CURRICULLUM OF 4th SEMESTER

For

DIPLOMA IN MINING ENGINEERING(PT)

(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.(PT)(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		Mechanical Operation in Mines	4			20	80	3	100
Th .3		Mine Survey-II	4			20	80	3	100
		Total	12			60	240		300
		Practical							
Pr .1		Mechanical Operation in Mines LAB			6	25	50	3	75
Pr .2		Mine Survey -II LAB			6	50	50	3	100
Pr .3		Technical Seminar			2	25	-		25
		Student Centred Activities(SCA)			3				
		Total			17	100	100		200
		Grand Total	12		17	160	340		500

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 2nd semester and/or 4th semester.

Th.1. SURFACE MINING TECHNOLOGY

Name of the Course : Diploma in Mining Engineering(PT)			
Course code:		Semester	4th
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.

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Chapter 1,2,3,4.

Learning Resourses:		
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. MECHANICAL OPERATIONS IN MINE

Name of the Course : Diploma in Mining Engineering(PT)			
Course code:		Semester	4th
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.

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Chapter 1,2

Learning Resourses:		
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

Th. 3 . MINE SURVEY – II

Name of the Course : Diploma in Mining Engineering(PT)			
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 cove 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 colliery 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.

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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

Pr.1 . MECHANICAL OPERATION IN MINES LAB

Name of the Course : Diploma in Mining Engineering(PT)			
Course code:		Semester	4th
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 able to:

- Know application of Bernouli'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
o V e r i f y c	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-stain 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.

Pr.2 . MINE SURVEY – II LAB

Name of the Course : Diploma in Mining Engineering(PT)			
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. 3. Technical Seminar

Each

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

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 are the total presentation will be approximately 10 minutes duration .There will be interactive session between the presenter and 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.