

# JHARKHAND RAI UNIVERSITY



## **MINING ENGINEERING**

## **DIPLOMA**



## SYLLABUS

2021-2024

## **SEMESTER-IV**

Kamre | Ratu Road | Ranchi | Jharkhand

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<b>DIPLOMA IN MINING ENGINEERING</b>												
<b>SEMESTER IV</b>												
<b>S. No</b>	<b>Subject code</b>	<b>Name of Subject</b>	<b>Period</b>			<b>Evaluation Scheme</b>				<b>Subject</b>	<b>Credit</b>	<b>Hours</b>
			<b>L</b>	<b>T</b>	<b>P</b>	<b>Assignment</b>	<b>T A</b>	<b>Total</b>	<b>ESC</b>			
1	8D.251	Mining Machinery I	3	0	0	20	10	30	70	100	3	3
2	8D.252	Basic Mine Electrical Engineering	3	0	0	20	10	30	70	100	3	3
3	8D.253	Mining Geology II	3	0	0	20	10	30	70	100	3	3
4	8D.254	Underground Coal Mining	3	0	0	20	10	30	70	100	3	3
5	8D.255	Underground Metal Mining	3	0	0	20	10	30	70	100	3	3
6	40D.251	Professional Skills	2	0	0	20	10	30	70	100	2	2
<b>PRACTICAL/ SESSIONAL</b>												
1	8DP.252	Basic Mine Electrical Engineering Lab	0	0	2	0	30	30	20	50	1	2
2	8DP.253	Mining Geology II Lab	0	0	2	0	30	30	20	50	1	2
									<b>Total</b>	<b>700</b>	<b>19</b>	<b>21</b>

- **Note: Vocational Training in a Surface / Underground Mine of minimum 30 (Thirty) days to be taken at the end of IVth Semester Will be Credited in VIth Semester.**
- **MOOCS introduced through SWAYAM in all semester.**
- **\*\* NOTE: Qualifying Non Credit Course & only Viva voce is conducted**

**Program:** Diploma

**Semester:** Four

**Course:** Mining Machinery I

**Course Code:** 8D.251

L	T	P	C
3	0	0	3

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### Course Objective:

- Enables the students to be familiar with the various machines used in opencast mine, their construction and performance.
- The students will get exposure towards the material handling methods and systems and its principle to convey the minerals or materials from mines, plants and workshops.
- Enables the students to select appropriate machinery for various mining operations based on the production targets.
- Enables students about the conveyor system and its advancement.

### Unit I

Transport of ore: Different types of haulages, Description of each haulage system, Direct rope haulage, Endless rope haulage, Main and Tail rope haulage, Gravity haulage Calculation of rope haulage, Calculation of TTF, Power of the rope, Safety devices used on rope haulage system Stop block/Buffers, Back stay, Monkey catch, Age craft Device, Runaway Switch, Drop Warwick. Locomotive haulage: Different types/ Applicability, Diesel locomotive, Electric locomotive, Air compressed locomotive, Battery locomotives. Definition of draw bar pull, Ideal gradient, super elevation. Different Types of Conveyor, Chain conveyor, Plate conveyor, Belt conveyor, Condition of Suitability of each type, Advantageous and disadvantages.

### Unit II

Winding shaft: Purpose of Winding, Main equipments used for Winding, Head gear, Headgear pulley, Cage/Skip, Winding Rope, Winding drum, Guides, Keps, Suspension Gear, Electric motor. Different types of winding, Drum winding, Koepe Winding, Drum winding different types, Cylindrical drum, Conical drum, Cylindro conical drum, Bi-cylindro conical drum, Provisions on winding drum, Flanges, Depth indicator, Mechanical Brakes (different types), Automatic Contrivance, Angle of fleet, Guides different types, Rigid guides, Flexible cable, Causes of cage oscillation, Cage suspension Gear Rope Capel, D link and bull chain, Safety hook, Triangular distribution plate, Bridle chain, Different types of kep, Rigid keps, Davies improved keps gear, List of safety devices used in winding, Characteristics curves, Koepe winding.

### Unit III

Wire ropes: Classification of different types of wire ropes, Stranded rope and Non stranded rope Different types of stranded rope, Different types of Non stranded rope, Lays of rope, Different definition like Space factor, static load, dynamic load, factor of safety.

### Unit IV

Selection of wire rope, Care and maintenance in ropes, Types of deterioration in the ropes, testing of wire ropes, Types of Rope capping, White metal capping (cone socket type capel), Wedge type capping (Reliance rope capel), Capping with split capel and rivets (Split capel), Recapping and Rope splicing procedure.

### Suggested Reading:

1. D.J. Deshmukh, VOL- III
2. Mine pump, haulage, winding, S. Ghatak

**Program:** Diploma

**Semester:** Four

**Course:** Basic Mine Electrical Engineering

**Course Code:** 8D.252

L	T	P	C
3	0	0	3

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### Course Objective:

- To understand the electrical layouts and power distribution in mine.
- To study the various modes of transport means and electrical circuits.
- To study the types of electrical equipment used in mines.
- Students should be able to verify the principles studied in theory by performing experiments in the laboratory.

### Unit I

Electric circuit: Resistance, Current, Voltage, Work, Power and Energy Ohm's Law, AC Current Three phase & Single phase, Storage Batteries- Constructing & working

### Unit II

DC Machine: Construction & principles of operating, Magnetization and load characteristics of series shunt and compound generators and motors. Motor starter, speed control and their field of applications. Construction and principles of operation, Different types of A.C motors, methods of starting and speed control of Induction motor, Universal motor.

### Unit III

Power supply system: Transmission & distributing of Electrical power by overhead lines and cables Types of cables, layout of underground cables, shaft cables protection system and switchgear like Relays, circuit breaker and fuses. Earthing and types of earthing.

### Unit IV

Single phase transformers: Construction and principles of operation, types of transformers, Efficiency and Regulations, Auto transformer.

### Suggested Reading:

1. *Electrical Technology*, A.K. Theraja
2. *Electrical Engineering In mines*, N.K Dutta

**Program:** Diploma

**Semester:** Four

**Course:** Mine Electrical Engineering Lab

**Course Code:** 8DP.252

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L	T	P	C
0	0	2	1

### **List of Experiments:**

1. Measurement of Resistance by voltmeter, Ammeter method.
2. Magnetization curve of DC machine.
3. Load characteristics of DC shunt generator
4. Load characteristics of DC series generator.
5. Speed control of DC shunt motor.
6. Speed-load Characteristics of Induction motor
7. Voltage and current ratios of transformer
8. Determination of efficiency and regulating of transformer.
9. Study of DC shunt motor starter to understand normal principles of working.
10. Study of Induction motor starters to understand normal principles of working.

**Program:** Diploma  
**Semester:** Four  
**Course:** Mining Geology II  
**Course Code:** 8D.253

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L	T	P	C
3	0	0	3

### **Course Objective:**

- The course provides for basic knowledge on economics of ore, exploration and practical site investigation
- The students will have familiarity about economic geology and Indian mineral deposits. They will have deep knowledge about geophysics, remote sensing and GIS.
- The students will have knowledge about ore reserve estimation, ore assaying, remote sensing, geological mapping and identification of geological structures in the field.

### **Unit I**

Structural Geology :Study of Topographic maps, unconformities, folds, faults, and joints-their nomenclature , classification and recognition, forms of igneous intrusion- Dyke, sill and batholiths, effect of fold & fractures on strata pre bodies.

### **Unit II**

Economic geology: Ore and Gangue, process of Ore formation, major Indian mineral deposits (Iron, Manganese, Copper, Lead, Zinc) - distribution & mode of occurrence, resources and reserves. Exploration & prospecting: Different methods of prospecting, Geological – Geophysical & Geochemical, Geographical information system & remote sensing.

### **Unit III**

Coal Geology :Rank, characteristics and important constituents of coal, classification and origin of Coal chief characteristics of Indian Coals, Geology of principle Coalfields of India Stratigraphy: Principles of Stratigraphy, Geological Time-scale, Physiographic Divisions of India, Major geological formations of India, Archean & Dharwar System with Economic importance, Cuddapah system with economic importance, Vindhyan System with economic importance, Gondwana super group with economic importance, Deccan traps.

### **Unit IV**

Petroleum geology: Properties & Uses of Petroleum, Origin of Petroleum and Occurrence of Petroleum in India.

### **Suggested Reading:**

1. *A text book of Geology, P.K. Mukherjee*
2. *Physical Geology, A.K. Dutta*

**Program:** Diploma

**Semester:** Four

**Course:** Mining Geology II Lab

**Course Code:** 8DP.253

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L	T	P	C
0	0	2	1

**List of Experiments:**

1. Study of Geology maps.
2. Study of Contour maps.
3. Maps illustrating fold, fault and unconformity.
4. Demonstration of igneous intrusions: Dykes, Sills, & Batholiths
5. Demonstration of streaks in different minerals.

**Program:** Diploma  
**Semester:** Four  
**Course:** Underground Coal Mining  
**Course Code:** 8D.254

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L	T	P	C
3	0	0	3

### **Course Objective:**

- Enables the students to appreciate various coal mining methods and to ably manage highly mechanized mines.
- The students will have good exposure about the various advanced methods of coal
- Mining with the knowledge about advanced coal face mechanization.
- To introduce the recent trends of level of mechanization for coal face.
- To understand the various advanced methods of coal mining.

### **Unit I**

Mine Supports: Steel support, Steel arches, Yielding supports, Friction props, and hydraulic props, description, applicability and comparison, Powered support, Fore poling, Long wall face support, Withdrawal of support from goaf.

### **Unit II**

Working Coal: Board and Pillar Method, classification of method of working, Conditions for selection of method of working, Board and pillar applicability advantages and disadvantages, Calculation of percentage of extraction, Design of panel, Different layout classification, SDL chain conveyor layout, Continuous miners, LHD layout, Manpower calculation and OMS, Open & closed panel system, Preparatory arrangements before depillaring, Line of extraction and numbering of pillars, systematic support rules, Different types of pillar extraction methods Caving: Stowing, Thick seam working, Precautions while working near restricted areas, Working near fire area, Working below waterlogged area, Working below depillared goaf, Contiguous working of seams, Layout and case study

### **Unit III**

Longwall mining: Applicability, Design of long wall panel, Factors affecting length of long wall face, Barrier width, gate road length, Long wall advancing, Long wall retreating, Cyclic long wall and Non cyclic long wall, Different machines used, Layout of DERD manpower calculation, Thick seam working with long wall. Top slicing and sub level caving, long wall caving and stowing.

### **Unit IV**

Subsidence in mining: Theories of subsidence, Different definition related to subsidence, Different factors affecting subsidence, precautions to be taken on surface in subsidence area, measurement of subsidence and preservation of record.

### **Suggested Reading:**

1. *Underground Winning of Coal*, T.N.Singh
2. *Modern Coal Mining Technology*, S.K. Das



**Program:** Diploma  
**Semester:** Four  
**Course:** Underground Metal Mining  
**Course Code:** 8D.255

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L	T	P	C
3	0	0	3

### **Course Objective:**

- Enables the students to select suitable methods of working underground metal mines and decide the necessary parameters of mine construction.
- The students will have good knowledge about the various advanced methods of metal Mining and special mining techniques to overcome the field issues.
- To understand the various advanced and recent methods of metal mining.
- The students will have basic concept on metal mining methods, mine design, development and operations of metal mines. They will also know about novel methods of metal mining and its applications.

### **Unit I**

Underground development: Terminology used in metal mines, Types of ore bodies, Types of ore bodies, Types of underground opening, location of openings, Opening up of a mineral deposit by vertical shaft, inclined shaft, Adit, Level interval, factor considered while deciding level interval/length of back, Drivages of raises and winzes, Driving manually, Modern methods Alimak, long hole method, Drop raising, raise boring, Common supports in metal mines.

### **Unit II**

Unsupported Stoping Methods: Classification and choice of stoping, Methods, Open stoping methods, underhand, overhand, Breast stoping, sublevel stoping, Blast hole stoping, VCR, Shrinkage method, their conditions of Applicability, Sequence of Development, stoping operation, Cycle of operations etc. System of removal of ore from stope. Supported & caving methods: Artificially supported methods cut and fill, square set, stull stoping Methods. Their applicability, stope Preparation, stoping operation, cycle of operation, relative merits and demerits etc. Caving methods - Top slicing, Sublevel caving and block caving methods, applicability, stope preparation stoping, cycle of operation etc.

### **Unit III**

Shaft Sinking: Size, shape, Factors considered for location of shaft, marking center, and shaft-centering arrangement, sinking of shaft below rock head- operation of drilling, charging and blasting and mucking operation. Disposal of debris, Shaft lining: Temporary lining, Permanent lining of shaft: Brick, monolithic, reinforced concrete lining, shaft tubing's etc, Walling scaffold, rider, ledge formation, underpinning, water garland crib etc. Special method of shaft sinking: Different special methods of shaft sinking, condition of applicability of each method, Description etc, Widening and Deepening of shaft.

### **Unit IV**

Boring: Purpose of boring, classification of boring methods, applicability of boring methods, Drill Bits for various types of drilling/boring, Surface arrangement, assembly, working of Rotary boring, Screw and hydraulic feed mechanism, Core recovery, core barrels, Recover of broken tools, Bits, Bore hole survey, Deviation of boreholes.

### **Suggested Reading:**

1. *Elements of Mining Technology Vol I, II, D.J. Deshmukh*
2. *Surface Mining, G.B. Mishra*

**Program:** Diploma  
**Semester:** Four  
**Course:** Professional Skills  
**Course Code:** 40D.251

L	T	P	C
2	0	0	2

**Course Objective:** It is student-centric, value based, activity oriented professional education, where the Faculty is not only the disseminator of common wealth of knowledge and experience but the organizer of learning situations, facilitator of the learning process and co coordinator of learning following the age old adage of “I hear, I forget, I see, I remember, I do, I understand

- In this unit the students get opportunities to apply their classroom learning to practical situation.
- This course aims to develop the professional traits in them, so that they can meet the neo-challenges of job opportunities.
- Students become the architect of their career goals.
- Acquire leadership traits,
- Interpersonal skills,
- Adaptability, discussion skills, interview skills etc.

## Unit I

### DISCUSSION SKILLS

Introduction  
 Importance of Group Discussion Skills  
 Process, Scope & Limits of Group Discussion  
 Group Discussion, Interaction Strategies, Individual Contribution  
 Leadership Skills, Team Management, Creating Friendly Co-operative Atmosphere  
 Selection Group Discussion, Interactive Oral Process, Purposeful & Goal Oriented  
 Characteristics, Agreement on Group Goals, Agreement on Procedure, Effective  
 Communication, Equitable Distribution of Time; Speaking & Listening Skills; Adaptability;  
 Assertiveness; Command Over the Subject

## Unit II

### NEGOTIATION SKILLS

Speaking & Listening Skills  
 Rapport Building  
 Decision Making Ability  
 Problem Solving Skill  
 Attitudes  
 Adaptability  
 Conflict Handling Ability

## Unit III

### JOB SEARCH & CORRESPONDENCE SKILLS

Introduction; Job Search Strategies  
 Developing Job Communication Skills  
 Skill Analysis  
 Job Communication Process  
 Creating Network,

Prelude; Biodata, Curricula Vitae ( CV ) Resume  
Determining the Need of the Employer

## **Unit IV**

### **INTERVIEW SKILLS**

Interview; Introduction

The Interview Process

Types of Interview; Face to Face, Group Interview, Through Video Conferencing, Telephonic, Skype, Panel Interview

Planning/Purpose

Pre-Interview Techniques

Answering Strategies

Follow up

### **Suggested Readings:**

1. *Monippally, Matthukutty. M. 2001. Business Communication Strategies. 11<sup>th</sup> Reprint. Tata McGraw-Hill. New Delhi*
2. *Swets, Paul. W. 1983. The Art of Talking So That People Will Listen: Getting Through to Family, Friends and Business Associates. Prentice Hall Press. New York*
3. *Lewis, Norman. 1991. Word Power Made Easy. Pocket Books*
4. *Sen , Leena .Communication Skills ; Eastern Economy Edition*
5. *Ghanekar, Dr. Anjali. Essentials of Business Communication Skills ; Everest Publishing House*
6. *David Green. Contemporary English Grammar, Structure & Composition ; MacMillan*
7. *Dictionary; Oxford*
8. *Dictionary ; Longman*

### **Websites**

- [www.tatamcgrawhill.com/digital\\_solutions/monippally](http://www.tatamcgrawhill.com/digital_solutions/monippally)
- [www.dictionary.cambridge.org](http://www.dictionary.cambridge.org)
- [www.wordsmith.org](http://www.wordsmith.org)
- [www.edufind.com](http://www.edufind.com)
- [www.english\\_the\\_easy\\_eay.com](http://www.english_the_easy_eay.com)
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