



SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Course: B.Tech

Semester: VIII

Branch: Mining Engineering

Academic Session: 2024-25

SUBJECT – MINING MACHINERY – III

SUBJECT CODE – BMI081

Course Objective

This course aims to equip students with knowledge and practical skills related to various mining machinery and technology used in the extraction and transport of minerals, emphasizing operational efficiency and safety in mining environments.

Unit 1: Face Machinery

Drills for coal and stone, their constructional details, drill jumbos, their applications, operation and maintenance, introduction to coal cutting machines.

Unit 2: Loader and Transporting Machine

Rocker shovel, gathering arms loaders, LHD and SDL machines – their construction and operation and maintenance, cavo loader, shuttle car and underground trucks, its construction, operation and application.

Unit 3: Cutter Loaders

Different types of cutter loaders suitable for long wall and short wall faces, their constructions, operation and maintenance, different types of road headers their construction, operation and conditions of applicability, mechanics of rock cutting, rock cutting tools and their performance.

Unit 4: Compressed Air

Basic concept, compression process, working and constructional features of single stage and multistage compressor, unloading arrangement of compressor, layout of pipelines, transmission of compressed air, testing of compressor, in bye compressors.

Unit 5: Use of Electricity in Mines

Flame proof apparatus, intrinsically safe circuits, underground cables, drill panel, gate end box, circuit breakers, remote control (pilot circuit), underground substation, electrical signaling provisions of IER related to mines.



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Course Outcomes

- CO1** Understand the construction, operation, and maintenance of drills for coal and stone, along with coal cutting machines and drill jumbos.
- CO2** Analyze the design and operation of loaders and transporting machines, including rock shovels, gathering arms loaders, and underground trucks.
- CO3** Explore the types, construction, and operational principles of cutter loaders and road headers, including the mechanics of rock cutting and tool performance.
- CO4** Explain the principles of compressed air systems, including compressor types, pipeline layouts, and testing procedures.
- CO5** Assess the use of electricity in mines, focusing on safety standards, flame-proof apparatus, and electrical signaling systems relevant to mining operations.

Textbooks:

1. Elements of Mining Vol. III by D. J.Deshmukh
2. UMS Booklet
3. Winning and Working of Coal: R. T. Deshmukh & D. J.Deshmukh
4. Modern Coal Mining Practices: R. D.Singh
5. Longwall Mining: Syd. S. Chaing & Peng



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SUBJECT – STRATA CONTROL

SUBJECT CODE – BMI082

Course Objective

This course aims to provide students with an understanding of the principles and methods of strata control in underground mining, focusing on support systems, powered supports, stowing methods, rock mechanics, and the management of subsidence to ensure safety and stability in mining operations.

Unit 1: Supports

Timber & steel supports, examination of roof, roof bolting, roof stitching, method of supporting roadways, supporting under different conditions viz. Pit bottom, crossing, junctions, faulted area, longwall faces, depillaring areas and stoping areas, support loads, SSR, CTR, support plan, support withdrawal.

Unit 2: Powered Supports

Powered supports – their principles of operation, classification, designation, constructional features and applications, hydraulic fluids.

Unit 3: Stowing

Principal methods of stowing, their relative merits and applicability, hydraulic stowing, pneumatic stowing, mechanical stowing, hand packing, face arrangements, pipe wear, pipe jams.

Unit 4: Strata Control

Theories of ground movement, rock pressure due to narrow and wide excavation, front abutment and back abutment, failure of roof and floor, measurement of strata movement, rock burst, bumps, gas outbursts, potholes.

Unit 5: Subsidence

Theories of subsidence, damage and loss due to subsidence, vertical and lateral movements and their estimation, angle of fracture and angle of draw, factors affecting subsidence, subsidence control, protection of surface structures, design of protection pillars including shaft pillars, pot holes.



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Course Outcomes

- CO1** Analyze various timber and steel support systems, including roof bolting and supporting methods under different mining conditions.
- CO2** Understand the principles, classification, and construction features of powered supports and their application in underground mining.
- CO3** Evaluate the principal methods of stowing, including hydraulic, pneumatic, and mechanical stowing, along with their advantages and practical applications.
- CO4** Examine theories of ground movement, rock pressure impacts, and methods for measuring strata movement and associated risks such as rock bursts and gas outbursts.
- CO5** Explore theories of subsidence, its causes, effects, and control measures, including the design of protection pillars to safeguard surface structures.

Textbooks:

1. Strata control in mines: Chaing & Peng
2. Winning and Working of Coal: R. T. Deshmukh & D. J. Deshmukh
3. Modern Coal Mining Practices: R. D.Singh
4. D.G.M.S. Circulars (Tech.) 1995 onwards
5. Longwall Mining: Syd. S. Chaing & Peng



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ELECTIVE SUBJECT – SURFACE MINING – II

SUBJECT CODE – BMI0831

Course Objective

This course aims to equip students with advanced knowledge and skills in the design and operation of open pit mines, focusing on mine layouts, continuous mining equipment, ultimate pit design, rock slope engineering, and slope stability assessments to optimize surface mining operations.

Unit 1:

Layouts of open pit mines, methods of sidecasting, sidecasting by stripping shovel and dragline, range diagram, calculation of operating radius, explosive casting, layouts of waste dumps, design of haul roads.

Unit 2:

Introduction to continuous surface mining equipment, bucket wheel excavators, their construction, basic operation and productivity, continuous surface miner, their construction, basic operation and productivity. Face layouts.

Unit 3:

Ultimate pit design, factors affecting ultimate pit limits; significance of ultimate pit limits, manual methods of developing ultimate pit limits, floating cone technique, production planning, some basic mine life and plant size concepts, mine and mill plant sizing.

Unit 4:

Introduction to rock slope engineering, slopes in surface mines and their formation, pit slopes and their influence on mine economics, slope stability, factors influencing slope stability, various types of slope failure and their conditions.

Unit 5:

Determination of factor of safety of a slope under plane and circular failure, planning of slope stability investigations, stabilisation and protection methods for stability of slopes.



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Course Outcomes

- CO1** Design effective layouts for open pit mines and waste dumps, including methods for sidecasting and haul road design.
- CO2** Analyze the construction, operation, and productivity of continuous surface mining equipment, including bucket wheel excavators and continuous surface miners.
- CO3** Develop ultimate pit limits using various methods, understanding the significance of these limits in production planning and mine life concepts.
- CO4** Evaluate the principles of rock slope engineering, including factors influencing slope stability and types of slope failures.
- CO5** Assess slope stability by determining factors of safety for plane and circular failures, and implement stabilization and protection methods for slope stability.

Textbooks:

1. Surface Mining: G.B.Misra
2. Surface mining equipment: Martin
3. Surface Mining: Pfeleider
4. Rock slope engineering: Hoek & Bray
5. SME handbook: Hartman
6. Surface Mine Planning & Design: Hustralid & Kuchha



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ELECTIVE SUBJECT – GEOSTATISTICS

SUBJECT CODE – BMI0832

Course Objective

This course aims to provide students with a foundational understanding of classical and geostatistics, focusing on statistical methods, reserve estimation techniques, variogram analysis, and advanced geostatistical techniques like kriging for accurate mineral resource estimation.

Unit 1:

Introduction to classical statistics, histograms, mean, median, mode, skewness, kurtosis, standard deviation, variance, confidence interval, normal and lognormal distribution.

Unit 2:

Different types of mineral reserves, estimation of grade and reserves, different techniques of grade estimation, rule of nearest point, constant distance weighting technique and inverse distance weighting technique, method of triangles and polygonal method, bench compositing.

Unit 3:

Introduction to geostatistics, theory of regionalised variable, application of geostatistics in mining, covariogram and semivariogram, definitions and their estimation, parameters of semivariogram, sill variance, nugget effect, range of influence, zonal and directional anisotropy.

Unit 4:

Mathematical representation of semivariogram and covariogram, semivariogram models and their characteristics, calculation, plotting and fitting of experimental semivariogram.

Unit 5:

Volume-variance relationship, extension variance and estimation variance, optimal valuation and kriging, kriging estimator and kriging error, kriging of a square block valued by two samples, grade tonnage relationship.



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Course Outcomes

- CO1** Apply classical statistical methods, including measures of central tendency, distribution, and variability, for data analysis in mining.
- CO2** Estimate mineral grades and reserves using various techniques, including nearest point and inverse distance weighting methods.
- CO3** Understand the principles of geostatistics and apply variogram analysis to regionalised variables in mining.
- CO4** Construct and fit semivariogram models to analyze spatial continuity and variations in mineral deposits.
- CO5** Utilize volume-variance relationships and kriging techniques for optimal resource estimation and error minimization.

Textbooks:

1. Geostatistics: Runge
2. Basic Geostatistics: Liu
3. Application of Geostatistics: Isobel Clark



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ELECTIVE SUBJECT – SURFACE MINING – II LAB

SUBJECT CODE – BMI0831P

S. No.	List of Experiments
1	Study of Drivage of Internal and External Box Cut
2	Determination of Ultimate Pit Slope, Overall Ramp slope and Inter ramp and Design of Ultimate pit by manual methods.
3	Study of Constructional features of Scrapers and the machine operation.
4	Study of Constructional features of Electric Rope Shovel and the machine operation.
5	Study of Constructional features of Dragline and the machine operation.
6	Determination of Productivity of shovel dumper combination and synization of shovel dumper operated face.
7	Study of Dragline side casting operation and drawing of layout of layout of Dragline operated faces.
8	Study of Constructional features of Multi bucket Excavators and the machine operation.
9	Study of working of jack Hammer Drilling Machine.
10	Study of working of Down the hole Drilling Machine.



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ELECTIVE SUBJECT – GEOSTATISTICS LAB

SUBJECT CODE – BMI0832P

S. No.	List of Experiments
1	Geostatistical Predication Practical.
2	Geostatistics vs. Simple Interpolation Practical.
3	Probability theory review practical.
4	Spatial Analysis Practical.
5	Variogram Modeling Practical.
6	The Problem of Estimation Practical.
7	Cross Validation Practical.
8	Simple Kriging Practical.
9	Block Kriging Practical.
10	Geostatistical Simulation Practical.



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SUBJECT – INDUSTRIAL ENGINEERING LAB

SUBJECT CODE – BMI084P

S. No.

List of Experiments

- 1 To study & prepare Operation Process Chart (OPC) for the given assembly.
- 2 To study & prepare Flow Process Chart (FPC) for the given assembly.
- 3 To study & prepare Man-Machine (multiple activity) chart for the given assembly.
- 4 To study & calculate co-efficient of correlation for time study person using performance rating technique.
- 5 To study & calculate standard time for given job.
- 6 To study & prepare a frequency distribution curve for the given data source.
- 7 To study & construct $\bar{X} - R$ chart for the given process.
- 8 To study & construct P – chart for the given process.
- 9 To study & construct C – chart for the given process.
- 10 To study about sampling plans & decide about acceptance or rejection of a particular product using sampling plans.



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SUBJECT – REPORT WRITING AND SEMINAR

SUBJECT CODE – BMI086P

Course Objective

This course is designed to enhance students' technical writing and communication skills, focusing on the preparation of structured reports, correspondence, and presentations for various audiences in professional settings.

Unit 1: Introduction to Technical Writing

How differs from other types of written communication purpose of technical writing, correspondence: prewriting, writing and rewriting objectives of technical writing. Audience recognition: high-tech audience, low tech audience, laid audience, multiple audiences.

Unit 2: Correspondence

Memos, letters, e-mails, its differentiation, types of letters, document design, its importance, electronic communication: internet, intranet, extranet, writing effective e-mail.

Unit 3: Summary

Report strategies, effective style of technical report writing: structures: content, introduction, conclusions, references, etc., presentation, writing first draft, revising first draft, diagrams, graphs, tables, etc. Report lay-out.

Unit 4: Report Writing

Criteria for report writing, types of report: trip report, progress report, lab report, feasibility report, project report, incident report, etc. Case studies.

Unit 5: Proposals and Presentation

Title page, cover letter, table of content, list of illustrations, summary, discussion, conclusion, references, glossary, appendix, case studies. Oral presentation/seminar.



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Course Outcomes

- CO1** Understand the purpose of technical writing and differentiate it from other types of communication, recognizing the needs of diverse audiences.
- CO2** Develop and apply effective correspondence skills through memos, emails, and letters, with a focus on document design and electronic communication.
- CO3** Write concise summaries and first drafts of reports using effective strategies, incorporating visuals such as diagrams and tables.
- CO4** Demonstrate the ability to structure and write various types of reports, including progress, feasibility, and project reports.
- CO5** Prepare and deliver proposals and presentations, incorporating elements like cover letters, summaries, and references.

Textbooks:

1. Sharon J. Gerson & Steven M. Gerson "Technical Writing - Process & Product", Pearson Education.

Reference Books:

1. Sunita Mishra, "Communication Skills for Engineers" Pearson Education
2. Davies J.W. "Communication for engineering students", Longman
3. Eisenberg, "Effective Technical Communication", Mc. GrawHill.