



SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Course: Diploma
Semester: IV

Branch: Mining and Mine Surveying
Academic Session: 2024-25

SUBJECT – MINE LEGISLATION

SUBJECT CODE – DMI041

Course Objective

The objective of this course is to familiarize students with the legal framework governing mining operations in India. Students will learn the essential laws, regulations, and guidelines that ensure safety, compliance, and sustainability in mining, preparing them to manage and operate mines within legal boundaries.

Unit 1:

Coal Mines Regulations, 2017

Preliminary definitions; Returns, Inspectors and Mine Officials; Duties and responsibilities of Mine Management, Officials, and Competent Persons; Plans and Sections; Means of Access and Egress; Winding in Shafts; Haulage; Mine Working; Precautions against Dangers from Fire, Dust, Gas and Water; Ventilation; Lighting and Safety Lamps; Explosives and Shotfiring; Machinery, Plant and Equipment; Conventions for preparing Plans and Sections.

Unit 2:

Mines Rules, 1955

Preliminary definitions; Returns, Committee; Health and Sanitation Provisions; First-Aid and Medical Appliances; Employment of Persons; Leave with Wages and Overtime; Welfare Amenities.

Unit 3:

Mines Act, 1952

Preliminary definitions; Inspectors and Certifying Surgeons; Committees; Mining Operations and Management of Mines; Provision as to Health and Safety; Hours and Limitation of Employment; Leave with Wages; Regulations, Rules and Bye-Laws; Penalties and Procedure.

Unit 4:

Metalliferous Mines regulations, 1961

Preliminary definitions; Inspection and Mine Officials; Duties and Responsibilities of Workman, competent persons and officials, etc.; Plans and Sections; Means of Access and Egress; Ladders and Ladderways; Transport of Men and Materials – Winding in Shafts; Transport of Men and Materials – Haulage; Mine Workings; Precautions against Dangers from Fire, Dust, Gas and Water; Ventilation; Lighting and Safety Lamps; Explosives and Shotfiring; Machinery and Plant.

Unit 5:

Mines Rescue Rules, 1985

Preliminary definitions; Rescue Stations and Rescue Rooms; Duties and Responsibilities of Superintendents etc.; Organisation and Equipment in Mines; Conduct of Rescue Work.



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Course Outcomes

- CO1** Adopt the latest Coal Mines Regulations to improve safety standards, operational procedures, and risk management in coal mining.
- CO2** Implement the Mines Rules to manage health, safety, and labor practices, ensuring compliance in daily mining operations.
- CO3** Apply provisions of the Mines Act to regulate working conditions, employee safety, and welfare in mining environments.
- CO4** Understand and compare key aspects of the draft CMR-2006 and Metalliferous Mines Regulation for application in coal and metalliferous mining operations.
- CO5** Apply the Mine Rescue Rules to manage and execute effective mine rescue operations, enhancing safety during mining emergencies.

Reference Books:

1. Legislation in Indian Mines (A critical Appraisal) Vol. II & I, S. D. Prasad & Prof. Rakesh
2. CMR-2017 & MMR-1961 L. C. Kaku.
3. Mines Act-1952 & Mines Rules-1955 L. C. Kaku.
4. Mines Rescue Rules-1985: DGMS



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SUBJECT – DRILLING AND BLASTING

SUBJECT CODE – DMI042

Course Objective

This course aims to provide knowledge of exploration drilling, various types of explosives, and initiating systems. It covers techniques and equipment used in drilling and blasting operations in both surface and underground mining environments, ensuring efficiency and safety.

Unit 1: Exploration Drilling

Boring for exploration, various types of exploratory drills and their applicability – auger, cable-tool, odex, core drills, and core recovery: single and double tube core barrels, wire line core barrel, storage of cores, and interpretation of borehole data.

Unit 2: Explosives and Initiating Systems

Types of explosives, their composition and properties, classification; selection of explosives, manufacture, transport, storage and handling of explosives, testing of explosives; types of initiating systems – electrical detonators, detonating fuse, detonating relays, NONEL, electronic detonators, blasting accessories, exploders.

Unit 3: Drilling and Blasting in Surface Mines

Drilling: blast hole drills – types, classification, applicability and limitations; mechanics of drilling, performance parameters, drilling cost, compressed air requirement for hole cleaning; selection of drilling systems, drilling errors, organization of drilling.

Blasting: mechanics of rock fragmentation; living stone theory of crater formation; factors affecting blasting, blast design - estimation of burden and spacing, estimation of charge requirement; initiation patterns; secondary blasting – pop and plaster shooting; problems associated with blasting, ground vibration and air over pressure, blast instrumentation.

Unit 4: Drilling and Blasting in Underground Coal Mines

Drilling systems and their applicability, blasting-off-solid, different blasting cuts, ring hole blasting, calculation of specific charge, specific drilling and detonator factor, initiation patterns.

Unit 5: Drilling and Blasting in Underground Metal Mines

Drilling systems and their applicability, blast design for horizontal drivages, different blasting cuts, long-hole blasting, vertical crater retreat blasting.



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Course Outcomes

- CO1** Understand different exploratory drilling techniques and borehole data interpretation.
- CO2** Learn about the classification, properties, and safe handling of explosives and initiating systems.
- CO3** Apply drilling and blasting techniques for surface mines, focusing on blast design, rock fragmentation, and safety.
- CO4** Understand drilling and blasting methods for coal and metal mines, including specific charge calculations and advanced techniques.
- CO5** Understand the applicability of drilling systems and blast design techniques in underground metal mining operations.

Textbooks:

1. mine drilling and blasting by S.K Das
2. mine Drilling and blasting by GKPradhan



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SUBJECT – ADVANCE GEOLOGY

SUBJECT CODE – DMI043

Course Objective

The course aims to provide in-depth knowledge of geological principles and their application in mineral exploration, mining, and geotechnical engineering.

Unit 1: Indian Stratigraphy

Principles of Stratigraphy, principles of correlation, geological timescale, Stratigraphic classification of Indian rock formations, physiographic divisions of Indian Peninsular India, Indo-Gangetic plain and Extrapeninsular India; Archaean system-a brief account of the Dharwar system, Sausor group, iron-ore group, Archaean rocks of Rajasthan, economic minerals of Archeean rocks; Cuddapah system-Cuddapah rocks of Cuddapah basin Andhra Pradesh, Delhi system economic minerals of Cuddapah rocks; Vindhyan system-a brief account of the Vindhyan rocks of North India, economic minerals of Vindhyan rocks; Gondwanas system-a brief account of the Gondwana rocks of India, economic minerals of the Gondwana rocks; Deccan traps-a brief account of the Deccan traps of India, economic importance of Deccan traps.

Unit 2: Ore Deposits

Concept of ore mineral, gangue and tenor of ores, a brief outline of the classification of ore deposits, Magmatic ore deposits early magmatic, late magmatic, Pegmatic deposits, sublimation deposits, contact Metasomatic deposits, Hydrothermal deposits classification of hydrothermal deposits cavity filling deposits, types of cavity filling deposits, replacement deposits, types of replacement deposits, Sedimentation deposits, evaporation deposits, residual deposits, mechanical concentration deposits (placer deposits), types of placer deposits, Oxidation and supergene enrichment deposits, Metamorphic deposits, Controls of ore deposition structural controls, Stratigraphic controls, physical control, physical and chemical controls, ores and mineral deposits of India.

Unit 3: Coal and Petroleum

Ranks of a coal, classification of coal-peat, lignite, bituminous coal, anthracite and cannel coal, banded constituents of coal, chemical properties of coal structural features of coal seam, origin of coal in situ theory, drift theory, formation of coal preservation, biochemical change, carbonization and metamorphism occurrence of coal in India, a brief outline of the lower gondwana coalfields, petroleum, origin of petroleum migration of petroleum, oil traps, types of oil traps, petroleum deposits of India.

Unit 4: Prospecting Methods

Ground prospecting methods a brief outline of the various prospecting methods, surface prospecting methods geological mapping, trenching, pitting, augering and wash boring, and drilling, geophysical prospecting methods elementary study of gravity, magnetic, electrical resistivity and seismic methods of geophysical prospecting.

Unit 5: Ground Water

Elementary idea of ground water occurrence of ground water, zone of aeration, saturation, water table, hydrological properties of rocks porosity and permeability, aquifer.



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Course Outcomes

- CO1** Understand geological structures, including folds, faults, and joints, and their importance in mining and exploration activities.
- CO2** Gain knowledge of various geophysical methods such as seismic, magnetic, gravity, and electrical techniques used for mineral exploration.
- CO3** Learn the fundamentals of groundwater, aquifers, and water management in mining operations, including hydrogeological investigations.
- CO4** Understand the chemical composition of the Earth's crust and the geochemical processes involved in the formation of mineral deposits.
- CO5** Learn how remote sensing and GIS techniques are applied to geological mapping and mineral exploration.

Textbooks:

1. Principles of Engineering Geology – K.M.Banger
2. A textbook of Geology – P.K.Mukherjee
3. Engineering and General Geology – Parbin Singh
4. Mineral Economics – Sinha & Sharma
5. Ground Water Hydrology – Todd.



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SUBJECT – METHOD OF WORKING COAL

SUBJECT CODE – DMI044

Course Objective

This course is designed to familiarize students with the various methods and layouts used in underground coal mining, focusing on pit top and bottom arrangements, extraction techniques, subsidence management, stowing practices, and special mining methods.

Unit 1: Pit top and Pit bottom Layouts

Ideal pit top and pit bottom layout, Tub circuit, Study of pit top and pit bottom layouts of important U/G mines of India.

Unit 2: Bord and Pillar Method

Classification of method of working, conditions for selection of method of working, bord 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 3: 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 longwall, non-cyclic longwall, different machines used, layout of DERD man power calculation, thick seam working with long wall top slicing and sub level caving, long wall caving and stowing.

Unit 4: 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.

Unit 5: Stowing

Hand packing, mechanical sands towers, hydraulic sand stowing, conditions, suitability, quality and gathering of sand, transportation of sand and storage, mixing chamber and water sand ratio, stowing practice.

Unit 6: Special Methods of Mining

Horizon mining –applicable condition, suitability, limitation & working method, hydraulic mining- applicable condition, suitability, limitation & working method, coal gasification- applicable condition, suitability, limitation & working method, thin & thick seam working.



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Course Outcomes

- CO1** Analyze the ideal pit top and bottom layouts, including tub circuits in underground coal mines.
- CO2** Understand the principles, layout, and extraction techniques of the Bord and Pillar method, including panel design and manpower calculation.
- CO3** Learn the design and operation of longwall mining systems, including cyclic and non-cyclic longwall methods and thick seam working.
- CO4** Comprehend subsidence theories and their impact on surface structures, including measurement and precautionary measures.
- CO5** Understand various stowing techniques and their suitability for underground coal mining operations.
- CO6** Explore advanced mining methods like horizon mining, hydraulic mining, and coal gasification with their practical applications.

Textbooks:

1. Elements of Mining Technology Vol I - D. J. Deshmukh
2. Modern Coal Mining Technology - S. K. Das
3. Underground Winning of Coal - T. N. Singh.
4. Mine Planning for coal - S. P. Mathur
5. Mine working part I & II - H. N. Karmakar



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SUBJECT – PRINCIPLES OF MANAGEMENT

SUBJECT CODE – DMI045

Course Objective

The course aims to provide a foundational understanding of management principles, decision-making processes, and managerial economics to equip students with the skills needed for effective resource management and productivity enhancement in industrial settings.

Unit 1: Management Concept

Management, Administration and Organization Difference and Relationship between Organization Management and Administration. Importance of Management, Characteristics of Management.

Unit 2: Management

Scientific Management, Principles of Management, Process of Management, Functions of Management, Levels of Management, Project Management.

Unit 3: Decision Making

Introduction and Definition, Types of Decisions, Techniques of Decision Making, Decision making under certainty, Decision making under uncertainty, Decision Making under risk.

Unit 4: Managerial Economics

Introduction, Factors Influencing Manager, Micro and Macro-economics, Theory of the Cost, Theory of the Firm, Theory of Production Function.

Unit 5: Productivity

Input-Output Analysis, Micro-economics Applied to Plants and Industrial Undertakings, Production and Production system, Productivity, Factors affecting Productivity, Increasing Productivity of Resources.



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Course Outcomes

- CO1** Understand the concepts and distinctions between management, administration, and organization, and recognize the importance and characteristics of management.
- CO2** Explain scientific management principles and the functions, processes, and levels of management, including project management.
- CO3** Apply various decision-making techniques under conditions of certainty, uncertainty, and risk.
- CO4** Analyze the factors influencing managerial decisions and understand micro and macroeconomics concepts relevant to managerial roles.
- CO5** Evaluate productivity factors and apply input-output analysis to industrial production systems to increase resource efficiency.

Textbooks:

1. The Practice of Management Peter Drucker Harper and Row
2. Essentials of Management: Koontz, Prentice Hall of India
3. Management Staner, Prentice Hall of India
4. Principle and Practice of Management T.N. Chhabra, Dhanpat Rai New Delhi



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SUBJECT – DRILLING AND BLASTING LAB

SUBJECT CODE – DMI042P

S. No.	List of Experiments
1	Study of rotary drilling method
2	Study of Percussive drilling method
3	Study of bulk explosive.
4	Study of various blasting tools.
5	Design of blast for underground coal face
6	Measurement of ground vibration by seismograph.
7	Measurement of VOD by VOD meter and analysis.
8	Study of different types of exploder used for blasting.

References:

1. Mine explosives and practical blasting techniques by L.C. Kaku
2. Mine drilling and blasting by S.K. Das



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SUBJECT – ADVANCE GEOLOGY LAB

SUBJECT CODE – DMI043P

S. No.	List of Experiments
1	Plotting of important mine locations on map of India.
2	Preparation of Stratigraphic columns to ascending order of rocks of Paleozoic (Gondwana super group).
3	Preparation of Stratigraphic columns to ascending order of rocks of Precambrian (Dharwar super group, Cuddpah super group, Vindhyan super group)
4	Preparation of Stratigraphic columns to ascending order of rocks of Mesozoic (Triassic of Spiti, Jurassic of Kutch, Cretaceous rock of Trichinopoly).
5	Plotting of important petroleum deposits location on map of India.
6	Study of common ore minerals in hand Specimens: - <ol style="list-style-type: none">Iron – magnetite, hematite, pyriteManganese – pyrolusite, psilomelaneCopper – chalcopyrite, chalcocite, malachite, cuprite, azurite.Lead, zinc and tin – galena, sphalerite, cerussiteAluminium – bauxite



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SUBJECT – METHOD OF WORKING COAL LAB

SUBJECT CODE – DMI044P

S. No.	List of Experiments
1	To sketch and describe a pit top layout for coalmine.
2	To sketch and describe pit bottom lay out for coalmine.
3	To plan an underground coal mine (bord & pillar method) under given conditions and required output.
4	To plan an underground coal mine (Longwall working) under given conditions and required output.
5	To sketch the general arrangements of sand stowing plant.
6	To sketch the stowing arrangements from surface to underground stowing site.
7	To sketch and describe the pneumatic and mechanical stowing.
8	To calculate the dimensions of a shaft pillar under given conditions and to sketch the same.
9	To sketch a section of Horizon Mining.
10	To study of Hydraulic Mining.
11	To study of Coal Gasification.