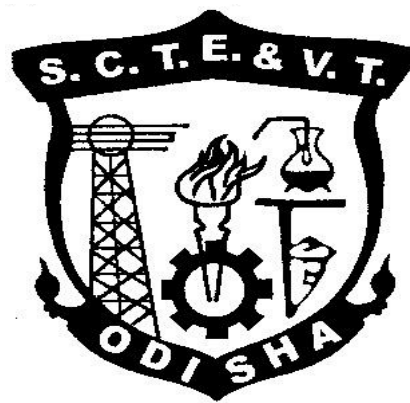


**CURRICULLUM OF 5<sup>TH</sup> SEMESTER  
For  
DIPLOMA IN MINING ENGINEERING(PT)  
(Effective FROM 2020-21 Sessions)**



**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.(PT)(wef 2020-21)**

SUBJECT NUMBER	SUBJECT CODE	SUBJECT	Periods/Week			Evaluation Scheme			
			L	T	P	Internal assessment/Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Entrepreneurship and Management & Smart Technology	4			20	80	3	100
Th .2		Underground Coal Mining	4			20	80	3	100
Th .3		Mine Ventilation	4			20	80	3	100
Th. 4		Electrical Equipment in Mines	4	1		20	80	3	100
		<b>Total</b>	<b>16</b>			<b>80</b>	<b>320</b>		<b>400</b>
		Practical							
Pr .1		Mine Ventilation LAB			06	50	100	3	150
Pr .2		Electrical Equipment in Mines LAB			06	25	50	3	75
		Student Centered Activities(SCA)			3	-	-		-
		<b>Total</b>			<b>15</b>	<b>75</b>	<b>150</b>		<b>225</b>
		<b>Grand Total</b>	<b>16</b>	<b>1</b>	<b>15</b>	<b>155</b>	<b>470</b>		<b>625</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.**

**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. UNDERGROUND COAL MINING

Name of the Course : Diploma in Mining Engineering(PT)			
Course code:		Semester	5th
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 contigious 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. 3. MINE VENTILATION

Name of the Course : Diploma in Mining Engineering(PT)			
Course code:		Semester	5th
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 pitot 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(PT)			
Course code:		Semester	5th
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 VENTILATION LAB

Name of the Course : Diploma in Mining Engineering(PT)			
Course code:		Semester	5th
Total Periods:	90	Examination	3 hrs
Practical Periods:	6P/week	Sessional Examination	50
Maximum Marks:	150	End Semester Examination	100

### 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 .2 . ELECTRICAL EQUIPMENT IN MINE LAB

Name of the Course : Diploma in Mining Engineering(PT)			
Course code:		Semester	5th
Total Periods:	90	Examination	3 hrs
Practical Periods:	6P/week	Sessional Examination	25
Maximum Marks:	75	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.