SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Course: Diploma
Branch: Mining and Mine Surveying
Semester: VI
Academic Session: 2024-25

SUBJECT – MINE SAFETY AND MANAGEMENT

SUBJECT CODE – DMI061

Course Objective

This course aims to provide students with knowledge of safety principles, accident prevention, and effective safety management techniques specific to mining operations, ensuring safe and healthy work environments.

Unit 1: 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 drive and organization of safety in the mines/area etc.

Unit 2: Safety Aspects in Mines

Accidents classification and analysis, safe condition, unsafe condition, mine safety, safety objectives, major factors to be considered for safety, safety week, pit safety committee, safety organization and safety policy.

Unit 3: Personal Protective Equipment

Introduction to PPE, need of PPE, Indian standards, and factors of selection of PPE.

Unit 4: Occupational Health and Ergonomics

Occupational health hazards in mining, prevention of occupational diseases in mines, ergonomics and human factors in mining operations.

Unit 5: Safety management and Leadership in Mining

Role of safety culture, safety week-based programs, safety communication and reporting systems, case studies of successful management in mines.

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

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Syllabus

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Course Outcomes

CO1 Understand the classifications, causes, and prevention methods for various mine accidents related to roof falls, explosions, and other hazards.

CO2 Analyze accident causes and develop strategies for maintaining safe mine conditions and organizing safety initiatives.

CO3 Learn about Personal Protective Equipment (PPE), including selection criteria and relevant Indian standards.

CO4 Address occupational health hazards and apply ergonomics principles to enhance worker safety in mining.

CO5 Explore safety management techniques and leadership in mining, with emphasis on building a strong safety culture through communication and case studies.

Textbooks:

1. Mine Management Legislation and General Safety (Mine Capsule) – Ranjan Kumar
2. Mine Safety: A Modern Approach – B.S.Dhillon

References:

1. Mine Safety Science and Engineering: Health and Disaster Management, 1st Edition – D.P.Tripathy

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

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ELECTIVE SUBJECT – MINE ENVIRONMENT, RESCUE AND RECOVERY

SUBJECT CODE – DMI0621

Course Objective

The course aims to provide in-depth knowledge of the causes, prevention, and management of mine fires, explosions, inundations, and rescue operations, with a focus on safety measures, rescue equipment, and continuous monitoring systems for ensuring mine safety.

Unit 1: Mine Fires

Factors responsible for mine fire, causes of mine fire, accidental fire, spontaneous heating; factors responsible for spontaneous heating, incubation period, crossing point, ignition point, precautions against spontaneous heating, preventive measures against mine fires, fire stopping-purpose, constructional details, opening of a sealed of area, sampling from sealed off area.

Unit 2: Fire Damp Explosion

Introduction, composition of firedamp modes of emission of firedamp, degree of gassiness, methane layering, mechanism of fire damp explosion, flammability of firedamp, lower and upper limit of explosibility of firedamp, coward diagram factors governing limits of flammability, lag on ignition, explosive limits of other flammable gases, causes of fire damp explosion and its prevention. Characteristic of fire damp explosion, study of some important gas explosions in Indian coal mines.

Unit 3: Coal Dump Explosion

Mechanism of coal dust explosion, flammability limits of coal dust, factors governing explosibility of coal dust, characteristics of coal dust explosion, causes of coal dust explosion, prevention of coal dust explosion, generalized stone dusting, quantity of stone dust, types and properties of stone dust, stone dusting plan, stone dust barriers, types of stone dust barriers, specifications and construction, location of primary and secondary types of barriers, situations under which barrier may fail, maintenance and care of stone dust barriers, water barrier.

Unit 4: Inundation

Surface and underground causes of inundation and its prevention, water dams, bulk head doors, precaution while approaching old water-logged areas, dewatering, burn side safety boring apparatus, dams-purpose; site of dam; types of dams & their constructional details, study of some important inundation causes in Indian mines, additional precautions in rainy season in the mines located nearby the rivers.

Unit 5: Mine Rescue and Recovery Work

Introduction, classification of mine rescues apparatus, modern self-contained breathing apparatus BG 174, its construction, application and scope, common tests of self-contained compressed oxygen breathing apparatus, chemical oxygen self-rescuers, gas mask, and filter self-rescuers: their construction, application and limitations, fresh air hose type breathing apparatus, fresh air base: location, personnel & equipments required, layout of FAB, resuscitation, modern reviving apparatus, rescue stations-equipments used in rescue station, rescue organization, and its working, training of officials.

Unit 6: Continuous Monitoring of Ventilation System

Continuous recording and monitoring of air velocity and quantity, tele-monitoring systems: advantages and disadvantages of it.

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

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Syllabus

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Course Outcomes

CO1 Understand the causes, prevention, and control of mine fires, including fire-stopping techniques and reopening sealed areas.

CO2 Comprehend the factors leading to firedamp explosions and their prevention, including safety measures in methane-rich environments.

CO3 Explain the mechanism of coal dust explosions, prevention methods, and the use of stone dust and barriers.

CO4 Identify causes and prevention of inundation, and understand the construction and application of water dams in mines.

CO5 Gain knowledge of mine rescue operations, breathing apparatus, and organization of rescue teams and stations.

CO6 Learn about continuous monitoring systems for mine ventilation and their advantages in maintaining mine safety.

Textbooks:

1. Mine Disaster And Mine Rescue –M.A.Ramlu
2. Elements Of Mining Technology Vol II –D.J.Deshmukh
3. Mine Ventilation & Environmental Engg. – G.B.Mishra
4. Mine Disasters in India- Vol I, II, & III

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

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Syllabus

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ELECTIVE SUBJECT – MINE MANAGEMENT AND ENTREPRENEURSHIP

SUBJECT CODE – DMI0622

Course Objective

The course aims to provide a comprehensive understanding of mine management, entrepreneurship, and the application of industrial laws and quality management principles within the mining industry.

Unit 1:
Mine management, role of mining industry in country's economic development, ownerships of industries, management and organization in the context of mining industry.

Unit 2:
Entrepreneurship motivating factors, risks and rewards, requirements self-employment schemes, products selection, site solution, plant layout, setting of a mine, market survey, feasibility report, man power requirement, techno-economic and cost factors, work study - work study, principle of work study, scope and necessity of work-study, method study, advantages of method study, time study, principle of time study.

Unit 3:
Industrial dispute act-1947, causes for industrial dispute adverse effects for industrial dispute various provisions of id act works committee, conciliation officer, board of conciliation court of enquiry, industrial tribunal, voluntary organization, strike and lockout.

Unit 4:
Total quality and Management concepts of quality and its use in mine production.

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

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Semester: VI **Academic Session:** 2024-25

Course Outcomes

CO1 Understand the role of mine management in economic development and industry ownership structures in mining.

CO2 Gain insights into entrepreneurship, self-employment schemes, market surveys, feasibility reports, and techno-economic aspects of setting up a mine.

CO3 Understand the provisions of the Industrial Dispute Act-1947, the causes and impact of industrial disputes, and dispute resolution mechanisms.

CO4 Learn the concepts and implementation of Total Quality Management (TQM) and its relevance to improving mine production efficiency.

Textbooks:

1. Mine Management, Legislation and Ground safety: S. Ghatak.
2. Mine Management: V.N.Singh
3. Industrial Management: O.P.Khanna
4. Industrial Management: Jain and Bhanu
5. Mines act 1952
6. Mines rules 1955
7. Critical Appraisal: Rakesh & Prasad

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

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SUBJECT – SURFACE MINING TECHNOLOGY

SUBJECT CODE – DMI063

Course Objective

The course aims to provide students with comprehensive knowledge of various surface mining methods, equipment, and technologies used in opencast mining. It also covers environmental impacts, safety measures, and best practices in surface mining operations.

Unit 1: Introduction To Opencast Mining

Classification of surface mining methods, classification based on mechanization, factors affecting choice of opencast mining methods, stripping ratio: maximum allowable stripping ratio, overall stripping ratio, break even stripping ratio, advantages and disadvantages of opencast mining, elements of benches: height, width, angle of slope, toe, crest, statutory provisions regarding height, width, angle of slope etc.

Unit 2: Opening up of Deposit

Unit operations involved, site preparation, box cut, entry system in opencast mines, Opencast mine layout, factor determining choices of layout, overburden excavation, disposal of overburden, overcasting etc, sample layouts for limestone, copper, coal, iron ore deposits, method of work, machines required, manpower, OMS etc.

Unit 3: Opencast Mining Machinery

Classification of excavating equipments, selection, choices of opencast mining machinery, excavators shovel, rope shovel, hydraulic shovel, application, advantages, disadvantages, comparison of rope shovel and hydraulic shovel, operating parameter, output of a shovel, various attachments to shovel, specifications, back hoe, operating parameter, application, dragline and its comparison with shovel, specifications, bucket wheel excavators, rippers, scrappers, bulldozer etc., surface miner in-pit crushing system, precautionary measures while use of HEMM.

Unit 4: Opencast Explosives

Explosives used in opencast mine, ANFO, slurry explosive, emulsion explosives, heavy ANFO explosive, lox, their properties, composition etc., boosters, initiation system, non-electric initiation system, raydets, nonel, exel shock tubes, electronic detonators, etc., bulk explosive system, site mixed slurry, site mixed emulsion, bulk-loading system, advantages, comparison, ANFO precautions while mixing, handling and use, conditions for using bulk explosives.

Unit 5: Blasting Practice in Opencast Mines

Bench blasting terminology, blast hole geometry, hole depth, burden, spacing, sub grade drilling, bottom change, column charge, stemming height, factors to be considered while blast designing, simple numerical on blast design for the bench of surface mines, single and multiple rows blasting their comparison, sequence of blasting in single & multiple row, precautions while charging and firing of holes in deep hole blasting, deck charging, muffled blasting, control blasting techniques, secondary blasting/breaking in opencast mines, transport of explosives in bulk, precautions while drilling and blasting of deep holes.

Unit 6: Environmental Aspects of Opencast Mining

Environmental aspects of opencast mining fly rock, ground vibration, air blast their causes & prevention, noise pollution, water pollution, degradation of land, land reclamation, salient features of environment protection act, EMP and Environment Impact Assessment, slope stability: causes of unstability, forms of failure preventive measures.

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

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Course Outcomes

CO1 Understand the classification of surface mining methods, factors affecting the choice of methods, stripping ratios, and statutory provisions related to bench elements.

CO2 Learn the unit operations involved in opening up an opencast mine, layout planning, and overburden management for different minerals such as coal, limestone, copper, and iron ore.

CO3 Gain insight into the classification, selection, and operation of various opencast mining machinery like shovels, draglines, bucket wheel excavators, rippers, scrapers, and bulldozers.

CO4 Familiarize with different types of explosives used in opencast mines, including ANFO, slurry, emulsion explosives, and their initiation systems, safety measures, and handling precautions.

CO5 Understand bench blasting terminology, blast hole geometry, design considerations, blasting sequences, control blasting techniques, and safety precautions in deep hole blasting.

CO6 Study the environmental aspects of opencast mining such as fly rock, ground vibration, air blast, and water pollution, along with prevention methods, land reclamation, and compliance with environmental laws.

Textbooks:

1. Elements of mining technology vol- I - D.J.Deshmukh
2. Surface Mining Technology - S.K.DAS
3. Open cast Mining method - C.P.Singh
4. Surface Mining - G.B.Mishra

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SUBJECT – SURFACE MINING TECHNOLOGY LAB

SUBJECT CODE – DMI063P

S. No.	List of Experiments
1	Study of the layout of some important open cast mines in India.
2	Design of an open cast mine for a given output and other specified parameters.
3	Study of Blasting pattern.
4	Sketch & describe O/C Machineries with their important units.
5	Preparation of a plan for transportation of mineral from mine to beneficiation plant.
6	Study of land reclamation case of some important Indian mines.