SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

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

SUBJECT – SURFACE MINING – I

SUBJECT CODE – BMI051

Course Objective

The objective of this course is to provide students with a comprehensive understanding of surface mining operations, including key concepts, equipment selection, and productivity evaluation. By the end of the course, students will be able to design and optimize surface mining layouts and operations, ensuring safe and efficient extraction of mineral resources.

Unit 1: Introduction to Surface Mining

Definition of important terms, Advantages and disadvantages of surface mining, mineral deposits amenable to surface mining, Various surface mining methods, Introduction to unit operations in surface mining. Introduction to various types of machineries used in surface mining.

Unit 2: Open Pit Design and Layouts

Classification of surface mining method mineral deposits suitable for open pit mining, Important parameters of Open pit design; Design of Benches, Ultimate pit, Stripping ratio, Break even stripping ratio, Different methods of opening up the deposits; Box cuts, internal and external box cut, Methods of driving Box cuts; Layout of open pits; Layout of waste dumps, unit operations in opencast mining.

Unit 3: Exploratory & Rock Drilling

Theory of Rock Drilling, Different Types of Drill Machines Used in Open Pits; Rotary, Percussive and Rotary Percussive Drilling, Selection of Drill Machines on the basis of Drillability; Computation of Productivity of Drill Machines; Inclined Drilling; their Advantages and Disadvantages. Drilling machines used for exploratory drilling viz. Rotary & Percussive, their attachments; Core Barrels; Conditions of applicability of drilling methods; Borehole Survey, Directional drilling, Underground methods of exploratory drilling.

Unit 4: Pit preparation, Loading and Excavation

Dozers, Scrapers, Front-End Loaders, Grader, Back Hoe, etc.; their Construction, Operation, Suitability and applicability; Calculation of Their Productivity Different Types of Excavators used in Open Pits; Shovel, Dragline, Hydraulic Excavators, Multi Bucket Excavators, their Construction, Specifications, Operation, Suitability and Applicability; Calculation of their Productivity.

Unit 5: Transport in open pits

Automobile Transport, Rail Transport and Conveyors; their Suitability; Computation of their Productivity; Automation in Open Pit transport such as Truck Dispatch System.

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Syllabus

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

Course Outcomes

CO1 Define key surface mining terms, assess advantages and disadvantages, and identify suitable deposits and equipment used in surface mining operations.

CO2 Design open pits by analyzing bench parameters, stripping ratios, and box cuts, and plan efficient layouts for waste dumps and unit operations.

CO3 Select appropriate drilling methods and equipment based on rock drillability, and compute the productivity of drilling machines in open-pit mining.

CO4 Evaluate and calculate the productivity of dozers, scrapers, excavators, and loaders for excavation and loading operations in surface mines.

CO5 Analyze the suitability and productivity of various transport systems, including trucks, rail, and conveyors, and explore automation in open-pit transport systems.

Textbooks:

1. G.B. Mishra, “Surface Mining”
2. Martin, “Surface mining equipment”

Reference Books:

1. Pfleider, “Surface Mining”
2. Boki, “Mining Equipment”
3. Hartman, “SME handbook”
4. S. K. Das, “Surface Mining Technology”

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School of Engineering and Technology

Syllabus

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

SUBJECT – MINE SURVEYING – II

SUBJECT CODE – BMI052

Course Objective

The objective of this course is to provide students with a comprehensive understanding of surface mining operations, including key concepts, equipment selection, and productivity evaluation. By the end of the course, students will be able to design and optimize surface mining layouts and operations, ensuring safe and efficient extraction of mineral resources.

Unit 1: Theodolite Surveying

Types of Theodolites; Description of various parts of a Vernier's Theodolite; Requirements of Mining type Theodolites; Measurements of height and distances of accessible and inaccessible points; Traversing with Theodolite on surface and underground; Checks on Closed and Open traverses; Balancing of traverses; Temporary & Permanent adjustments of Theodolites; Sources of errors and their prevention.

Unit 2: Tacheometry

Principles of Stadia Methods; Determination of constants; Theory of anallactic lens; Distance and elevation formulae, Subtense and Tangential Methods; Auto- Reduction Tacheometer.

Unit 3: Setting Out

Setting out simple curves on surface and in underground; Elementary knowledge of compound and transition curves; joint boundary survey; Equalization of boundaries; Maintenance of direction and gradient of roadways i.e. marking and checking of center line and grade line, transfer of point from roof to floor and floor to roof

Unit 4: Errors & Problems

Computation of areas and volumes; Earthwork calculation; Problems based on Coordinates, faults, Dip- Strike and boreholes; Sources, classification and relative importance of errors, their prevention and elimination, theory of errors, adjustment of errors.

Unit 5: Plans & Sections

General requirements of mine plans; types of plans; Symbols used in mine plans; preparation of plans & sections; Plotting of traverse; Checking accuracy of old mine plans; Planimeter and its uses; Enlargement & reduction of plans.

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School of Engineering and Technology

Syllabus

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

Course Outcomes

CO1 Use theodolites for surface and underground traversing, measure heights and distances, and apply adjustments to prevent errors in surveying operations.

CO2 Apply stadia and tacheometric methods to determine distances and elevations, using anallactic lenses and auto-reduction tacheometers for accurate surveying.

CO3 Set out simple and compound curves in surface and underground environments, maintain roadway gradients, and perform joint boundary surveys.

CO4 Compute areas, volumes, and earthwork, identify and adjust survey errors, and solve problems related to coordinates, faults, dips, strikes, and boreholes.

CO5 Prepare, check, and update mine plans and sections using standard symbols, traverse plotting, and tools like planimeters for enlargement and reduction of plans.

Textbooks:

1. Frederick Winniberg, *"Metalliferous Mine Surveying"*
2. T.P.Kanethar & S.V.Kulkarni, *"Surveying and leveling Vol-I"*
3. B.C. Purmia, "Surveying- Vol-I"

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School of Engineering and Technology

Syllabus

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

SUBJECT – MINE LEGISLATION AND SAFETY – I

SUBJECT CODE – BMI053

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: Introduction to Mines Acts, Rules and Regulations

Introduction to Acts, Rules & Regulation applicable to Mining Industry, Development of mining legislation in India.

Unit 2: 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; Miscellaneous.

Unit 3: Mines Rules – 1955

Preliminary definitions; Returns, Committee; Court of Enquiry; Inspectors and Certifying Surgeons; Health and Sanitation Provisions; First-Aid and Medical Appliances; Employment of Persons; Leave with Wages and Overtime; Welfare Amenities; Registers, Notices and Returns; Miscellaneous; Rescission and Savings.

Unit 4: Coal Mines Regulations –2017

Preliminary definitions; Returns, Notices and Records; Examination and Certificates of Competency and of Fitness; 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; Extraction of Methane from Working Coal Mine or Abandoned Coal Mine; Miscellaneous; Conventions for preparing Plans and Sections.

Unit 5: Introduction to draft CMR-2006 & Metalliferous Mines Regulation-1961

Preliminary definitions; Returns, Notices and Records; Examinations and Certificates of Competency and of Fitness; 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; Miscellaneous.

Unit 6: Mine Crèche Rules 1966

Preliminary definitions; Standards for Creches; Use of the Creche; Provision of Staff.

Unit 7: Mine 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; Miscellaneous.

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Syllabus

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

Course Outcomes

CO1 Understand the development of mining legislation in India and its role in ensuring compliance, safety, and sustainability in mining operations.

CO2 Apply provisions of the Mines Act to regulate working conditions, employee safety, and welfare in mining environments.

CO3 Implement the Mines Rules to manage health, safety, and labor practices, ensuring compliance in daily mining operations.

CO4 Adopt the latest Coal Mines Regulations to improve safety standards, operational procedures, and risk management in coal mining.

CO5 Understand and compare key aspects of the draft CMR-2006 and Metalliferous Mines Regulation for application in coal and metalliferous mining operations.

CO6 Ensure compliance with Mine Crèche Rules to provide essential welfare facilities for the children of mine workers, promoting a safe working environment.

CO7 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-1957 & MMR-1961 L. C. Kaku.
3. Mines Act-1952 & Mines Rules-1955 L. C. Kaku.
4. Vocational Training Rules L. C. Kaku.
5. Mine Accidents S.J. Kejeriwal

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School of Engineering and Technology

Syllabus

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

SUBJECT – MINERAL PROCESSING

SUBJECT CODE – BMI054

Course Objective

The objective of this course is to provide students with a solid understanding of the principles and techniques used in mineral processing, focusing on optimizing ore beneficiation and maximizing resource recovery. Through this course, students will learn how to apply various methods to process and concentrate minerals, ensuring the efficient use of resources in mining operations.

Unit 1: Comminution

Introduction, definition, scope and economic justification, main steps in ore dressing operations, Comminution, crushing, principles of crushing, jaw crushers, gyratory crushers, cone crushers, roll crushers, gravity stamps their classifications and applications, grinding principles of grinding, application and classification of ball mills, rod mills, tube mills and pebble mills.

Unit 2: Sizing

Object of sizing, scale of sizing, laboratory sizing, screening and classification, different type of screens, their mode of operations and application and limitation, classification- principles of classification, movement of solids through fluids, different types of classifiers, hydraulic and pneumatic classifiers, sampling-importance of sampling and methods used.

Unit 3: Gravity Concentration

Jigging, flowing film concentrators like spirals and shaking tables, heavy media separation, applications and limitations of methods.

Unit 4: Flotation

Physico-chemical principles, function of various flotation reagents, important machines, their principles, and working, flotation of sulphide, oxide and non sulphide ores.

Unit 5: Processing Methods of Some Common Minerals

Electrostatic and Magnetic Separation - Principle operation and field of application, Pelletisation of low grade iron ore, Drying and dewatering - thickening, filtration and drying. Coal washing; Simplified flow sheets for beneficiation of coal and typical ores of copper, lead, zinc, iron and manganese with special reference to Indian deposits

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Syllabus

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

Course Outcomes

CO1 Apply crushing and grinding principles to optimize the comminution process using crushers and mills, improving the efficiency of ore reduction in mining operations.

CO2 Utilize sizing techniques, screens, and classifiers to separate minerals by size and density, ensuring effective processing and classification of ore particles in mining.

CO3 Implement gravity concentration methods like jigging, spirals, and heavy media separation to recover valuable minerals from ore, maximizing yield in mineral processing.

CO4 Apply flotation techniques, using reagents and machines, to concentrate sulphide, oxide, and non-sulphide ores, improving recovery in mineral beneficiation.

CO5 Use electrostatic and magnetic separation, pelletization, and coal washing techniques for the beneficiation of common minerals, focusing on Indian deposits for optimal resource utilization.

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Textbooks:

1. Ore Dressing by Gaudin
2. Ore Dressing by B. A. Wills

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Syllabus

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

SUBJECT – MINING MACHINERY – I

SUBJECT CODE – BMI055

Course Objective

The objective of this course is to provide students with a comprehensive understanding of mining machinery and equipment used in various mining operations. Students will learn how to select, operate, and maintain critical mining equipment, ensuring safe and efficient transportation, ore extraction, and dewatering processes in mining.

Unit 1: Wire Rope

Wire ropes used in Mines and their installation, Application of wire ropes in Mines, Testing of wire ropes, Factor of safety, Examination of Wire ropes, Care of wire ropes. Ropes splicing: Rope capels

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Unit 2: Haulage

Different systems of rope haulage, rope haulage calculations, safety devices, tubs, haulage road and manholes, locomotive haulage and calculations based on it, track laying, mine cars.

Unit 3: Winding - I

Head gear arrangement, shaft fittings, safety devices, cages & skips, their suspension arrangements. Location of winding engine.

Unit 4: Winding – II

Electric winders, winding drums, types of construction, duty cycle, mechanical & electrical breaking, safety devices on winders, Electrical & Electronic methods of speed control, Multi level winding; automatic winding, Torque- time & power- time diagram; calculation for winding. Pit top and pit bottom arrangements.

Unit 5: Pumping

Sources of mine water, types of pumps, design calculations, characteristics, operation, maintenance and selection, pump fittings, special types of pumps used in mines.

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

Course Outcomes

CO1 Understand the application, testing, and care of wire ropes in mines, including safety factors and splicing methods to ensure operational efficiency and safety in hoisting and haulage.

CO2 Apply different rope haulage systems, conduct haulage road and locomotive calculations, and implement safety devices to ensure effective and safe transportation of minerals and workers in mines.

CO3 Design and assess headgear arrangements, shaft fittings, and suspension systems for cages and skips, ensuring proper location and function of winding engines for safe ore lifting and personnel transport.

CO4 Operate and maintain electric winders, understand mechanical and electrical braking systems, and apply methods for speed control and automatic winding to enhance productivity and safety in shaft mining.

CO5 Select and maintain appropriate pumps to manage mine water effectively, perform design calculations, and ensure continuous dewatering operations for safe mining environments.

Textbooks:

1. D. J. Deshmukh, “Elements of Mining Tech. Vol I & Vol III”
2. S. C. Walker, “Mining Machinery”
3. Stathum, “Coal Mining Practice”

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Syllabus

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

SUBJECT – MINE SURVEYING – II LAB

SUBJECT CODE – BMI052P

S. No.	List of Experiments
1	Study of Vernier Theodolites
2	Angle measurement by repetition methods
3	Angle measurement by reiteration methods
4	Measurement of height of accessible and inaccessible point by trigonometric surveying
5	Determination of stadia constant
6	Distance and elevation determination by Tacheometric surveying
7	Setting out of circular curve by chord and offset method
8	Setting out of circular curve by Rankine's method
9	Study of Planimeter
10	Study of Pantagraph / Ediograph.

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Syllabus

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

SUBJECT – MINERAL PROCESSING LAB

SUBJECT CODE – BMI054P

S. No.	List of Experiments
1	Study of Jaw crusher
2	Study of Roll crusher
3	Study of grinding mills
4	Study of Akins's classifier
5	Study of shaking table
6	Study of Mineral jig.
7	Study of Spiral concentrator
8	Study of Floatation cell
9	Study of Thickeners
10	Study of Washability curves

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Syllabus

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

SUBJECT – MINING MACHINERY – I LAB

SUBJECT CODE – BMI055P

S. No.	List of Experiments
1	Study of Different types of Rope Capels
2	Study of Rope Splicing
3	Study of Clifton pulley
4	Study of various safety devices on rope haulages
5	Study of Exhaust Conditioner on a diesel locomotive
6	Study of Cage Suspension Gear
7	Study of Detaching Safety Hook
8	Study of Lilly Controller
9	Study of Turbine Pump
10	Study of a Balancing Disc

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

SUBJECT – COMPUTER AIDED MINE PLANNING LAB

SUBJECT CODE – BMI058P

S. No.	List of Experiments
1	**Study of mine closure plan** Introduction, EIA (Environmental Impact Assessment), sustainable development framework (SDP), Estimation of mine closure plan, CMR-2017 & MMR 1961, Rules and Regulation of mine closure plan.
2	**Study of mine reclamation methods** Introduction, cost estimation of mine reclamation, factor affecting mine reclamation, parameters used in mine reclamation analysis.
3	**Study & mine planning software-SURPAC** Introduction, SURPAC user interface, geographical database tables, impacting database tables, drill holes styling, drill hole display option.
4	**Study & mine planning software-MINEX** Introduction, MINEX in survey, import CSV files to string, create triangle, contouring and volume calculation, import CAD file into MINEX, import image files in MINEX**.**
5	**MINEX in Geology and plotting** Create boreholes, create geological database, display the database, splitting on seam and interpolate missing seam, create multi seam, multi variable gridding from unfaulted model, detailed resource planning, MINEX in plotting: plot borehole log, plot section, plot surface plan, plot floor contour plan for seam**.**

Equipment/Machines/Instruments/Tools/Software Required:

1. GEOVIA Surpac – Mine Planning Software
2. GEOVIA Minex – Geology and Mine Planning software for Coal and Stratified Deposits