JHARKHAND Rai University

JHARKHAND RAI UNIVERSITY

RANCHI

SYLLABUS

DIPLOMA

MINING ENGINEERING

SEMESTER VI

2025 - 2028

JHARKHAND Rai University

DIPLOMA VI

DIPLOMA IN MINING ENGINEERING													
SEMESTER VI													
				Evaluation Scheme				Subject	Period			Credit	Hours
S. No	Category	Subject code	Name of Subject	Assign ment	T A	Total	ESC		L	T	P		
1	Professional Core Courses	8DPCCMiE305	Mine Legislation & Safety	20	10	30	70	100	3	0	0	3	3
2	Professional Core Courses	8DPCCMiE306	Fuel Technology & Mineral Procesing	20	10	30	70	100	3	0	0	3	3
3	Professional Core Courses	8DPCCMiE307	Rock Mechanics	20	10	30	70	100	3	0	0	3	3
4	PROFESSIONAL ELECTIVE II	(Any one of the followings)		20	10	30	70	100	3	0	0	3	3
		8DPECMiEEL304	Mine Safety Engineering										
		8DPECMiEEL305	Mine & Mineral Economics										
		8DPECMiEEL306	Mine Automation										
5	Humanities and Social Sciences	8DHSMC302	Seminar in Executive Communication	20	10	30	20	50	2	0	0	1	2
PRACTICAL / SESSIONAL													
1	Professional Core Courses	8DPCCMiE306P	Fuel Technology & Mineral Procesing Lab		30	30	50	50	0	0	2	1	2
2	Professional Core Courses	8DPCCMiE307P	Rock Mechanics Lab		30	30	50	50	0	0	2	1	2
3	Project	8DPROJMiE302	Mining Project		-	100	100	200	0	0	5	5	5
						Total		750				20	23
							Overall Total	4500				120	

Program: Diploma
Semester: Six
Course: Mine Legislation and Safety
Course Code: 8DPCCMiE305

L	T	P	C
3	0	0	3

Course Objective:

- Enables the students to understand the organizational structure, working safety and management concepts for mining enterprises to effectively manage them within the frame work of rules and regulations.
- Students will be acquainted with rules, laws and order for running a mine.
- The students will have knowledge on various acts, rules and regulations relating to the mineral industry. They will also know about accidents, diseases and mine safety.
- Student will know about subsidence control, governing norms and regulations.

Unit I

Mines Act: Important definition: Adolescent, adult, child, Employed, Mine, Open cast working, Relay, Shift, Serious bodily injury. Provisions under chapter V, Provision for health and safety. Provisions regarding leave with wages, Act 49 to 56 .Hours & Limitations of Employment, act 28 to 48.Mines rules: Provisions regarding health & sanitation, first aid and medical appliances. Mines Rules- Provisions connected with leave with wages and over time and welfare amenities. Employment of persons, Rule 46 to 52

Unit II

Coal Mines Regulations**:** Important definitions: Duties and responsibilities of workman, competent person & officials. Provisions of Reg. 38, 39, 43, 44, 45, 46, 48, 56 Planes and sections Reg. 58, 59, 61, 63.Means of access & egress. Reg. 66 to 70 Provisions regarding winding in shaft Reg. 71 to 86. Transport of men & material Reg. 88, 89,90,91,92,93,94,95 mine working Reg. to 115 Precautions against dangers from the dust, gas & water .Reg. 116 to 128. Ventilation Reg. 130 to 149 Provisions regarding lighting and safety lamp. Reg. 150 to 158. Explosives & Blasting Reg. 158 to 180 Provisions regarding machinery, plant & equipments and important provisions under chapter on miscellaneous.

Unit III

Mine accidents**:** Types of mine accidents, their classifications, Causes of accidents due to fall of roof, explosives and blasting, haulage and winding and their preventions, Cause and prevention of accidents due to, fires, explosions and inundations. Safety statistics, safety drive and organization of safety in the mines/area etc. Management: Types of business organizations, organization of Coal India Ltd. Supervision qualities of good supervisors, Leadership, functions of industrial leadership, delegation of responsibility , Principles of time study, Wage and payment , Trade unions, their functions, Strikes and lockouts.

Unit IV

Circulars, Byelaws & standing orders: Model standing order in the event of stoppage of main mechanical ventilator, Maximum air velocity, Systematic support rules for coal mine with Board and pillar method of working, Conditions for solid blasting with P5 explosives, Precautions for use of Auxiliary fan underground. Procedure for dealing with misfire and Precautions regarding Blown through shots. Inspection Procedure: Procedure of inspection of old working, Haulage roadways, sinking shaft, working shaft, Winding rope, Sealed off area, subsidence and goaf area Mines Rules: Important provisions of coalmines rescue rules: Organization & equipment in mines, Rescue station, Conduct of rescue work.

Suggested Reading:

1. *Mines Act, 1952, Lovely Prakashan*

2. *CMR, 1957, L C Kaku*

Program: Diploma
Semester: Six
Course: Fuel Technology and Mineral Processing
Course Code: 8DPCCMiE306

L	T	P	C
3	0	0	3

Course Objective:

- The course enables the students to select the suitable parameters and appropriate machinery for processing various types of minerals.
- Give the students an understanding of how the basic mineral processing unit operation can be combined into specific processes.
- Students will be acquainted with mineral separation methods – an overview, including: physical separation (gravity, magnetic and electrical); solid/liquid separation; flotation.

Unit I

Mine sampling**:** Definition, terms, purpose and various uses. Different Sampling methods. Salting- purpose, safety against salting. Reduction of sampling-Methods used.

Unit II

Assaying: Introduction- assay map, assay plan factor, assay values, grade value, tenor, type of grade value. Calculation based on average assay value. Estimation of ore reserves.

Unit III

Mineral dressing**:** Scope, objectives & limitations of mineral dressing. Commination. Size separation. Gravity concentration methods. Introductory froth flotation. Simplified flow sheets of coal, copper, Lead, &Zinc, Iron, Limestone, Coal Beneficiation methods

Unit IV

Fuel technology: Proximity & ultimate analysis of coal, caking & coking properties of coal, low & high temperature carbonization.

Suggested Reading:

1. *Mineral Processing Technology –Barry A. Wills*
2. *Basics in Mineral Processing- Mesto*
3. *Mineral Processing Technology- Gauddin*

Program: Diploma
Semester: Six
Course: Fuel Technology and Mineral Processing Lab
Course Code: 8DPCCMiE306P

L	T	P	C
0	0	2	1

List of Experiments:

1. Proximity analysis of coal.
2. Caking index of coal.
3. Crushing by Jaw roll crusher.
4. Grading of iron ore fines.
5. Floating of coal fines.

Program: Diploma
Semester: Six
Course: Rock Mechanics
Course Code: 8DPCCMiE307

L	T	P	C
3	0	0	3

Course Objective:

- The course provides detailed knowledge on rock properties
- This will equip the students with the ability to carry out various tests and monitoring the rock behavior.
- Students will be able in analysis of analysis of data and solving rock mechanics problem in mining and excavation projects.
- Data and solving rock mechanics problem in mining and excavation projects.
- Provides detailed knowledge on rock properties and equips the students with the ability to carry out various tests.
- Students will be able in analyzing the data and solving rock mechanics problem in mining and excavation projects.
- The students will have knowledge about the subsidence mechanism, prediction and influencing parameters.
- The students will have the concept about the rock mass classification, mechanism of rock reinforcement, existing and special methods of rock reinforcement.

Unit I

Introduction to Rock Mechanics: Concept of stress and strain in rock, stress due to weight of strata, vertical lateral stresses. Stress due to tectonic and orogenic force, Residual stresses, induced stresses. Field stresses, modulus of elasticity poison`s number, Poison`s ratio stress fields. Introduction to elementary rock mass classification based on strength, hardness, RQD, Bieniawski RMR classification.

Unit II

Rock Mass Properties: Strength Properties: Compressive strength, Tensile Strength, Shear Strength, Flexural Strength. Strength Indices- Point Load Strength index, Impact Strength index, Protodyakonov strength index. Rebound hardness, insitu stress by flat jack, Cohesion, Young's modulus, poison`s ratio, angle of internal friction. Porosity, Density, Moisture content permeability. Material Characteristics: Brittle material, ductile material, Elastic material, Plastic material. Time dependent properties: creep. Creep curve, factors contributing Creep, deformation.

Unit III

Rock Testing: Uniaxial compressive strength, Tensile strength – Brazilian test, bending test. Shear strength test- punch shear test, direct shear test on Rock cube, Triaxial method. Determination of strength indices- point load strength index, Protodyakonov strength index, impact strength index. Rock burst, Bumps, causes controlling measures, factors affecting proneness to rock burst/Bumps. Pillar Design- factors considered. Pillar design by tributary area approach, determination of factor of safety.

Unit IV

Ground control: Theories of mechanics of strata behavior: Dome or arch theory, Beam theory, Function of roof bolts, Principle of Action Roof Bolts, Varieties of Roof Bolts: Slot and Wedge, Expansion shell, Grouted Roof Bolts and Resin Roof Bolts, Anchorage Testing of Roof Bolts, Bolt density, Code of practice for roof bolting in underground mines, Roof stitching, Principle of Roof stitching, Cable Bolting.

Suggested Reading:

1. *Elements of Mining Technology Vol I, D.J. Deshmukh*
2. *The elements of mechanics of mining ground, B.S. Verma*
3. *Rock Mechanics for Engineers, Dr. B.P. Verma*

Program: Diploma
Semester: Six
Course: Rock Mechanics Lab
Course Code: 8DPCCMiE307P

L	T	P	C
0	0	2	1

List of Experiments:

1. Preparation of rock sample for laboratory testing.
2. Determination of Uniaxial compressive strength of a rock sample.
3. Determination of tensile strength (Brazilian test) of a rock sample.
4. Determination of shear strength of a rock sample.
5. Determination of point load strength index.
6. Determination of Protodyakonov strength index.
7. Determination of impact strength index.
8. Demonstration of various Rock bolts.

JHARKHAND Rai University

PROFESSIONAL ELECTIVE -II

Program: Diploma
Semester: Six
Course: Mine and Minerals Economics
Course Code: 8DPECMiEEL305

L	T	P	C
3	0	0	3

Course Objective:

- The course enables the students to understand the economics of business enterprise to become a successful manager.
- Students gain knowledge on the basic management principles to become management(s) professional.
- Upon completion of the course, students will be able to gain knowledge and skills Needed to run a business successfully.
- Expertise the students to brings employment, government revenues, and opportunities for economic growth and diversification through mining.
- Study of estimation and valuation of mineral deposit and study of project appraisal.

Unit I

Mineral Industry**:** Mineral Industries in India, Role of Mineral Industries in National Economy. Major Economical minerals coal, Iron, Copper, Manganese, Limestone, Lead and Zinc, Gold, Radioactive minerals. Geological formation modes, Locations, Reserve, Uses, Production, Imports, Exports. Conservation of Minerals and their substitution including coal. National Mineral Policy. Incentives provided by government to Mining sector, Computation & classification of Reserve and Grades.

Unit II

Valuation & depreciation**:** Valuation methods of valuation by different methods of annuity. Calculation of different annuities, Methods of depreciation and calculation of Depreciation methods of calculations of Redemption values. Main valuation methods of mining Property which under production. Valuation under different methods. Report of valuation of small mining property.

Unit III

Mine Leasing Procedure: Different Acts, Rules related to Scientific Development, Regulation and Conservation of Minerals, major and minor mineral concessions. General Restriction on undertaking mining operation, Maximum area for which Mining lease may be granted, Period for which mining lease may be granted, procedure for obtaining mining lease.

Unit IV

Mining Plan: As per the MCDR, 1988: MCR, 1960. Procedure of arranging finance for small-scale mining through financial institutes, Mine Closure plan.

Suggested Reading:

1. *Mine Valuation, sparks*

2. *Mine Economics, R.T. Deshmukh*
3. *Elements of Mineral exploration, IBM*

Program: Diploma
Semester: Six
Course: Mine Safety Engineering
Course Code: 8DPECMiEEL304

L	T	P	C
3	0	0	3

Course Learning Objective:

- This course provides the theory and principles of mine safety management system and mine ventilation involving the subsurface environment in underground mining operations.
- To make students conversant about significance of safety in industry and safety management - To provide the training about risk assessment and carrying out safety audit - To impart knowledge about site specific safety and training.

Course Content:

Unit 1:
Safety management systems in Indian mining industry; engineering aspects of safety management. Basic concept of risk, reliability and hazard potential; elements of risk assessment; statistical methods; control charts; Pre and post analysis of accidents, Techniques used in Safety analysis, Root cause Analysis: Principles and applications, HAZOP Study, Design of Personal Protective Equipment (PPE), Effectiveness of PPE.

Unit II:
Appraisal of advanced techniques - fault tree analysis, failure mode and effect analysis, quantitative structure - activity relationship analysis; fuzzy model for risk assessment. Measurement of safety efficiency; safety audit methods; safety records management.

Unit III:
Safety legislations, Safety meetings, constitution of safety committees, functions, pit safety committee Ergonomics, Safely practices in various operations, blasting, drilling, equipment and machine handling, site specific safety, ground control, ventilation and gases; safety codes, implementation and monitoring of safety programmes Recent Trends of development of safety engineering approaches. Safety training.

Unit IV:
Safety Management Plan, Safety Campaign, Training and Awareness Programme: Virtual Reality Application for Accident Prevention, Human Factors and Occupational Safety, Industrial Robots and Robot System Safety.

Suggested Reading:

1. *Progressive Technologies of Coal, Coal bed Methane, and Ores Mining by* Volodymyr Bondarenko, Iryna Kovalevs'ka
2. *Advanced Reservoir and Production Engineering for Coal Bed Methane by Pramod Thakur*

3. *Fundamentals of Coal bed Methane Reservoir Engineering by John Seidle*

Program: Diploma
Semester: Six
Course: Mine Automation
Course Code: 8DPECMiEEL306

L	T	P	C
3	0	0	3

Course Objective:

- Enable students conversant with aspects automation and control applied to mines

Unit 1:
Basic Elements of an Automated System, Automation in Production System, Principles and Strategies of Automation, Advanced Automation Functions, Levels of Automations, Introduction to automation productivity. Autonomous mining systems - Operations Centre, Autonomous haulage systems, Automation of drilling and drill rig, drilling process. Automation of underground loading and transportation systems. Automation in tunnelling projects. Automation in monitoring of environments in longwall and continuous mining system, Automation of transportation system in surface mining.

Unit II:
Fleet Management System: TDS, CMMS, ERP for Mining Industry; Mining Remote Operations & Control: Robotics & Armchair Mining; Use of robotics in mining for production and disaster management purpose. Overview of Material Handling Systems - Principles and Design Consideration, Material Transport Systems, Storage Systems. (DCS - automation).

Unit III:
Automated Communication and Tracking Technologies: Proximity Systems, GNSS/UPS, Vision Based Systems, Radar Systems, RFID and Geo-fencing, CCD camera, Data Logging Systems, SCADA, Image Processing etc.

Unit IV:
Virtual Reality Applications: Mining Equipment Concept development, Mine Safety Applications, Mining operation simulations.

Suggested Reading:

1. *Engineering Economics, J A L Waddell*
2. *Engineering Economics, R pannerselvam*

Program: Diploma
Semester: Five
Course: Seminar in Executive Communication
Course Code: 8DHSMC302

L	T	P	C
2	0	0	0

Course Objective To impart more advanced basic skills through intensive practice, in this unit again the students get opportunities to apply their general awareness and classroom learning to practical situation to achieve the targeted career goal in this increasingly competitive world Some of the career oriented units are Discussion Skills, Interview Skills, Job Search Strategies, Job Correspondence etc., they need to undergo,

- An average student acquires basic skills required for a cherished job.
- Their appreciative personality development becomes a value added attribute in their professional sphere.
- The course enhances *communication*, leadership and teamwork *skills*; and personal development *skills* using practical approach and exposure of students to the realities of the world
- To put greater emphasis on development of non-technical skills, such as flexibility, leadership and good *communication*.

Activity Based
WORKSHOPS

- Debate
- Extempore
- Group Discussion
- Panel Discussion
- Presentation-Paper & Oral
- Reports: Survey Report, Project Report, Case Study

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

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- *www.englishclub.com*
- *www.english_grammar_lessons.com*
- *www.wikipedia.org/wiki/english_grammar*

Program: Diploma
Semester: Four
Course: Mining Project
Course Code: 8DPROJMiE302

L	T	P	C
0	0	5	5

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.