SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

SUBJECT – MINE ENVIRONMENT – I

SUBJECT CODE – BMI041

Course Objective

The course aims to provide an understanding of mine atmospheres, gases, ventilation, and environmental control systems. It equips students with knowledge of detection methods, safety measures, and ventilation devices to ensure safe and healthy working conditions in mining operations.

Unit 1: Mine Atmosphere

Mine gases, their origin, occurrence, physiological effects and detection, calibration of detectors, methane drainage, system for monitoring of mine environment by tube bundle apparatus and telemonitoring systems, analysis of mine air by haldane apparatus, gas chromatograph, heat and humidity in mine atmosphere, their sources and effects, cooling power of mine air, assessment of comfort conditions, air conditioning of mines.

Unit 2: Drivage of Inclines/Drifts/Adits

Types of openings, choice of openings, location of openings, drilling, blasting, loading and transportation of muck during drivage of inclines/adits/drifts, ventilation, lighting and drainage, extension of center line, organization and cycle of operations, mechanized methods of drivages of inclines/adits/drifts.

Unit 3: Shaft Sinking and Theory of Ventilation

Drilling, blasting, loading and transportation of muck, ventilation, lighting and drainage, extension of center line, shaft lining and its design, special methods of shaft sinking, shaft boring, deepening and widening of shafts, objects and standards of ventilation, flow of air in ducts and mine roadways, resistance of air ways, laws of ventilation, Chezy's and Atkinson's equations, equivalent resistance and equivalent orifice of mine.

Unit 4: Mine Ventilation and Ventilation Devices

Natural ventilation pressure and its measurements, thermodynamics of natural ventilation & mechanical ventilation, distribution and control of air current, doors, regulators, stoppings and their types, air crossings, air locks.

Unit 5: Flame Safety Lamps and Mine Illumination

Constructional details of flame safety lamp, gas testing by flame safety lamp, types of portable lamps, their maintenance and examination, lamp room design and organization, lighting from mains, photometry and illumination surveys, standards of illumination for underground and open cast working as per CMR-2017.

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School of Engineering and Technology

Syllabus

Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

Course Outcomes

CO1 Understand the occurrence, detection, and effects of mine gases, and methods for monitoring the mine environment.

CO2 Learn methods for the drivage of inclines, adits, and drifts, including drilling, blasting, and ventilation techniques.

CO3 Apply shaft sinking techniques and ventilation theory to improve air quality and safety in mines.

CO4 Implement natural and mechanical ventilation systems and devices for effective air distribution.

CO5 Understand the construction and use of flame safety lamps, portable lamps, and mine illumination systems.

Textbooks:

1. Elements of Mining Technology, Vol. II; D.J. Deshmukh
2. Mine Environment & Ventilation; G.B. Misra

Reference Books:

1. Mine Ventilation, UMS
2. Subsurface Mine Ventilation; M. J. McPherson
3. Principles and Practices of Modern Coal Mining; R.D. Singh

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Syllabus

Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

SUBJECT – ADVANCE GEOLOGY – II

SUBJECT CODE – BMI042

Course Objective

The course aims to deepen students' understanding of stratigraphy, Indian geology, and economic geology. It also introduces methods of prospecting and exploration, focusing on mineral deposits, their classification, and distribution.

Unit 1: Stratigraphy

Introduction, definitions and basic principles of stratigraphy, units of stratigraphy, criteria for stratigraphic classification and correlation, standard geological time scale, fossils- elementary idea about their conditions, modes of their preservation and their uses, broad palaeontological groups of animals and plants, brief palaeontological study of gondwana fields.

Unit 2: Indian Geology

Major geomorphic divisions of india, general review of indian stratigraphy, descriptions of important indian geological formations – archeans, cuddapahs, vindhyans, gondwanas and tertiaries.

Unit 3: Economic Geology – I

Introduction and scope of the subject, fundamental terms and their definitions, distribution and morphology of minerals deposits, brief review of the processes of mineral formation and the genetic classification of mineral deposits.

Unit 4: Economic Geology – II

Mode of occurrence, origin, distribution, association and industrial uses of important metallic (Au, Al, Cu, Fe, Mn, Sn, Pb And Zn) and Non-Metallic (Diamond, Mica, Radioactive Minerals, Gypsum, Dolomites, Fire-Clay, Magnesite, Talc, Asbestos, Graphite, Kyanite, Sillimanite, Corundum, Fluorite, Phosphorite, Precious and Semi Precious Stones) Minerals, Petroleum Deposits of India.

Unit 5: Prosecting and Exploration

Prospecting and exploration – their definitions and classification of methods, elementary methods of geological, geophysical, geochemical prospecting, guides to ores – physiographical, mineralogical, stratigraphical and structural guides to ores.

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School of Engineering and Technology

Syllabus

Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

Course Outcomes

CO1 Understand the basic principles of stratigraphy and its application in geological classification and fossil study.

CO2 Gain knowledge of Indian geological formations and the major geomorphic divisions of India.

CO3 Learn the processes and classifications related to mineral deposit formation and economic geology.

CO4 Understand the characteristics, origin, and industrial uses of important metallic and non-metallic minerals.

CO5 Apply basic prospecting and exploration methods for identifying and locating mineral deposits.

Textbooks:

1. Fundamentals of Historical Geology and Stratigraphy of India: RavindraKumar
2. Geology Of India and Burma: M.S.Krishnan
3. Economic Mineral Deposits: M.L.Jensen& A. Bateman
4. India's Mineral Resources: S. Krishnaswamy
5. Geophysical Prospecting: M.Dorbin& B. Miller
6. Courses in Mining Geology: Arogyaswamy
7. Applied Geology: S.Banger

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School of Engineering and Technology

Syllabus

Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

SUBJECT – UNDERGROUND COAL MINING

SUBJECT CODE – BMI043

Course Objective

The course aims to provide a comprehensive understanding of coal formation, classification, and the techniques used in underground coal mining, including board and pillar, longwall, and thick seam mining methods. It also covers safety challenges and advanced mining techniques.

Unit 1: Introduction

Origin of coal, theories of coal formation, classification of coal, coaking coal, coal seam and its classification, coal seam structures and abnormalities like faults, joints, cleats, folds etc., coal measuring rocks and their characteristics, distribution of coal in india, indian coal mining industry; choice of coal mining methods.

Unit 2: Bord and Pillar Method

Important terminology, development size and shape of the pillar, galleries as per CMR-2017 panel and without panel system of development, size of panel, cycle of operation, depillaring, problems in depillaring, preparatory arrangements, depillaring by stowing, depillaring by caving methods, pillar extraction techniques, dangers associated with depillaring.

Unit 3: Longwall Mining

Important terminology, types of longwall faces and their choice, merits and demerits of longwall mining, development of longwall panels and faces, longwall advancing method, longwall retreating method, length of longwall faces, rate of face advance, double unit longwall faces, face organization and material supply.

Unit 4: Thick Seam Mining

Problem in mining of thick seams, choice of thick seam mining methods, inclined slicing, horizontal slicing, diagonal slicing, transverse slicing, sublevel caving, blasting gallery method, cable-bolting method of thick seam extraction.

Unit 5: Room and Pillar Mining

Vermelles method, slant method, sublevel method, coal saw method, mining of contiguous seams, mining of steeply inclined seam, mining under water, mining of seams prone to spontaneous heating, bumps, air blast etc.

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School of Engineering and Technology

Syllabus

Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

Course Outcomes

CO1 Understand the origin, classification, and distribution of coal, along with abnormalities and structures of coal seams.

CO2 Learn the principles and techniques of the Board and Pillar mining method, including development and depillaring processes.

CO3 Understand the development and extraction processes of longwall mining and analyze its advantages and limitations.

CO4 Explore various methods for mining thick seams, including slicing and caving techniques.

CO5 Understand the room and pillar mining method and specialized techniques for challenging seam conditions.

Textbooks:

1. Principle and practices of modem Coal Mining — R.D.Singh
2. Coal Mining in India — S.P.Mathur

Reference Books:

1. Wining & working coal — R.T.Deshmukh
2. U/G winning of Coal — T.N.Singh

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

SUBJECT – MECHANICS OF SOLIDS AND FLUID MECHANICS

SUBJECT CODE – BMI044

Course Objective

This course aims to provide students with foundational knowledge in stress-strain relationships, bending stresses, beam deflection, and the principles of fluid mechanics, preparing them for practical applications in mining and mechanical engineering contexts.

Unit 1: Concept of Stress and Strain

Stress and strain at a point; Axial and shear stresses' Ultimate a working stress; Relation between stress and strain' Poisson's Ratio; Two-dimensional state of strain' Principle stresses and Principle planes' Mohr's Circle' Two state of strain' Principle strains and principle axis of strain; Determination of Principle strain from strain measurements; Calculation of Principle stresses from; Principle strains; Composite bars in tension and compassion; Thermal stresses in composite bars.

Unit 2: Bending Stresses in Beams and Plates

Pure bending' Bending Stresses' Section Modulus of rolled and built up sections; Composite beams' Distribution of normal and shear stresses across the section of a simple beam with vertical section of symmetry; Theory of plates.

Unit 3: Deflection of Beams

Slope and deflection of beams by deflection methods; Area moment and conjugate beam methods' propped cantilever and fixed beams.

Unit 4: Introduction to Fluid Mechanics

Physical properties of fluids; Compressible and Incompressible fluids; Newtonian and Non- Newtonian fluids.

Unit 5: Fluid Statics

Pressure, density and height relationships; manometer pressure on curved and plane surfaces; Centre of Pressure; Buoyancy; Stability of Immersed and Floating bodies; Fluids in relative equilibrium.

Unit 6: Fluid Kinematics

Classification of flow: Uniform and Non-Uniform; Steady and Non- Steady; Laminar and Turbulent; One, Two, Three dimensional flows; Stream lines; Streak lines; Path lines; Stream Tubes; Elementary Explanation of stream function and velocity potential; Basic idea of flow nets.

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

Course Outcomes

CO1 Understand the concepts of stress and strain, principal stresses, and thermal stresses in composite bars.

CO2 Analyze bending stresses in beams and plates, and apply the theory of plates and section modulus.

CO3 Calculate the slope and deflection of beams using deflection methods and conjugate beam methods.

CO4 Explain the properties of fluids and distinguish between compressible, incompressible, Newtonian, and non-Newtonian fluids.

CO5 Analyze fluid statics, including pressure relationships, buoyancy, and the stability of floating bodies.

CO6 Classify fluid flow types and apply basic concepts of fluid kinematics, including streamlines and flow nets.

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Textbooks:

1. Strength of material by B.C. Punmia
2. Strength of material by Ramamurtham
3. Fluid Mechanics by Bansal

References:

1. Fluid Mechanics, F. M. White

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School of Engineering and Technology

Syllabus

Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

SUBJECT – DRILLING AND BLASTING

SUBJECT CODE – BMI045

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.

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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: blasthole 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; livingstone 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 Mines

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.

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

Unit 5: Alternate Rock Breaking Systems

Substitutes for explosives and their applications – hydrox, cardox, hydraulic coal burster, airdox, pulsed infusion shot firing.

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School of Engineering and Technology

Syllabus

Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

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 Explore and evaluate alternate rock-breaking systems such as hydrox, cardox, hydraulic coal burster, and airdox, focusing on their applications and effectiveness.

Textbooks:

1. Mine Drilling and Blasting by S.K.Das
2. Mine Drilling and Blasting by G.K.Pradhan

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School of Engineering and Technology

Syllabus

Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

SUBJECT – MINE ENVIRONMENT – I LAB

SUBJECT CODE – BMI041P

S. No.	List of Experiments
1	Detection of presence and accumulation of Firedamp in mine atmosphere.
2	Detection of presence and accumulation of CO in mine atmosphere.
3	Study of various techniques of methane drainage
4	Study of surface air conditioning plant.
5	Study of underground air conditioning plant
6	Study of different types of ventilation devices
7	Study of cap lamps used in underground mine
8	Study of Flame safety lamps used in underground mine.
9	Design of a cap lamp room for a large underground coal mine.

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School of Engineering and Technology

Syllabus

Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

SUBJECT – ADVANCE GEOLOGY – II LAB

SUBJECT CODE – BMI042P

S. No.	List of Experiments
1	Megascopic Description and Distribution of Ore Forming Minerals:- Iron-magnetite, hematite, pyrite, Manganese-pyrolusite, psilomelane, Copper-chalcopyrite, chalcocite, malachite, cuprite, azurite., Lead, zinc and tin-galena, sphalerite,cerussite, Aluminium-bauxite.
2	Megascopic Study of the following plan Fossils: Glossopteris, gangamopteris, vertebraria, ptilophyllum, williamsonia, schizoneura.
3	Description and identification of following fossils:- Mollusca:-lamellibranchia-gryphea,pecten,venus.gastropoda-conus,physa,murex,natica.cephalopoda goniatites, ceratites, nautilus. Brachiopoda-lingula, productus, spirifer, terebratula., Echinodermata-hemiaster, micraster, Trilobite-calymene, aradoxide,phacops. Graptolite-monograptus, diplograptus.
4	Preparation of stratigraphc columns to ascending order of rocks of paleozoic(Gondwana super group).
5	Preparation of stratigraphc columns to ascending order of rocks of Precambrian (dharwar super group, cuddpah super group, Vindhyan super group).
6	Preparation of stratigraphc columns to ascending order of rocks of Mesozoic (Triassic of spiti, jurassic of kutch, cretaceous rock of Trichinopoly).
7	Plotting of important mine locations on map of India.

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Course: B.Tech **Branch:** Mining Engineering
Semester: IV **Academic Session:** 2024-25

SUBJECT – MECHANICS OF SOLIDS AND FLUIDS MECHANICS LAB

SUBJECT CODE – BMI044P

S. No.	List of Experiments
1	Determination of Compressive strength of cement cube.
2	Determination of tensile strength of cement cube.
3	Determination of fineness of cement by sieving method.
4	Determination of fineness of cement by Blain Apparatus.
5	To Determine Uni-axial tensile test of mild steel.
6	To determine Izod or Charpy Value of given mild steel.
7	To determine the Rockwell Hardness of given material.
8	To determine Compressive strength of wood: (a) Along the fiber and (b) Across the fiber.
9	To study the cupping test machine and determination of Ercheser value of mild steel sheet.
10	To determine the meta-centric height of a ship model.
11	To calibrate an orifice-meter.
12	To determine the head loss in various pipe fittings.
13	To determine the coefficient of discharge of a mouthpiece.
14	To Study the variation of friction factor for pipe flow.
15	To verify the Bernoulli's theorem.

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SUBJECT – DRILLING AND BLASTING LAB

SUBJECT CODE – BMI045P

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