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

DISCIPLINE: MINING ENGINEERING   **SEMESTER: 3RD**

SL NO	SUBJECT CODE	SUBJECT	PERIODS			EVALUATION SCHEME						
			L	T	P	INTERNAL EXAM			END SEM EXAM	TERM WORK	PRACTICAL EXAM	TOTAL MARKS
						TA	CT	Total				
THEORY												
1.	MNT 301	MINE DEVELOPMENT	4	-	-	10	20	30	70			100
2.	MET 331	GENERAL MECHANICAL ENGG.	4	-	-	10	20	30	70			100
3.	MNT 302	MINE SURVEY-I	4	-	-	10	20	30	70			100
4.	MNT 303	GEOLOGY	4	-	-	10	20	30	70			100
5.	MNT 304	MINE METHOD (OPEN CAST)	4	-	-	10	20	30	70			100
PRACTICAL/TERM WORK												
6.	MEP 331	GENERAL MECHANICAL ENGG LAB.	-	-	6	-	-		-	25	25	50
7.	MNP 301	MINE SURVEY-I LAB.	-	-	6	-	-		-	50	50	100
8.	MNP 302	GEOLOGY LAB.	-	-	6	-	-		-	25	25	50
9.	MNP 302	INDUSTRIAL TRAINING REPORT & SEMINAR	-	-	1	-	-		-	25	25	50
GRAND TOTAL			20	-	19	50	100	150	350	125	125	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%

MINE DEVELOPMENT

Name of the Course: Diploma in MINING ENIGINEERING			
Course code:	MNT 301	Semester	3RD
Total Period:	44	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 Mining Engineer, one has to develop the basic concept and principles of wining and working in mines. Further, he should have basic knowledge of explosives, shaft sinking and stone drifting for development of mines.

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

1. Generalize the elementary idea of various types of winning methods and mode of entries to mines.
2. Explain various composition, properties and uses of explosives.
3. Explain blasting practice in Mines.
4. Identify basic constructional features and safety provisions of magazines.
5. Identify alternatives to explosives.
6. Identify methods of shaft sinking.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topic	Periods:
1.	Introduction to Mining	08
2.	Explosive and blasting accessories	15
3.	Blasting practices in Mines	09
4.	Alternative to Explosives	01
5.	Magazine	01
6.	Shaft Sinking	10
		44

COURSE CONTENTS (Based on specific objectives)
1.0   Introduction to Mining
    1.1   Define a Mine, classify mining methods.
    1.2   Classify modes of entries- adits, inclines and shafts, applicability of entries.
    1.3   Physico-mechanical properties of rocks and their applications.
        1.3.1   Define Physico-mechanical properties such as hardness, compressive strength, ISI, PSI & Drillability.
        1.3.2   Time dependent properties of rocks .Applications of different properties.

2.0   Explosive and blasting accessories

2.1 Define explosive, state constituent of explosives , properties & characteristics of explosives.
2.2 Classify explosives, state composition and use of explosives.
2.3 Explain PMS and SMS.
2.4 Define permitted explosive and classify permitted explosive.
    2.4.1 Explain sheathed, equivalent sheathed and ultra safe explosive. State properties of permitted explosives.

2.5 State composition & constructional features of safety fuse, detonating fuse, detonating relay, igniter cord, nonel and ray date.
    2.5.1 Describe different types of detonators and uses, state advantages of delay detonators.
2.6 State different types of exploder, its construction and safety features, circuit tester.
2.7 Describe stemming rod, crack detector knife, crimper.

3.0 Blasting practices in Mines.
3.1 Describe preparation of charge.
3.2 State procedure of firing shots, direct and inverse initiation, stemming materials, water ampoules, cushion firing.
3.3 Define blasting efficiency.
3.4 Solid Blasting.
    3.4.1 Define blasting of solid, state advantages and disadvantages of B.O.S. State precautions, restrictions of B.O.S. Describe different patterns of shot holes.

4.0 Alternative to explosives.
4.1 State cardox, Hydraulic Coal Burster, Rock frac . Their advantages and disadvantages.

5.0 Magazines

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

6.0 Shaft Sinking

6.1 Describe vertical shaft and inclined shaft, determine shape and size of shaft, location of shaft. Describe sinking through normal ground. State shaft plumbing.
6.2 Describe sinking through difficult ground, cementation, freezing, mechanised shaft sinking, sinking upward, widening and deepening of shafts.

Learning Resources:[Text Books]			
Sl.No	Name of Authors	Title of the Book	Name of the publisher
1.	Sandhu & Pradhan	Blasting Manuals	
2.	S.K. Das	Blasting Practice in Mines	
3.	D.J. Desmukh	EMT Vol-I	
4.	G.B.Mishra	Coal Mining Practice- Surface Mining	
5.	1. S.M.E. Hand Book 2. Principles of Blasting in Mines-Vol-I & II		

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GENERAL MECHANICAL ENGG

Name of the Course: Diploma in MINING ENIGINEERING				
Course code:	MET 331	Semester		3RD
Total Period:	44	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 Mining Engineer it is essential to have the fundamental concept of mechanical engineering specially related to working of machines, which are used in mines.

OBJECTIVES

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

1. Describe the concept of stress, strain, bending moment and shear force, torsion with power transmission.
2. Explain Fluid static's and dynamics with solution of problems.
3. Power Transmission.
4. Explain the concept of Internal Combustion engines.

TOPIC WISE DISTRIBUTION OF PERIODS (Theory)

Sl.No.	Topic	Periods
1.	Strength of Materials & Power transmission	16
2.	Elements of Hydraulics	13
3.	Power Transmission	09
4.	Internal Combustion Engines	06
	Total	44

COURSE CONTENTS (Based on Specific Objectives)

1.0   Strength of Materials and Power Transmission.

      1.1   Define
          1.1.1   Elasticity
          1.1.2   Hook's Law
          1.1.3   Limit of Proportionality.
          1.1.4   Young's Modulus
          1.1.5   Factor of safety. Lateral strain and Poisson's ratio.

1.2 Explain stress-strain curve for ductile materials.
1.3 Explain the effect of axial load on bar of
    1.3.1 Uniform section
    1.3.2 Variable section
1.4 Solve numerical problems on above
1.5 Define bending moment and shear force.
1.6 State types of beam and types of loading.
1.7 Explain shear force diagram and bending moment diagram for
    1.7.1 Cantilever with concentrated loading.
    1.7.2 Cantilever with U.D.I. over whole span.
    1.7.3 Simply supported beam with concentration loading.
    1.7.4 Simply supported beam with U.D.I. over whole span.
1.8 State bending formula.
1.9 Define section modules.
    1.9.1 Find out section modules for beam section of simple cases.
1.10 Define torsion and state its effects.
1.11 State application of torsion formula.

2.0 Elements of Hydraulics.
2.1 State various fluid properties.
2.2 Define pressure of fluid and pressure head.
2.3 State and explain working principle of various pressure measuring devices such as:
    2.3.1 Pieccometer tube.
2.4 State and explain continuity equation.
2.5 State and explain Bernoulli's theorem.
2.6 Explain working of venturimeter.
2.7 Solve numerical problems on above.
2.8 Define and classify orifices.
2.9 State the formula and discharge for rectangular orifices and solve problems.
2.10 Define and differentiate between orifice and notch.
2.11 Classify notches.
2.12 State formula for discharge through notches & solve problem on above.
2.13 State and explain laws of fluid friction.
2.14 State and explain loss of head due to friction (Darcy weisbach formula)
2.15 Explain hydraulic gradient and energy gradient.
2.16 Solve numerical problems as above.

3.0 Power Transmission.
3.1 Explain working of
    3.1.1 Shaft couplings such as hydraulic and magnetic couplings.
    3.1.2 Belt, chain and rope Drive.
    3.1.3 Simple and compound gear train.
    3.1.4 Torque converters.
    3.1.5. State function of flywheel and governors.
    3.1.6. Explain working of watt, purler and proel governors.
3.2. Explain introduction of compressed air as a power.
3.3. Classify Compressor & state working principle.
3.4. State the various methods of transmission and storage of compressed air.
3.5. State and explain the advantages of use of compressed air in mines.
3.6. Explain the working principle of pneumatic machines.

4.   Internal Combustion Engines

    4.1. Explain various air cycles utilized in I/C Engines such as:
        4.1.5. OTTO Cycle.
        4.1.6. Diesel Cycle.
    4.2. Explain working principle of 2 stroke and 4 stroke petrol and diesel engines.
    4.3. Define I.H.P., B.H.P. & Mechanical efficiency of I/C Engine.
    4.4. State various applications of I/C Engines in Mining field.

Learning Resources:[Text Books]

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

MINE SURVEY-I

Name of the Course: Diploma in MINING ENIGINEERING			
Course code:	MNT 302	Semester	3RD
Total Period:	44	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. Introduction & Classification of Survey.
2. Explain different chains and their use in the field.
3. Explain prismatic compass and surveyor's compass and determine magnetic meridian. Explain local attraction and make necessary correction.
4. Outline knowledge regarding plane table survey in the field.
5. Describe general methods of determining areas.
6. Explain different procedures for calculating volume by application of different formulae.

TOPIC WISE DISTRIBUTION OF PERIODS (Theory)

Sl.No.	Topic	PeriodsL
1.	Introduction & Classification of Survey	04
2.	Chain Survey	09
3.	Compass Survey	09
4.	Plane Table Survey	04
5.	Computation of areas	06
6.	Computation of Volumes	06
7.	Estimation of quantity and	06
	Cost of construction.	_____
		44

COURSE CONTENTS (Based on specific objectives)

1.0 **Introduction & Classification of Survey**.
2.0 **Chain Survey**
    2.1 Give survey conventional signs, abbreviation used.
    2.2 Give standards of lining, inking and coloring.
    2.3 Describe selection of scales used.
    2.4 Explain principle of chain surveying.
    2.5 Describe instruments used and checking their correctness.
    2.6 Explain ranging and chaining of a line.
    2.7 Calculate errors in chaining.
    2.8 Explain obstruction while chaining.
    2.9 Describe chaining along a shopping ground.
    2.10 Describe use of optical square and line range and checking optical square for correctness.
    2.11 Describe offsets and their measurements.
    2.12 Give reference sketches of stations.
    2.13 Give procedure of chain surveying.
    2.14 Explain field booking and plotting of chain survey.
3.0 **Compass Survey**
    3.1 Describe prismatic compass, its adjustments and use.
    3.2 Explain true meridians, magnetic meridian, grid line meridian and arbitrary meridian.
    3.3 Explain W.C.B. and Q.B. and conversion from one to other
        3.3.1 Find out fore and back bearing and their conversion.
        3.3.2 Compute angles from bearing and bearing angles
    3.4 Define local alteration
        3.4.1 Determine local alteration and necessary correction to the bearing.
    3.5 Explain closed and open compass surveying and its plotting.
    3.6 Give procedure of field booking in compass and chain traverses.
    3.7 Explain adjustment of closing error in compass traversing.
4.0 **Plane Table Survey.**
    4.1 **Fundamentals of Plane Table Survey**.
    4.2 Explain two point problems.
    4.3 Explain three point problems and its solution by tracing paper method.
    4.4 Describe advantages and disadvantages of plane table.
5.0 **Computation of areas**
    5.1 Explain methods of determining areas.
    5.2 Find out areas from offset to a base line using
        5.2.1 Mid ordinate rule
        5.2.2 Average ordinate rule
        5.2.3 Trapezoidal rule
        5.2.4 Simpson's rule
    5.3 Compute area by Planimeter and from graph paper.
6.0 **Computation of Volumes**
    6.1 Compute volume from cross section.
    6.2 Find out volume using
        6.2.1 Prismoidal formula
        6.2.2 Trapezoidal formula
        6.2.3 Spot levels
        6.2.4 Contour plan
7.0 **Estimation of quantity and cost of construction**
    7.1 Describe different building materials such as sand, lime, cement, timber, bricks, aggregates, concrete.
    7.2 Explain estimation of quantity and costs including construction.

Learning Resources:[Text Books]			
Sl.No	Name of Authors	Title of the Book	Name of the publisher
1.	B.C. Punmia	A Text Book of Surveying Vol-I & II	
2.	T.P. Kanetkar	A Text Book of Surveying.	

GEOLOGY

Name of the Course: Diploma in MINING ENIGINEERING			
Course code:	MNT 303	Semester	3RD
Total Period:	44	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

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.

OBJECTIVES

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

1. 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.
2. Distinguish and identify the various structures that one may encounter in the field.
3. Underline the importance of crystal structures in the identification and study of minerals.
4. Identify minerals based on their physical properties. They will possess a sound knowledge of silicate structures.
5. Identify different rocks in the laboratory.
6. Distinguish between Igneous, Sedimentary and Metamorphic rocks and their texture and structures.

TOPIC WISE DISTRIBUTION OF PERIODS (Theory)

Sl.No.	Topic	PeriodsL
1.	Physical Geology	11
2.	Structural Geology	09
3.	Elements of Crystallography	04
4.	Elements of Mineralogy	09
5.	Petrology	<u>11</u>
		44

COURSE CONTENTS (Based on specific objectives)

1.0 Physical Geology
  1.1 Define weathering and erosion.
  1.2 Explain with suitable sketches the erosional and depositional land forms produced by wind.
  1.3 Explain with neat sketches the erosional and depositional land forms produced by river.
  1.4 Differentiate between glacier and iceberg
      1.4.1 Describe the erosional and depositional features produced by glacier.
      1.4.2 Define moraine. Describe the different type of moraine with sketches.

2.0 Structural Geology
  2.1 Define Dip. Distinguish between true dip and apparent dip.
  2.2 Define strike.

2.3   Define folds. Classify folds and describe them.
2.4   Define faults. Describe the various types of fault.
2.5   Define unconformity. Describe the various type of unconformity with neat sketches.
2.6   Define joints. Describe various joints.

3.0   Element of Crystallography
3.1   Define a crystal.
3.2   Explain Miller's indices.
3.3   Describe the Symmetry elements and forms present in the normal class of isometric system.

4.0   Elements of Mineralogy
4.1   Define a mineral.
4.2   Enumerate and describe the physical properties of minerals.
4.3   Explain briefly the silicate structures along with diagrams.
4.4   Classify minerals.
4.5   Describe mineralogy and physical properties of Olivine, Quartz, Feldspar and Pyroxene group of minerals.

5.0   Petrology
5.1   Define a Rock. Distinguish between a rock and a mineral.
5.2   Define Igneous, Sedimentary and Metamorphic rocks.
5.3   Describe the various textures and structures found in Igneous rocks.
5.4   Describe some important structures of sedimentary rocks along with neat sketches.
5.5   Describe various structure found in metamorphic rocks.

Learning Resources:[Text Books]			
Sl.No	Name of Authors	Title of the Book	Name of the publisher
1.	P.K. Mukherjee.	A Text Book of Geology	
2.	H.H. Reid	Ruttley's Elements of Mineralogy	
3.	G.W. Tyrrel	Petrology	
4.	George H. Davis, Stephen J Reynolds	Structural Geology of Rocks at Regions	
5.	M.P. Billings	Structural Geology	

GENERAL MECHANICAL ENGG LAB.

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MEP 331	Semester	3rd
Total Period:	66	Examination	4hrs
Lab. periods:	6P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

Periods

01.   Verify Bernoulli's Theorem by Bernoulli's Verification Apparatus.   06

02.   Determine rate of flow through the venturimeter set-up.   06

03.   Conduct tensile test of a mild steel specimen and plot
stress-stain curve, show salient points on it.   18

04.   Determine volumetric efficiency of air- compressor.   12

05.   Study of 2-stroke & 4-stroke diesel engines.   12

06.   Conduct I/C engine testing on single cylinder diesel engine
& find out I.H.P., B.H.P. & mechanical efficiency.   12

MINE SURVEY-I LAB.

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MNP 301	Semester	3rd
Total Period:	66	Examination	4hrs
Lab. periods:	6P/W	Term Work	50
Maximum marks:	100	End Semester Examination:	50

01. a.   Study & Uses of different Scales.   6 periods
      b.   Sketch survey conventional signs, abbreviations and
           colors used.   6 Periods

02.   Chain Survey   30 Periods

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

03.   Compass Survey   24 Periods

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

GEOLOGY LAB.

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MNP 302	Semester	3rd
Total Period:	66	Examination	4hrs
Lab. periods:	6P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

01.   Identification of rock forming minerals in hand specimens.

02.   Identification of Ore forming minerals in hand specimens.

03.   Determination of Dip & Strike of bed using Brunton or Clino Compass.

04.   Identification of Symmetry elements and forms of various models present in the normal class of Isometric system.

05.   Determinations of specific gravity by workers steel yard balance.

06.   Analysis of thin sections of minerals and rocks under the microscopes.

INDUSTRIAL TRAINING REPORT & SEMINAR

Name of the Course: Diploma in MINING ENGINEERING			
Course code:	MNP 302	Semester	3rd
Total Period:	11	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 at the end of 2nd, 3rd, 4th & 5th Semester for a period of 04 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 and 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 from respective fields will be called.