

JHARKHAND RAI UNIVERSITY
RANCHI



SYLLABUS

DIPLOMA
MINING ENGINEERING



SEMESTER IV

2025 - 2028

SEMESTER IV

| DIPLOMA IN MINING ENGINEERING | | | | | | | | | | | | | |
|-------------------------------|--------------------------------|--------------|-----------------------------|-------------------|----|----|--------------|------------|--------|---|---|-----------|-----------|
| SEMESTER IV | | | | | | | | | | | | | |
| S. No | Category | Subject code | Name of Subject | Evaluation Scheme | | | | Subject | Period | | | Credit | Hours |
| | | | | Assign-ment | T | A | Total | | ESC | L | T | | |
| 1 | Professional Core Courses | 8DPCCMiE204 | Mining Machinery I | 20 | 10 | 30 | 70 | 100 | 3 | 0 | 0 | 3 | 3 |
| 2 | Professional Core Courses | 8DPCCMiE205 | Mine Surveying II | 20 | 10 | 30 | 70 | 100 | 3 | 0 | 0 | 3 | 3 |
| 3 | Professional Core Courses | 8DPCCMiE206 | Mining Geology II | 20 | 10 | 30 | 70 | 100 | 3 | 0 | 0 | 3 | 3 |
| 4 | Professional Core Courses | 8DPCCMiE207 | Underground Coal Mining | 20 | 10 | 30 | 70 | 100 | 3 | 0 | 0 | 3 | 3 |
| 5 | Professional Core Courses | 8DPCCMiE208 | Surface Mining | 20 | 10 | 30 | 70 | 100 | 3 | 0 | 0 | 3 | 3 |
| 6 | Humanities and Social Sciences | 8DHSMC202 | Professional Skills | 20 | 10 | 30 | 70 | 100 | 2 | 0 | 0 | 2 | 2 |
| PRACTICAL/ SESSIONAL | | | | | | | | | | | | | |
| 1 | Professional Core Courses | 8DPCCMiE205P | Mine Surveying II Lab | | 30 | 30 | 20 | 50 | 0 | 0 | 2 | 1 | 2 |
| 2 | Professional Core Courses | 8DPCCMiE206P | Mining Geology II Lab | | 30 | 30 | 20 | 50 | 0 | 0 | 2 | 1 | 2 |
| 3 | Project | 8DPROJMiE201 | Practical Training Report I | | 0 | 50 | 50 | 100 | 0 | 0 | 0 | 3 | 0 |
| | | | | | | | Total | 800 | | | | 22 | 21 |

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 Vth Semester.

Program: Diploma
Semester: Four
Course: Mining Machinery I
Course Code: 8DPCCMiE204

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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: Mine Surveying II

Course Code: 8DPCCMiE205

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Course Objective:

- The student will enable to carry out underground surveys and stope measuring.
- Plotting contour plans
- Understand advanced surveying techniques such as remote sensing and geodetic surveying.
- Enables the students to select and use suitable survey instruments for data needed in planning and executing the mineral extraction.

Unit I

Theodolite: Classification of theodolite, definitions and terms used in operating theodolite, Temporary adjustments of transit theodolite. Fundamental axes of theodolite, Measurement of horizontal and vertical angles, Observe magnetic bearing of a line, Use of theodolite for Prolonging a straight line, for lining in, Lay-off horizontal angle, Sources of errors in theodolite work and their elimination. Permissible errors in mine surveying. Theodolite traversing: Methods of traversing, by included angles & Deflection angles, Checks in closed & open traverse, Traverse computation: latitude, departure, Consecutive coordinates, independent coordinates, error of closure. Adjustment of closed traverse, balancing by Bowditch and transit rule, Gales Traverse table, Permanent adjustments of theodolite. (Only relationship of different axis of theodolite)

Unit II

Geodetic Triangulation: Basic principles, Triangulation figures, Classification, Base line measurement. Correction to Base line Measurement. (Elementary idea only). Tachometric surveying: Instruments, Requirement of a tachometer. Tachometric methods: Fixed hair method; Reduction formula for horizontal distance & elevation with horizontal sights.

Setting out of curves: Classification of curves. Definition of various parts of curves, Elements of simple circular curve, Relation between radius of curve & degree of curve. Setting out curves by linear methods and single theodolite method, super elevation or cant. Purpose of super elevation, Study and use of Planimeter including digital planimeter.

Unit III

Underground surveying: Marking of underground stations, Correlation Survey- Direct traversing through incline, by plumbing wires in shaft, co planning method, Weisbach's triangle method, Weiss quadrilateral method, Gyro-theodolite method. Stope survey: Definition & Purpose of stope survey, Classification of stope surveying, Methods of stope surveying Stop survey flat deposit: Tape triangulation, Tie Method, instrumental method Stope survey in steeply inclined deposit. Stop survey in massive ore bodies, irregular in dip & shape.

Unit IV

Advances in mine surveying: Global Positioning System; Principle, The system, application in Opencast mine surveying, Advantages and Disadvantages. Total station; application in distance measurement, angle measurement, Electronic Distance Measurement; Principle of measurement, types etc. Gyro theodolite; principle of gyro, gyro attachments and Laser plummet. Dip & fault: Introduction, Definition of Dip, Strike Apparent dip, Full dip, Numerical for determining true and apparent dip, strategically thickness of seam. Definition of Fault. Normal fault, Reverse fault. Numerical on fault problems, connection of mine plan to national Grid.

Suggested Reading:

1. *Surveying and leveling*, T. P. Kanetkar
2. *Surveying & Levelling*, B.C. Punmia

Program: Diploma

Semester: Five

Course: Mine Surveying II Lab

Course Code: 8DPCCMiE205P

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List of Experiments:

1. Demonstration of theodolite reading the vernier.
2. Temporary adjustments of theodolite & measurement of horizontal angle by repetition method.
3. Measurement of horizontal angle by reiteration method.
4. Observation of magnetic bearing of a line by Theodolite by compass attachment.
5. Measurement of deflection angle by Theodolite by taking an open traverse of 4 – 5 sides.
6. Prolongation of a survey line with the help of a Theodolite.
7. Measurement of Vertical angles using theodolite.
8. To Find constants of a given tachometer.
9. Determining the reduced level and horizontal distance of an inaccessible object by Tachometer.
10. Setting out a simple circular curve by offsets from long chord
11. Setting out a simple circular curve by sub chord produced method.
12. Setting out a simple circular curve by (single Theodolite method) Rankine's method.
13. Demonstration of EDM.
14. Demonstration of micro optic theodolite.
15. Demonstration of Total station.

Program: Diploma
Semester: Four
Course: Mining Geology II
Course Code: 8DPCCMiE206

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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: 8DPCCMiE206P

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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

Program: Diploma
Semester: Four
Course: Underground Coal Mining
Course Code: 8DPCCMiE207

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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: Surface Mining
Course Code: 8DPCCMiE208

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Course Objective:

- Enables the students to apply the knowledge of mining machinery in their economic deployment for achieving the production targets in opencast mines.
- To introduce the various techniques for mine planning, geotechnical investigation and equipment management.
- To appreciate the modern trends in opencast mines, safety and environment.
- The students will have insight about the advanced techniques for mine planning, geotechnical investigation and equipment management and also will understand the modern trends in opencast mines, safety and environment.
- The students will have ability to classify and select the suitable surface mining methods and equipment based on site conditions. They will also have a concept of waste dump formations and slope failures in surface mines.

Unit I

Introduction to opencast mining: Classification of surface mining methods, classification based on mechanization .Factors affecting choice of opencast mining methods, Stripping ratio: Maximum allowable stripping ratio, overall stripping ratio, Break even stripping ratio. Advantages and disadvantages of opencast mining. Elements of Benches: Height, width, angle of slope, toe, crest, statutory provisions regarding height, width, angle of slope etc. Opening up of deposit:Unit operations involved, site preparation, Box cut, entry system in opencast mines. Opencast mine layout, factor determining choices of layout, overburden excavation, Disposal of overburden, overcasting etc, sample layouts for lime stone, copper, coal , iron ore deposits, method of work, machines required , manpower, OMS etc.

Unit II

Opencast mining machinery: Classification of Excavating equipments, selection, choices of opencast mining machinery, Excavators shovel, Rope shovel, hydraulic shovel, application, advantages, disadvantages, comparison Rope shovel and hydraulic shovel, operating parameter, output of a shovel. Various attachments to shovel, Specifications. Back hoe, operating parameter, application. Dragline, operating parameters, applicability, working, advantages, disadvantages, comparison with shovel. Specifications, Bucket wheel and Bucket chain excavators, Application, advantages & disadvantages, operation, working methods by Bucket wheel excavator, Rippers, Scrappers, bulldozer etc, Surface miner its application, working.

Unit III

Opencast explosives: Explosives used in opencast mine, AN/FO, slurry explosive, emulsion explosives, Heavy AN/FO explosive, LOX, their properties, composition etc. Boosters. Initiation system, non electric initiation system, Raydets, Nonel, shock tubes, electronic detonators, etc. Bulk explosive system, site mixed slurry, site mixed Emulsion, Bulk-loading system. Advantages, comparison. ANFO precautions while mixing, handling and use, Conditions for using bulk explosives.

Unit IV

Blasting practice in opencast mines: Bench blasting terminology, Blast hole geometry, hole depth, burden, spacing, sub grade drilling, bottom charge, column charge, stemming height. Factors to be considered while blast designing. Simple numerical on blast design for the bench of surfaces mine. Single and multiple rows blasting

their comparison, Sequence of blasting in single & multiple rows. Precautions while charging and firing of holes in deep hole blasting, deck charging, muffled blasting, control blasting techniques, secondary blasting/breaking in opencast mines, transport of Explosives in bulk.

Suggested Reading:

1. *Explosive and Blasting Techniques, G.K. Pradhan*
2. *Surface Mining Technology, S.K. Das*
3. *Elements of Mining Technology Vol I, D.J. Deshmukh*

Program: Diploma

Semester: Four

Course: Professional Skills

Course Code: 8DHSMC202

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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. 11th 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
- www.dictionary.cambridge.org
- www.wordsmith.org
- www.edufind.com
- www.english_the_easy_eay.com
- www.englishclub.com
- www.english_grammar_lessons.com

Program: Diploma

Semester: Four

Course: Practical Training Report I

Course Code: 8DPROJMiE201

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Course Objective:

- Enables the students to experience with the practical applications of the theoretical learning.
- The outcome at the place of work is always much more than what can be learned in the class room.
- To provide the students an opportunity to express their skills, academic knowledge, practical experience and ability to analyze problems.
- The aim of the project is to stimulate creative and innovative aspects of their technological learning.

Vocational Training in a Surface / Underground Mine of minimum 30 (Thirty) days to be taken at the end of Semesters.