure and temperature, conversion of heat into mechanical work, properties of steam, sensible heat, latent heat of evaporation, wet, dry and superheated steam; enthalpy of steam, (use of steam table).

Functions of boilers and their classification, brief description and working principles only of the following boilers - Cochran, Lancashire and Babcock Wilcox.

Locations & functions only of the following boiler mountings and accessories - water level indicator, fusible plug, pressure gauge, stop valve, safety valve, economiser, superheater, air preheater and feed pump.

GROUP - B

3. Fluid Mechanics

Properties of fluid, pressure of fluid, pressure head of liquid, pressure gause such as piezometer tube, manometer, fluid flow, equation of continuity of flow, Bernoulli's theorem(proof not required), venturimeter- simple numerical problems.

Centre of pressure and depth of centre of pressure on flat surface vertically immersed in a liquid(no proof) problems only.

Flow of liquid through notches-definition of notch, type of notches- rectangular notch, triangle notch, formula of discharge through notches (proof not required). Simple numerical problems no discharge.

4. Compressed Air

compressed air as power. Different types of compressions and compressors, work done and HP required for compression(problems on single stage air compressor only), effect of clearance volume, multistage compressors, inter coolers and after coolers, compressors air transmission and losses in transmission and storage, advantages of use of compressed air in mine. Study of compressed air machines- air turbine only.

ELECTRICAL ENGINEERING & MECHANICAL ENGINEERING LAB

DETAIL COURSE CONTENT

Electrical Engineering Lab.

1. Study of Meggar and its application.
2. Study of Energy Meter(induction type) & its application.
3. Study of constructional features of 3-phase induction motor.
4. Study of star/delta starter for 3-phase induction motor.
5. Study of autotransformer for 3-phase induction motor.
6. Study of direct on line starter for 3-phase induction motor.
7. Measurement of armature resistance of a D.C. machine.
8. Study of constructional features of a D.C. machine.
9. Study of constructional features of single phase & 3-phase transformer.
10. Study of diode as full wave & half wave rectifier.

Mechanical Engineering Lab.

1. Verification of Hook's Law.
2. Study & sketch of Lancashire, Cochran, Babcock & Wilcox boiler.
3. Study & sketch of boiler mountings & accessories.
4. Measurement of flow through orifices, notches, pipes.
5. Verification of Bernoulli's theorem.

Syllabus for: INDUSTRIAL TRAINING.

Name of the Course: Industrial Training. (Part III - 1st semester, Mining Engineering)	
Course Code:	Semester: FIFTH
Duration: : Training period provided by the Industry	Maximum Marks: 300 (Practical)
Teaching Scheme	Examination Scheme(Practical)
Theory: Nil	Continuous Internal Assessment: 150 marks.
Tutorial: Nil	External Assessment: 150 marks.
Practical: Training period provided by the Industry	End Semester Exam. [theory]: Marks: Nil
Credit: 4	
Aim:	
Sl. No.	
1.	To enable candidates to acquire Knowledge and to develop an understanding of different activities performed in the Mine.
2.	To develop skill in practical aspect of handling different apparatus.
3.	To develop an interest in the field of Mining.
Objective:	
Sl. No.	The Students will be able to:
1.	Understand every Mining activities.
2.	Handle different gas detectors, apparatus in actual Mine environment.
3.	Acquire knowledge in Drilling, Blasting, Loading , Transporting and Winding in actual working field.
4.	Gather knowledge about every machinery and its principle of operation used in mines.
Pre-Requisite:	
Sl. No.	
1.	Elementary ideas in Mining Engineering, Electrical Engineering, Mechanical Engineering , Surveying etc.