JHARKHAND Rai University

JHARKHAND RAI UNIVERSITY

MINING ENGINEERING

DIPLOMA

SYLLABUS

2021–2024

SEMESTER- VI

Kamre | Ratu Road | Ranchi | Jharkhand

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JHARKHAND Rai University

DIPLOMA IN MINING ENGINEERING												
SEMESTER VI												
			Period			Evaluation Scheme				Subject	Credit	Hours
S. No	Subject code	Name of Subject	L	T	P	Assignment	TA	Total	ESC			
1	8D.351	Mine Legislation & Safety	3	0	0	20	10	30	70	100	3	3
2	8D.352	Fuel Technology & Mineral Processing	3	0	0	20	10	30	70	100	3	3
3	8D.353	Environmental Aspects of Mining	3	0	0	20	10	30	70	100	3	3
4	8D.354	Rock Mechanics	3	0	0	20	10	30	70	100	3	3
5	**ELECTIVE II(Any one of the following)**											
	8D.381	Mine & mineral Economics	3	0	0	20	10	30	70	100	3	3
	8D.382	Remote Sensing & Geo-informatics										
	8D.383	Engineering Economics										
	8D.384	Engineering Economics										
6	40D.451	**** Human Values and Ethics**	2	0	0	20	10	30	70	100	0	2
PRACTICAL / SESSIONAL												
1	8DP.352	Fuel Technology & Mineral Processing Lab	0	0	2	-	30	30	50	50	1	2
2	8DP.354	Rock Mechanics Lab	0	0	2	-	30	30	50	50	1	2
3	8D.395	Practical Training Project II	0	0	0	-	-	-		100	3	3
								Total		**800**	**20**	**24**

- **** NOTE: Qualifying Non Credit Course & only Viva voce is conducted.**
- **MOOCS introduced through SWAYAM in all semester.**

Program: Diploma
Semester: Six
Course: Mine Legislation and Safety
Course Code: 8D.351

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: 8D.352

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: 8DP.352

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: Environmental Aspects of Mining
Course Code: 8D.353

L	T	P	C
3	0	0	3

Course Objective:

- Enable the students to understand the ill effect of mining activities on environment and how to reduce it.
- Upon completion of this course, the students can able to identify the new methodologies / technologies for effective utilization of renewable energy sources.

Unit I

Environmental aspects of Mining & associated Activities**:** Ecosystem structure and function, Effects on Biodiversity due to mining, Effects on water bodies, subsidence and its effect.

Unit II

Pollution and its effects: Air pollution: sources, and control measures, Noise and vibration: Sources and control measures. Water pollution: Preventive and control measures, acid rain. Soil pollution: its effect, prevention and control measures.

Unit III

Reclamation: Land Degradation due to mining & its reclamation. Various methods of reclamation and process.

Unit IV

Resource depletion: Exploitation of natural resources, over drafting, overexploitation, Environmental impact of the coal industry, exporting of hazardous waste

Suggested Reading:

1. *Mining and its Environmental Impact- R E Hester, R M Harison*
2. *Mining Environmental handbook- Jerrold J Marcus*

Program: Diploma
Semester: Six
Course: Rock Mechanics
Course Code: 8D.354

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: 8DP.354

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.

ELECTIVE -II

Program: Diploma
Semester: Six
Course: Mine and Minerals Economics
Course Code: 8D.381

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: Remote Sensing & Geo-Informatics
Course Code: 8D.382

L	T	P	C
3	0	0	3

Course Objective:

- Student will understand potential application of remote sensing/GIS applications
- Enable students to learn the background to general image processing and GIS operation in order to extract and manage spatial information
- Students will Understand advanced surveying techniques such as remote sensing and geodetic surveying

Unit I

Basic concepts of remote sensing, airborne and space borne sensors, present status of remote Sensing satellites, data acquisition techniques from different sources. Digital image processing, restoration, image enhancement,

Unit II

Segmentation feature extraction, Clustering edge detection, introduction to digital terrain modeling. Geographic Information System, introduction to microwave remote sensing and Global Positioning System.

Unit III

Application of GPS in remote sensing. Application of remote sensing. Applications of remote sensing in mineral resource identification and estimation, mine environment and ecology, post mining land reclamation, mine disaster management and reuse of mined out area

Unit IV

Use of relevant software's for remote sensing and GIS with particular reference to mining. Hands on exercises on image processing and GIS packages

Suggested Reading:

1. *Surveying and leveling Vol. I & II , T. P. Kanetkar*
2. *Surveying & Levelling , B.C. Punmia*
3. *Surveying & Levelling , Amarjit Aggarwal*
4. Remote Sensing & GIS , Basudeb

Program: Diploma
Semester: Six
Course: Engineering Economics
Course Code: 8D.383

L	T	P	C
3	0	0	3

Course Objective:

- Enable students to perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
- Students will have knowledge of liability, insurance and safety/environmental requirements on projects.
- Prepare engineering students to analyze cost/revenue data and carry out make economic analyses in the decision making process to justify or reject.
- The objectives of this course are to review with students basic economic principles with students.
- Educate the students on how to systematically evaluate the various cost elements of a typical manufactured product, an engineering project or service, with a view to determining the price offer.

Unit I

Introduction, demand and supply, statistical demand and supply analysis, managerial application of the elasticity of demand and supply.

Unit II

Estimation of production and cost function; forecasting techniques and their use for decision making at different levels; linear programming and production analysis. Price output determination: a review with special reference to condition of uncertainty, kinds of pricing problems.

Unit III

Capital market and investment decisions: pay back method, average return on investment or accounting rate of return, net present value, and internal rate of return.

Unit IV

Outline of welfare economics, resource accounting and sustainability, income determination and fluctuations.

Suggested Reading:

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

Program: Diploma
Semester: Six
Course: Principle of Management
Course Code: 8D.384

L	T	P	C
3	0	0	3

Course Objective:

- To study the rudiments of business and various types of business.
- To understand the intellectual property rights.
- To comprehend the management process, organization and different functions of management.
- To perceive the principles of human resource management and financial management.

Unit I

Overview of Business: Types of Business, Service, Manufacturing, Trade, Industrial sectors, Introduction to Engineering Industry, Process Industry, Textile Industry, Chemical Industry. Agro Industry, Globalization, Introduction, Advantages & disadvantages w.r.t India, Intellectual Property Rights I (I P R), Concept, Types of IPR.

Unit II

Management Process: What is Management? Evolution, Various Definitions, concept of management, Levels of Management, Administration and Management, Functions of management: Planning, Organizing, coordinating, Directing, controlling, decision making.
Organizational Management: Organization, Definition, Steps in forming organization, Types of Organization, Line, Line & Staff, Authority & Responsibility, Span of Control (Management).

Unit III

Human Resource Management: Personnel Management: Introduction, Definition &Function Staffing: Introduction to HR, Introduction to HR Planning, Recruitment procedure. Personnel – Training & Development: Types of training- Induction- Skill enhancement. Safety Management: Causes of Accidents, Safety Procedures.

Unit IV

Financial Management: Financial Management- Objectives & Functions, Capital Generation & Management, Types of capitals, Sources of finance.

Suggested Reading:

1. *Essentials of Management, Harold Koontz &Weirich: (Tata McGraw Hill)*
2. *Principles & Practices of Management, L.M. Prasad ,S.Chand*
3. *Management, Stephen Robbins, INS* P

Program: Diploma
Semester: Six
Course: Human Values and Ethics
Course Code: 40D.451

L	T	P	C
2	0	0	0

Course Objective:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of human beings.
- To introduce students to information about some key aspects of Indian culture and ethics.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.

Unit I

1. **VALUE CRISIS IN CONTEMPORARY INDIAN SOCIETY**
   - 1.1 Value Crisis at the Individual Level
   - 1.2 Societal Level
   - 1.3 Intellectual Level
   - 1.4 Cultural Level
   - 1.5 Value – What are they?
   - 1.6 The Indian Concept of Values.
   - 1.7 Modern Approach to the Study of Values.
   - 1.8 Aesthetic Sensibilities

Unit II

2. MORAL AND ETHICAL HUMAN VALUES

- 2.1 Bases for Moral Judgment
- 2.2 Some Canons of Ethics.
- 2.3 Virtue Ethics.
- 2.4 Ethics of Duty.
- 2.5 Ethics of Responsibility
- 2.6 Factors to be considered in Making Ethical Judgments.
- 2.7 Different Meanings of Human Values
- 2.8 A New Approach to Human Value ,Freedom, Creativity Love &Wisdom

Unit III

3. **MORAL VALUES IN PROFESSION**

3.1 What is a Profession?
3.2 Professional Ethos
3.3 Code of Professional Ethics
3.4 Practicing the Code
3.5 Corporate Social Responsibility
3.6 The Larger Domain of Human Values
3.7 Institutionalizing Ethics and Human Values

Unit IV

4. **GENDER SENSITIZATION**

4.1 Socialisation of women

4.2 Just Relationships, being together as equals

4.3 Declining sex ratio, demographic consequences

4.4 Women's work, its politics and economics, fact and fiction, unrecognized and unaccounted work

4.5 Domestic violence, eve teasing and harassment. Is home a safe place?

Recommended Texts:

1. *Dr. Rajan Mishra, Human Values: Laxmi Publications Pvt. Ltd.*
2. *S. Dinesh Babu, Professional Ethics and Human Values; Laxmi Publications Pvt. Ltd.*
3. *P.S. Rathore. Business Ethics And Communication; S.Chand Publishing*
4. *Dr. K.Alex. Managerial Skills; S. Chand Publishing.*
5. *Dr. M. Adithan, Study Skills For Professional Students For Higher Education , S.Chand Publishing*
6. *Govindarajan M "Professional Ethics and Human Values."*
7. *R.R. Gaur and R. Sangal " A Foundation Course in Human Values and Professional Ethics"*

Websites:

- www.tatamcgrawhill.com/digital Solutions/ monopoly
- www.schandedutech.com
- www.laxmipublications.com

Program: Diploma
Semester: Six
Course: Practical Training Project II
Course Code: 8D.395

L	T	P	C
0	0	3	3

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.