

JHARKHAND RAI UNIVERSITY



MINING ENGINEERING

B.Tech



SYLLABUS

SEMESTER VIII

Kamre | Ratu Road | Ranchi | Jharkhand

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B.TECH SEMESTER VIII

B.TECH IN MINING ENGINEERING												
SEMESTER VIII												
S. No	Subject code	Name of Subject	Period			Evaluation Scheme				Subject	Credit	Hours
			L	T	P	Assignm ent	T A	Tot al	ESC			
1	8.451	Mine System Engineering	3	0	0	20	10	30	70	100	3	3
2	8.452	Mine Legislation & Safety II	3	0	0	20	10	30	70	100	3	3
3	8.453	Mine Management	3	0	0	20	10	30	70	100	3	3
4	8.454	Fuel Technology & Mineral processing	3	0	0	20	10	30	70	100	3	3
5	8.456	Mine & Mineral Economics	3	0	0	20	10	30	70	100	3	3
6	ELECTIVE II (Any one of the followings subjects)											
	8.481	Coral Bed Methane Mining	3	0	0	20	10	30	70	100	3	3
	8.482	Industrial Management										
	8.483	Engineering Economics										
7	40.451	** Human Values and Ethics	2	0	0	20		30	20	50	0	2
PRACTICAL / SESSIONAL												
1	8P.454	Fuel Technology & Mineral Processing Lab	0	0	2		20	20	30	50	1	2
2	8.495	Mining project Work	0	0	5			0	0	200	5	5
									Total	850	24	25

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

Program: B.Tech
Semester: Eight
Course: Mine System Engineering
Course Code: 8.451

L	T	P	C
3	0	0	3

Course Objective:

- The students will learn the concept of system engineering and applicability in mining field.
- To study the various techniques of operations research, simulation and network analysis.
- Enables the students to know basic of system engineering concept and analysis.

Unit I

Linear Programming :Linear Programming models; Assumption of linear programming, Graphical and Simple method of solving Linear Programming Problems; Basic and Basic feasible solution, optimal solution, interpretation of SIMPLEX table. Primal and Dual Problem. Application of Linear Programming for solution of mining related problems of production planning, scheduling and blending.

Unit II

Transportation and Assignment Problem: Transportation models, Variations on Classical Transportation models, Solution. Algorithm for Transportation problem. Assignment model, Variations on Classical Assignment model; solution algorithm for Assignment problems. Application to mining problems .Project Management with PERT &CPM: Assumption of PERT and CPM; Methods of drawing network; Redundancy and identification of redundant jobs; Critical path calculation, Criticality index; Statistics related to PERT; Probability of completing a project by aduedate, Lowest cost schedule: Case studies.

Unit III

Network Models: Introduction and concept; shortest route and minimal spannial tree problems, application to mining problems. Simulation: Introduction and concept; Scope and limitation; System type versus simulation technique; Generating input data; Monte-Carlo simulation; Simulation of equipment maintenance and inventory systems in mines.

Unit IV

Inventory management: Introduction, components and nature of inventory problems; Classical E.O.Q model; EOQ mode with quantity discount; Static and dynamic inventory problems.

Suggested Reading:

1. *Numerical Methods in Engineering and Science* by Grewal B.S. and Grewal J.S
2. *Optimization: Linear Programming* by B K Mishra and B N Mishra
3. *Linear Programming: Foundations and Extensions* by Robert J Vanderbei

Program: B.Tech
Semester: Eight
Course: Mine Legislation and Safety II
Course Code: 8.452

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.

Unit I

Mine Legislation: The Mines Act, 1952; the Coal Mines Regulations, 1957; the Metalliferous Mines Regulations, 1961; the Mine Rules, 1955.

Unit II

The Mines Rescue Rules 1985: Provisions of Electricity Rules, 1961 relevant to Mining. Salient provisions of the Mines and Minerals (Development & Regulation) Act, 1957, Mineral Concession Rules, 1960, and Mineral conservation and Development Rules.

Unit III

Mine Safety: Occupational hazards of mining; Accidents and their classification; Statistics of fatal and serious accidents; Frequency and severity rates of accidents; Place-wise and Cause-wise analysis;

Unit IV

Mine Safety: Basic causes of accident occurrence; Investigations into accidents and accident reports; Measures for improving safety in mines; Cost of accidents. Introduction to safety management system and risk assessment.

Suggested Reading:

1. Central Government, Mines Act 1952, Lovely Prakashan, Dhanbad
2. Central Government, Mines Rules 1955, Lovely Prakashan, Dhanbad
3. Central Government, Coal Mines Regulation 1957, Lovely Prakashan, Dhanbad
4. Central Government, DGMS Circulars, Lovely Prakashan, Dhanbad
5. Ghatak, A Study of Mine Management Legislation and General Safety, Shining Printers, Asansol

Program: B.Tech
Semester: Eight
Course: Mine Management
Course Code: 8.453

L	T	P	C
3	0	0	3

Course Objective:

- Students gain knowledge on the basic management principles to become management(s) professional.
- Students will be acquainted with rules, laws and order for running a mine.
- At the end of the course, the student should be able to the students would be able to understand the basic application of operational tools and manufacturing.

Unit I

Introduction: Evolution of management theory and practice; Principles of scientific management; Structure and design of organization for mining enterprises.

Unit II

Personnel management: Selection, Training and Development of human resources for mining enterprises. Industrial Relations: Concepts and relevant regulations.

Unit III

Finance management: Capital budgeting techniques for mine projects; Methods of cost analysis and cost control, Break-even analysis.

Unit IV

Behavioral sciences for management: Conflicts in organization; Motivation; Leadership; Communication.

Suggested Reading:

1. *Mine Management Legislation (up to 2004)[Vol.I to VII] (Coal) by H P Soni*
2. *Hand Book of Mine Management Legislation & General Safety by R K Raman*

Program: B.Tech

Semester: Eight

Course: Fuel Technology and Mineral Processing

Course Code: 8.454

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

Fuel Technology & Solid fuels: Wood, peat, lignite, coal, anthracite; proximate and ultimate analysis; coal characteristics for different industrial uses; characteristics of Indian coals; caking and coking properties; low and high temperature carbonization. Liquid fuels: Petroleum its products and testing methods. Gaseous fuels: Natural gas, producer gas and water gas. Combustion: Combustion stoichiometry; Coal burning equipment.

Unit II

Mineral Processing & Introduction: Scope, objectives and limitations of mineral processing; Liberation and beneficiation characteristics of minerals and coal. Comminution: Theory and practice of crushing and grinding; Different types of crushing and grinding equipment, their application and limitations. Size separation: Laboratory size analysis and interpretation; Settling of solids in fluids; Industrial screens; Mechanical classifiers and hydro cyclones.

Unit III

Gravity concentration methods: Jigging, heavy media separation, flowing film concentrator's, theory, application and limitations. Froth flotation: Physico-chemical principles; Reagents; Machines; Flotation of sulphides, oxides and coal. Electrical and magnetic methods of concentration: Principles, fields of application and limitations.

Unit IV

Dewatering: Thickener and filter. Hydro-metallurgical methods of recovery: Leaching- principle, various methods and applications. Laboratory sampling. Simplified flow sheets for coal, copper, lead, zinc, gold, iron, manganese ores and lime stone.

Suggested Reading:

1. *Mineral Processing Technology* by B A Wills
2. *Introduction to Mineral Processing* by E G Kelly and D J Spottiswood
3. *Mineral Processing* by S K Jain

Program: B.Tech

Semester: Eight

Course: Fuel Technology and Mineral Processing Lab

Course Code: 8P.454

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: B.Tech
Semester: Eight
Course: Mine and Mineral Economics
Course Code: 8.456

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

Mine Economics General: Economic importance of the mineral industry; Risky nature of the mining industry; National mineral policy; Mineral price and pricing; Conservation of mineral resources. Mine Sampling: Definition, purpose and scope, methods and computations; Reliability of mine sampling. Loss of mineral in mining: Classification and estimation; Dilution and recovery .Mine examination and valuation.

Unit II

Mineral Economics Introduction: Economic importance of the mineral industry; Mining economy, risky nature of the mining industry; State and the mining industry; National Mineral Policy. Mineral resource: concept, classification and estimation. Mineral inventory: concept, characteristic features, composition and economic significance; Estimation of life index. Economic s of mineral exploration and production. Mineral price and pricing, price index .Mineral consumption and substitution; Market survey and demand analysis. Market structure, market conduct and performance. Conservation of mineral resources– scope and limitations.

Unit III

Mine sampling: Definition, purpose and scope; Sampling methods and computations; Reliability of mine sampling. Loss of mineral in mining: Classification and incorporation of losses; Coefficient of completeness of mineral extraction; Dilution and recovery. Mine examination and valuation: Examination and valuation of mines/mineral properties; present value and its computation; Acquisition and merger. Mining costs :Capital and operating costs; Factors affecting operating cost; Methods of estimating future costs; standard cost and forecast; Budget and budgetary control. Economic feasibility studies: Need for economic analysis; Time value of money; Sources of finance and the cost of capital; Data estimates ;Methods of investment appraisal; Risk analysis; Societal versus private interest economic evaluation.

Unit IV

Forms of business organization: Private and public enterprises. Mine finance: Capital– its importance, various forms and formation; Raising capital. Mine accountancy and book keeping. Royalty, taxes and duties; Imports and exports. International investment and trade in mineral materials &products. Small mines and their socio-economic significance .Common heritage – space, Antarctica and the oceans vis-à-vis India's interests. Mineral Information System.

Suggested Reading:

1. *Mine Valuation, Sparks,*

2. *Mine Sampling and Valuation, Sulchre*
3. *Mine Geology, Arogyaswami*

ELECTIVE II (ANY ONE OF THE FOLLOWING SUBJECTS)

Program: B.Tech

Semester: Eight

Course: Coal Bed Methane Mining

Course Code: 8.481

L	T	P	C
3	0	0	3

Course Objective:

- After completion of this course student will be aware of alternate fossil fuels, their production methods.
- Upon completion of this course, the students can able to identify the new methodologies / technologies for effective utilization of renewable energy sources

Unit I

Coalification process and coal grades. Methane generation and storage in coal; Geological control in Coal Bed Methane (CBM) exploration; Methane adsorption, desorption in coal.

Unit II

Coal as CBM reservoir: In-place methane estimation; Transport of methane in coal-bed. Drilling & Completion of a CBM hole/well. Identification and characterization of coal beds by hole/ well logs.

Unit III

Hydraulic fracturing in coal beds. Production performance of a CBM hole/well; Water drainage & gas-water separation. Gas volume measurement.

Unit IV

Compression & transport; Liquefaction and utilization. Enhanced recovery by CO₂ and N₂ adsorption methods.

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 [Prmod Thakur](#)
3. *Fundamentals of Coal bed Methane Reservoir Engineering* by [John Seidle](#)

Program: B.Tech
Semester: Eight
Course: Industrial Management
Course Code: 8.482

L	T	P	C
3	0	0	3

Course Objective:

- To make the students aware of the outline of managerial functions relating to manufacturing.
- At the end of the course, the student should be able to understand the basic application of operational tools and manufacturing.
- Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

Unit I

Management functions, Evolution of management theory and practice, organization.

Unit II

Formation of companies, financial analysis and costing, engineering economy, work study. Elements of Operation Research- PERT, CPM, LPP, Scheduling and Sequencing.

Unit III

Deployment and management of human resources, Product engineering, Plant location and layout, production planning and inventory control.

Unit IV

Project management, Assurance Sciences – reliability, quality and maintainability.

Suggested Reading:

1. *Industrial Management* by O.N.Pandey
2. *Industrial Management* by K. Patrai
3. *A Text Book of Industrial Management* by A.P.Verma and N.Mohan

Program: B.Tech
Semester: Eight
Course: Engineering Economics
Course Code: 8.483

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* by Dr. R.K. Singal & Er. Rishi Singal
2. *Engineering Economics* by Panneerselvam

Program: B.Tech

Semester: Eight

Course: Human Values and Ethics

Course Code: 40B.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 Socialization 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/](http://www.tatamcgrawhill.com/digital%20Solutions/) monopoly
- www.schandedutech.com
- www.laxmipublications.com

Program: B.Tech

Semester: Eight

Course: Mining project Work

Course Code: 8.495

L	T	P	C
0	0	5	5

Course Objective:

- 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.
- The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

Any project /research work related to mining area.