<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>Teaching Period</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>03BMI101</td>
<td>Mine Development</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>03BMI102</td>
<td>NUMERICAL AND STATISTICAL METHODS</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>03BMI103</td>
<td>Mechanics of Solids</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>03BMI104</td>
<td>Mining Geology</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>03BMI105</td>
<td>Basic Surveying</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>03BMI106</td>
<td>Mineral Exploration</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>03BMI201</td>
<td>Numerical Methods Laboratory</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>03BMI202</td>
<td>Electrical Engineering Laboratory</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>03BMI203</td>
<td>Mining Geology &amp; Exploration Laboratory</td>
<td>0 0 3</td>
<td>2</td>
</tr>
<tr>
<td>03BMI204</td>
<td>Mechanics of Solids Laboratory</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>03BMI301</td>
<td>Discipline &amp; Co-Curricular Activities</td>
<td>0 0 3</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>18 6 12</td>
<td>30</td>
</tr>
</tbody>
</table>
### Semester IV

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of Subject</th>
<th>Teaching Period</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>04BMI101</td>
<td>Mine Surveying</td>
<td>4 L 0 T 0 P</td>
<td>4</td>
</tr>
<tr>
<td>04BMI102</td>
<td>Mathematics IV</td>
<td>4 L 0 T 0 P</td>
<td>4</td>
</tr>
<tr>
<td>04BMI103</td>
<td>Rock Mechanics</td>
<td>4 L 0 T 0 P</td>
<td>4</td>
</tr>
<tr>
<td>04BMI104</td>
<td>Mining Machinery</td>
<td>3 L 1 T 0 P</td>
<td>4</td>
</tr>
<tr>
<td>04BMI105</td>
<td>Introductory Mining Technology</td>
<td>4 L 0 T 0 P</td>
<td>4</td>
</tr>
<tr>
<td>04BMI106</td>
<td>Material Handling Systems</td>
<td>4 L 0 T 0 P</td>
<td>4</td>
</tr>
<tr>
<td>04BMI201</td>
<td>Mining Machinery Laboratory</td>
<td>0 L 0 T 2 P</td>
<td>1</td>
</tr>
<tr>
<td>04BMI202</td>
<td>Electronics Engineering Laboratory</td>
<td>0 L 0 T 2 P</td>
<td>1</td>
</tr>
<tr>
<td>04BMI203</td>
<td>Rock Mechanics Laboratory</td>
<td>0 L 0 T 2 P</td>
<td>1</td>
</tr>
<tr>
<td>04BMI204</td>
<td>Mine Surveying Laboratory</td>
<td>0 L 0 T 2 P</td>
<td>1</td>
</tr>
<tr>
<td>04BMI301</td>
<td>Discipline &amp; Co-Curricular Activities</td>
<td>0 L 0 T 4 P</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total:**

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>1</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>Subject Code</td>
<td>Name of Subject</td>
<td>Teaching Period</td>
<td>Credit Points</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------</td>
<td>-----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>05BMI101</td>
<td>Mine Ventilation</td>
<td>4 0 0</td>
<td>4</td>
</tr>
<tr>
<td>05BMI102</td>
<td>System Engineering</td>
<td>4 0 0</td>
<td>4</td>
</tr>
<tr>
<td>05BMI103</td>
<td>Computer Application in Mining</td>
<td>4 0 0</td>
<td>4</td>
</tr>
<tr>
<td>05BMI104</td>
<td>Surface Mining Technology</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>05BMI105</td>
<td>Mineral Processing Technology</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>05BMI106</td>
<td>Solid Waste Management</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>05BMI201</td>
<td>Mine Ventilation Laboratory</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>05BMI202</td>
<td>Mineral Processing Technology Laboratory</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>05BMI203</td>
<td>Material Handling Systems Laboratory</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>05BMI204</td>
<td>Computer Application in Mining Laboratory</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>05BMI301</td>
<td>Discipline &amp; Co-Curricular Activities</td>
<td>0 0 4</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>21 3 12</td>
<td>29</td>
</tr>
<tr>
<td>Subject Code</td>
<td>Name of Subject</td>
<td>Teaching Period</td>
<td>Credit points</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------</td>
<td>----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>06BMI101</td>
<td>Mine Environmental Engineering</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>06BMI102</td>
<td>Underground Mining Technology</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>06BMI103</td>
<td>Geomechanics</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>06BMI104</td>
<td>Ground Control Instrumentation</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>06BMI105</td>
<td>Remote Sensing and Its Application</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>06BMI106</td>
<td>Mine Economics</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>06BMI201</td>
<td>Mine Environmental Engineering Laboratory</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>06BMI202</td>
<td>Geomechanics Laboratory</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>06BMI203</td>
<td>Model preparation laboratory</td>
<td>0 0 2</td>
<td>1</td>
</tr>
<tr>
<td>06BMI204</td>
<td>Simulation and Modeling of Mining systems Laboratory</td>
<td>0 0 3</td>
<td>2</td>
</tr>
<tr>
<td>06BMI301</td>
<td>Discipline &amp; Co-Curricular Activities</td>
<td>0 0 3</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>18 6 12</td>
<td>30</td>
</tr>
<tr>
<td>Subject code</td>
<td>Name of subject</td>
<td>Teaching Periods</td>
<td>Credit Points</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------</td>
<td>------------------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>07BMI101</td>
<td>Advanced Surface Mining</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>07BMI102</td>
<td>Mine Legislation and Safety</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07BMI103</td>
<td>Industrial Management</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>07BMI104</td>
<td>Tunneling</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>07BMI105</td>
<td>Advanced Coal Mining</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>07BMI106</td>
<td>Mine Planning-I</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>07BMI201</td>
<td>Minor Project</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>07BMI202</td>
<td>PRACTICAL TRAINING &amp; INDUSTRIAL</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>VISIT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07BMI203</td>
<td>Mine Planning and Design</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07BMI301</td>
<td>Discipline &amp; Co- Curricular</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>Subject Code</td>
<td>Name of Subject</td>
<td>Teaching Period</td>
<td>Credit Points</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------</td>
<td>-----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>08BMI101</td>
<td>Mine Planning-II</td>
<td>3 L 1 T 0 P</td>
<td>4</td>
</tr>
<tr>
<td>08BMI102</td>
<td>Advanced Metaliferrous Mining</td>
<td>3 L 1 T 0 P</td>
<td>4</td>
</tr>
<tr>
<td>08BMI103</td>
<td>Environmental Pollution and Control in Mines</td>
<td>3 L 1 T 0 P</td>
<td>4</td>
</tr>
<tr>
<td>08BMI104</td>
<td>Safety engineering</td>
<td>3 L 1 T 0 P</td>
<td>4</td>
</tr>
<tr>
<td>08BMI105</td>
<td>Eco-friendly Mining</td>
<td>3 L 1 T 0 P</td>
<td>4</td>
</tr>
<tr>
<td>08BMI201</td>
<td>Mine Planning and Design Laboratory</td>
<td>0 L 1 T 5 P</td>
<td>3</td>
</tr>
<tr>
<td>08BMI202</td>
<td>Major Project</td>
<td>0 L 0 T 5 P</td>
<td>3</td>
</tr>
<tr>
<td>08BMI203</td>
<td>Seminar</td>
<td>0 L 0 T 2 P</td>
<td>1</td>
</tr>
<tr>
<td>08BMI301</td>
<td>Discipline &amp; Co- Curricular Activities</td>
<td>0 L 0 T 4 P</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>15 L 5 T 16 P</td>
<td>28</td>
</tr>
</tbody>
</table>
Introduction: Distributions of mineral deposits in India and other countries, mining contributions to civilization, mining terminology, stages in the life of the mine - prospecting, exploration, development, exploitation and reclamation, access to mineral deposit - selection, location, size and shape (incline, shaft and adit), brief overview of underground and surface mining methods. ; Drilling: Types of drills, drilling methods, electric, pneumatic and hydraulic drills, drill steels and bits, drilling rigs, and jumbos. ; Explosives: Classification, composition, properties and tests, fuses, detonators, blasting devices and accessories, substitutes for explosives, handling and storage, transportation of explosives. ; Rock blasting: Mechanism of rock blasting, blasting procedure, and pattern of shot holes. ; Shaft sinking: Ordinary and special methods, problems, and precautions, shaft supports and lining.

Essential Reading:

Supplementary Reading:
NUMERICAL AND STATISTICAL METHODS

Course/Paper: 03 BMI - 102
BMI Semester-III

Unit 1
Forward, backward, central and Divided differences, Newton’s formula of interpolation for equal and unequal intervals. Lagrange’s interpolation formula, Stirling’s and Bessel’s formula,

Unit 2
Solutions of systems of equations (Gauss elimination, Gauss Jordan, and Partition method for linear system of equations, power method for partition, method for linear system of equations, power method for finding eigen values),

Unit 3

Unit 4
Sampling theory: Introduction: Moments, Moment generating functions, Skewness, Kurtosis, Correlation and Regression, Normal sampling distributions: Binomial distribution, Poisson distribution, Normal distribution; Sampling distribution of the means; sampling distribution of the differences of the means; sampling distributions of proportions.

Unit 5
Tests of Significance; t-distributions, chi square distributions, F-distributions.
Regression And Correlation: Linear regression; correlation, multiple correlation & partial correlation Confidence Limits; Large samples, small samples, error bands in regression

Reference
a. Numerical Methods and Applied Statistics : Nupur Srivastva, Dr Anita Bhagora Dr Vivek Kumar Sharma—Geneous Publication Jaipur
Computer Based Numerical & Statistical Techniques: Udit Aggarwal- Dhanpat Rai Publication Delhi
MECHANIC OF SOLIDS
Course/Paper: 03 BMI-103
BMI Semester-III

Unit – 1

Unit – 2
Members subjected to flexural loads: Theory of simple bending, bending moment and shear force diagrams for different types of static loading and support conditions on beams. Bending stresses, Section modulus and transverse shear stress distribution in circular, hollow circular, I, Box, T, angle sections etc.

Unit – 3
Principal planes, stresses & strains: Members subjected to combined axial, bending & Torsional loads, maximum normal & shear stresses; Concept of equivalent bending & equivalent twisting moments: Mohr's circle of stress & strain. Theories of Elastic Failures: The necessity for a theory, different theories, significance and comparison, applications.

Unit – 4

Unit – 5
Transverse deflection of beams: Relation between deflection, bending moment, shear force and load, Transverse deflection of beams and shaft under static loading, area moment method, direct integration method: method of superposition and conjugate beam method. Variation approach to determine deflection and stresses in beam. Elastic strain energy: Strain energy due to axial, bending and Torsional loads; stresses due to suddenly applied loads; use of energy theorems to determine deflections of beams and twist of shafts. Castigiano's theorem. Maxwell's theorem of reciprocal deflections.

a) References
b) Strength of Materials : B.C Poonamia and ramamurtham, Dhanpatrai Publishers Delhi
d) Strength of Materials: G.H. Ryder, ELBS Publications Co Ltd
e) Elements of Strength of Material : J.P. Tinnoshko and G.H. Young, Affiliated East west Press New Delhi
MINING GEOLOGY
Course/Paper: 03 BMI-104
BMI Semester-III

Introduction to Geology: its scope and application to engineering problems, Physical Geology, Mineralogy - Determinative properties and occurrence of common rock forming minerals in India, Petrology - Igneous, Sedimentary and Metamorphic rocks; Structural Geology: Elementary knowledge of rock deformation and structural characteristics of deformed rocks, strike, dip, folds and faults, their description, classification, Joints, Un-conformities/simple forms of igneous rocks, Dykes, sills, etc., Geological maps and their interpretation, Stratigraphy - Principles of Stratigraphic Standard Stratigraphic Scale, Indian Stratigraphy; Economic minerals: their classification, origin, mode of occurrence, geographical and geological distribution, physical properties and industrial uses and distribution of major metallic and non-metallic mineral deposits of India. Origin and distribution of natural fuels - Coal, Petroleum and natural gas, nuclear fuels

Essential Reading:

Supplementary Reading:

BASIC SURVEYING
Course/Paper: 03 BMI-105
BMI Semester-III

Linear measurements and chain surveying: Errors due to incorrect chain, tape corrections, Compass surveying: Use of prismatic compass – dial traverse and adjustments, bearing of a line, local attractions and corrections for bearings, Theodolites: Seconds theodolites, micro-optic theodolites, electronic theodolites, temporary adjustments, Measurement of horizontal angles by repetition method and re-iteration method, measurement of vertical angles by general method, Traverse surveying: close traverse and open traverse, checks in closed traverse and open traverse, plotting a traverse surveying, consecutive co-ordinates: latitudes and departures, closing error, balancing a traverse, Omitted measurements, Leveling: Use of dumpy levels, micro-optic levels, quick setting levels, digital levels and leveling staff, temporary adjustments of levels, Reduction of levels by height of instrument method, and rise and fall method, ordinary and precise leveling, differential leveling, profile leveling, reciprocal leveling, Survey errors and their adjustments, Co-ordinate Calculations; Triangulation: Classification of Triangulation systems, Triangulation figures, Base line measurements; EDM and its application, Surveying by Modern instruments such as GPS & Total Station.

Essential Reading:

Supplementary Reading:
MINERAL EXPLORATION
Course/Paper: 03 BMI-106
BMI Semester-III

Classification of ore reserves: proved, probable, and geologist’s ore. Geological aspects of drilling borehole location, planning of drilling operations, borehole surveys, correction of deviated boreholes and directional drilling, core-sampling and assaying; Economic classification of mineral resources: calculation of in-situ reserves from borehole data. Underground sampling and calculation of blocked reserves; Exploration: Theory and application of various methods in mineral exploration, Seismic, Gravity and Magnetic methods Principles and methods of gravity and magnetic prospecting, instrumentation, data processing, interpretation with case studies, Fundamentals of remote sensing and its application in large scale mineral exploration. Exploration for oil and natural gas.

Essential Reading:

Supplementary Reading:

NUMERICAL METHODS LABORATORY
Course/Paper: 03 BMI-201
BMI Semester-III

Experiments to be handled using FORTRAN/C ++/JAVA
1. Bisection Method
2. Method of False Position and Secant Method
3. Newton-Raphson Method
4. Method of Successive approximation
5. Gaussian Elimination Method
6. Gauss-Seidel Iterative Method
7. Inversion of a Matrix
8. Eigen Values and Eigen Vectors
9. Lagrange’s interpolation
10. Newton’s forward and backward interpolation
11. Everette’s formula
12. Numerical Differentiation
13. Trapezoidal rule of integration
14. Simpson’s one-third rule
15. Simpson’s three-eighth rule
16. Euler’s method
17. Improved Euler’s method
18. Runge-Kutta Second and fourth order methods
19. Predictor-Corrector Methods
20. Taylor Series Method
ELECTRICAL ENGINEERING LABORATORY

Course/Paper: 03 BMI-202
BMI Semester-III

1. Verification of Thevenin’s Theorem and Superposition Theorem.
4. Testing of single phase energy meter at different power factors.
5. Study of series and parallel resonance circuit.
6. Verification of Reciprocity and Maximum Power Transfer Theorem.
7. Study of Electrical Motors and starters.
8. No-load and Blocked rotor test of three phase Induction Motor.
10. Speed control of DC motor by varying armature circuit & field circuit method.
12. Efficiency and Regulation of single phase transformer by open circuit & short circuit test

MINING GEOLOGY & EXPLORATION LABORATORY

Course/Paper: 03 BMI-203
BMI Semester-III

LIST OF EXPERIMENTS:
1. Identification of common rocks
2. Identification of common Minerals
3. Study of physical properties of minerals
4. Determination of strike and dip
5. Identification and stereographic plotting of joints.
6. Study of topographic maps
7. Drawing of geological section
8. Geological maps with folds and faults
9. Study of geophysical exploration equipment - resistivity meter
10. Study of aquameter
11. Study of magnetometer
12. Geological field trips

MECHANICS OF SOLIDS LAB

Course/Paper: 03 BMI-204
BMI Semester-III

1. Izod Impact testing.
2. Rockwell Hardness Testing.
3. Spring Testing
4. Column Testing for buckling
5. Torsion Testing
6. Tensile Testing
7. Compression Testing
8. Shear Testing
9. Brinell Hardness Testing
10. Bending Test on UTM.
Linear measurement, Compass surveying - use of prismatic compass, bearing of a line, dial traverse and adjustments, local attractions and correction of bearings, Theodolites-seconds theodolites, micro-optic theodolites, electronic theodolites, measurement of horizontal angles by repetition method and re-iteration method and measurement of vertical angles by general method; Traversing - surface and underground including boundary surveys and joint surveys, survey errors and their adjustments, co-ordinate calculations. Leveling- use of dumpy levels, quick setting levels, digital levels and leveling staff, temporary adjustments of levels, ordinary and precise leveling, reduction of levels by height of instrument method and rise and fall method, reciprocal leveling, profile leveling, differential leveling; Triangulation: Classification of Triangulation systems, Triangulation figures, Base line measurements ; Correlation of surface and underground surveys: Verticality of shafts, measurement of depth of shafts, setting out curves - surface and underground. Special Mine Surveys: Surveys for connecting national grid, survey of installations of mine structures, EDM and its application, Surveying by Modern instruments by using GPS & Total Station.

Essential Reading:

Supplementary Reading:

MATHEMATICS - IV
Course/Paper: 04 BMI -102
BMI Semester-IV

UNIT 1 : LAPLACE TRANSFORM - Laplace transform with its simple properties, applications to the solution of ordinary and partial differential equations having constant co-efficient with special reference to the wave and diffusion equations.

UNIT 2: Classification of partial differential equation. Linear partial differential equation of higher order with constant coefficients, Charpit’s method Monges Method

UNIT 3 : Bessel’s functions of first & second kinds, simple recurrence relations, Orthogonal property of Bessel’s transformation, Generating functions Legendre’s function of first kind, simple recurrence relation orthogonal property., Generating function.


UNIT 5 : COMPLEX VARIABLES -Taylor’s series Laurent’s series poles, Residues, Evaluation of simple definite real integrals using the theorem of residues. Simple contour integration.

References
1. Engg Mathematics III Mangal Maheswari ,Dhanpat Rai & co Delhi
2. Engg Mathematics IV Mangal Maheswari ,Dhanpat Rai & co Delhi
3. Differential Calculus: M.D.Raisinghana
4. Engg Mathematics III Dr okharoo & others ,Unique Books Ajmer
ROCK MECHANICS
Course/Paper: 04BMI103
BMI Semester-IV

Introduction: Structural Features of rock material and rock mass; Physico mechanical properties; Physical and mechanical properties including swelling potential, different strength parameters and their determination, Hydraulic properties of rocks and determination; Elastic and Time dependent properties of rock: Rock Deformability and its measurement. Elastic and non-elastic behavior, influence of time on rock properties; Theories of rock failure: Rock Strength, Analysis of Stress-Strain Curve. Rock failure and different failure criteria. Effect of anisotropy on rock strength; Stress: Fundamentals of stress and strain in two and three dimension, Stress-Strain relationships, Mohr's circle. Rock mass classification Systems and their interpretation, Rock Support and Design.

Essential Reading:

Supplementary Reading:

Composition of mine air, Mine gases: properties, origin, occurrence, physiological effects, detection, monitoring and control, Methane layering, Degasification of coal seams. Production, assessment, physiological effects and control of mine dusts; Thermal environment and psychrometry: Sources of heat load sources in mines, Effect of heat and humidity on miners. Psychrometry, Cooling power of mine air. Methods of improving of cooling power of mine air, Air Conditioning - basic vapour cycle; Mechanics of air flow through mine openings, Resistance of airways, Equivalent orifice, distribution of air current, control devices in ventilation systems, Natural ventilation: Calculation of NVP, Thermodynamic aspects, Artificial aids to natural ventilation; Mechanical ventilation: Principal types of mine fans, Installation, operation, characteristics and selection of mine fans, Fan testing and Out put Control, Fan laws and fan drives, Evasees, Diffusers, Booster fans, Auxiliary ventilation. Reversal of air currents and controlled recirculation; Ventilation Survey: Quantity and Pressure survey; Planning and Design of Ventilation Systems: mine ventilation design criteria and ventilation design factors, ventilation standards, Ascensional, descensional, homotropal, antitropal, central and boundary ventilations systems, Ventilation layouts for coal and metal mining, Network analysis: Hardy-Cross method, Computer application in mine ventilation.

Essential Reading:

Supplementary Reading:
MINING MACHINERY
Course/Paper: 04 BMI -104
BMI Semester-IV

General: Mechanical transmission of power in mining machinery, shafts, pulleys, gears, and gear/trains, belt drives, chain drives, couplings and clutches, brakes. ; Wire ropes: Constructions, examinations, listing and maintenance. ; Rope and Locomotive haulages: Direct, main and tail, balanced double drum and endless haulage, gravity haulage, constructional features, power calculation, selection of haulage ropes, haulage tracks and safety appliances, tubs and mine cars, diesel, battery and trolley wire locomotives, tractive effort, ideal gradient, power calculations, exhaust conditioners. ; Compressor and pumps: Generation, distribution and use of compressed air in mines, mine pumps, pumping ranges, and fittings, elements of pipe line transportation. ; Hydraulics and mining machines: Power hydraulics, hydraulic circuits, actuators, hydraulic fluids, control of hydraulic power, cutting and mining machines for coal, surface coal/ore handling plant.

Essential Reading:

Supplementary Reading:

INTRODUCTORY MINING TECHNOLOGY
Course/Paper: 04 BMI -105
BMI Semester-IV

Introduction: Distributions of mineral deposits in India and other countries, mining contributions to civilization, mining terminology, stages in the life of the mine - prospecting, exploration, development, exploitation and reclamation, access to mineral deposit- selection, location, size and shape (incline, shaft and adit), brief overview of underground and surface mining methods. ; Drilling: Types of drills, drilling methods, electric, pneumatic and hydraulic drills, drill steels and bits, drilling rigs, and jumbos. ; Explosives: Classification, composition, properties and tests, fuses, detonators, blasting devices and accessories, substitutes for explosives, handling and storage, transportation of explosives. ; Rock blasting: Mechanism of rock blasting, blasting procedure, and pattern of shot holes. ; Shaft sinking: Ordinary and special methods, problems, and precautions, shaft supports and lining.

Essential Reading:

Supplementary Reading:
MATERIAL HANDLING SYSTEMS

Course/Paper: 04BMI106
BMI Semester-IV

Mine hoist: Drum and koepe winders, constructional features, kinematics, torque and power calculation, speed control, safety contrivances, selection of mine winders, cages, skip, suspension gears, headgear structures, cage guides, pit top and pit bottom circuits and layouts; Conveyors: Belt conveyor, chain conveyor, cable belt conveyor, shaker conveyor, vibratory conveyor, constructional features and power calculations, selection and application; Aerial Ropeway: Mono-cable, bi-cable, twin-cable ropeway, constructional features and power calculations, selection and application; Scraper Haulage: Constructional features, applicability, advantages and disadvantages; Men and material transportation: Trackless vehicle loaders, shuttle cars, SDL and LHD, special men and materials transport in mines, men riding systems in mines.

Essential Reading:

Supplementary Reading:

MINING MACHINERY LABORATORY

Course/Paper: 04 BMI-201
BMI Semester-IV

LIST OF EXPERIMENTS:
1. Study of jack hammer drill
2. Study of different types of wire rope & their uses
3. Study of different types of rope clips
4. Study of reliance rope capel
5. Study of different types of roof bolts
6. Study of Sylvester prop withdrawal
7. Study of different types of brakes
8. Study of different types of Clutches
9. Study of different parts & functions of an electric coal drill
10. Study of direct rope haulage
11. Study of endless rope haulage
12. Study of main & tail rope haulage
**ELECTRONICS LABORATORY**

Course/Paper: 04 BMI-202
BMI Semester-IV

1. Familiarization with electronic components, and general purpose Laboratory equipment.
2. Use of CRO and function generator and calculation of amplitude, frequency, time period of different types of ac signals.
3. Verification of Junction Diode and Zener Diode characteristic and determination of static and dynamic resistance at the operating point.
4. Verification of input and output characteristics of a Bipolar Junction Transistor and determination of the operating point ad load line.
5. Verification of input and output characteristics of a Field Effect Transistor and determination of the operating point ad load line.
6. Verification of Series and Parallel Resonance theory.
7. Operation of diode as different form of rectifier and effect of different types of passive filters on the output.
8. Determination of frequency response of passive high pass and low pass filters.
10. Verification of truth table for different types of Logic gates viz. AD, OR, NAND, NOR, NOT, EX-OR with 2/ 3/ 4 inputs.
11. Use of OP-AMP as an inverting and non-inverting amplifier for different gains.
12. Introduction to circuit analysis using p-spice through frequency response study of a RC filter.

**ROCK MECHANICS LAB**

Course/Paper: 04 BMI-203
BMI Semester-IV

LIST OF EXPERIMENTS:
1. Preparation of Rock Specimens for various testing purposes
2. Study of Compressive Testing Machine
3. Determination of Protodyakonov Strength Index
4. Determination of Impact Strength Index
5. Determination of the Uni-axial Compressive Strength of rock materials
6. To Determine the Tensile Strength of a rock specimen by an Indirect Method (Brazilian Test)
7. Determination of Point Load Strength Index
8. Determination of Shear Strength by Direct Shear Test
9. Determination of Modulus of Elasticity and Poisson’s ratio of rock samples
10. Determination of Slake Durability Index of rock samples
11. Determination of Slake Durability Index of coal samples
12. Determination of Permeability of rock
13. Determination of C – φ by using Tri-axial Cell Unit
14. Determination of Index Parameter using Schmidth Hammer
LIST OF EXPERIMENTS:
1. Prismatic Compass Surveying: (a) Bearing of the lines (b) Traversing
2. Levelling: (a) Precise Levelling (b) Profile Levelling
3. Plane Table Surveying: (a) Intersection Methods (b) Radiation Method.
4. Theodolite Traversing
5. Theodolite: (a) Horizontal angle measurement (b) Vertical angle measurement.
6. Signs and Conventions used by the GSI, MMR and CMR.
7. Triangulation Survey: (a) By 1” Theodolite (b) By Electronic Theodolite
8. Triangulation Survey (a) By EDM (b) By Total Station
9. Distance Measurement: (a) By EDM (b) By Total Station
10. Coordinate Measurement: (a) By Total Station (b) By GPS
11. Traversing and Recording Position of points by GPS
Semester V

MINE VENTILATION
Course/Paper: 05 BMI -101
BMI Semester-V


Essential Reading:

Supplementary Reading:
SYSTEM ENGINEERING

Course/Paper: 05BMI102
BMI Semester-V

Introduction: Concept of system engineering. General model selection; Data collection: Data collection methods, time study, work sampling, sample number calculation; System analytical techniques: Statistical methods, control charts – X bar chart, R chart, S chart; Mathematical methods for loading and hauling; Stochastic models: Monte Carlo simulation, Activity oriented simulation, process oriented simulation; Reliability: Concepts of reliability, concept of different distribution: Normal, exponential, Beta, Gamma, Binomial, lognormal etc.; fitting a distribution to data, reliability of series and parallel systems, reliability analysis of a combined series parallel system; Optimization and design: Heuristic technique, Dynamic programming, network flow theory, Graph theory; Programming: Linear programming, transportation and assignment problems, Mixed integer linear programming, queuing theory, network analysis, inventory control and simulation techniques; Analysis: Analysis of exploration and mining systems using mathematical programming, simulation techniques and network models; stochastic model simulation; Concept of Artificial Intelligence: Natural language understanding, Machine vision, robotics, expert system.

Essential Reading:
2. N. Deo, System Simulation by Digital Computers, Prentice Hall of India, 2005

Supplementary Reading:
COMPUTER APPLICATION IN MINING

Course/Paper: 05 BMI-103
BMI Semester-V

Introduction to structure terminology and peripherals, algorithms, flow charts, programs, dedicated systems; Application in Mining: Exploration, rock topographic models, bore hole compositing, compositing, ore reserve calculation, interpolation and geostastical models; Open pit design: Ultimate pit design, introductory process control, underground mine design: Production scheduling; Operation Simulation: Introduction, Simulation overview, objective, understand the role of modeling, Understanding the basic concept in simulation; Example of simulation in mining aspects: Simulation of machine repair problems, Concepts of variability and prediction, Example with dumping time problem, fitting distribution with chi-square test; Random number generation: Methods of random number generation, Properties of random number, pseudorandom number; Random variates generation: Methods of random variates generation, inverse transformed method, acceptance rejection method, composition method, empirical method and rectangular approximation; Simulation languages: GPSS, SLAM; Logical flow diagram of different mining activities, Coding with GPSS and SLAM of different mining problems; Computer Control: Remote control, automatic control, application and limitations of control.

Essential Reading:

Supplementary Reading:
1. R.V. Ramani, Application of computer methods in the mineral industry.
SURFACE MINING TECHNOLOGY

Course/Paper: 05BMI104
BMI Semester-V

Introduction: Applicability and limitations, Stripping Ratio, Preliminary evaluation of surface mining projects. ; Surface Mining Methods: Development of Mineral deposits by opencast mining, design and layout of opencast mines. Methods of stripping, Bench geometry, Bench slope. Drilling, blasting, loading and transportation in opencast mines, Equipment used for different operations, Choice and their application. ; Placer Mining and Sea bed Mining: Ground sluicing, Hydraulicking and Dredging. Exploitation systems of ocean mineral resources. Relevant provisions of coal mines and metalliferous mines regulations. ; Environmental problems due to surface mining and their remedial measures, Recent developments in the deployment of heavy earth moving machineries in the surface mines.

Essential Reading:

Supplementary Reading:
2. V. V. Rzhevskey, Opencast Mining Unit operations, Mir Pub., Moscow, 1985.
MINERAL PROCESSING TECHNOLOGY

Course/Paper: 05BMI105
BMI Semester-V


Essential Reading:

Supplementary Reading:
2. B.A. Wills, Mineral Processing Technology, Willy & Sons, 2005

SOLID WASTE MANAGEMENT

Course/Paper: 05BMI106
BMI Semester-V


Essential Reading:

Supplementary Reading:
1. Hazarding waste Rules, 1989
MINE VENTILATION LABORATORY

Course/Paper: 05BMI 201
BMI Semester-V

LIST OF EXPERIMENTS:
1. Determination of Relative Humidity of Mine air with Fixed/stationary Hygrometer, and Whirling Hygrometer
2. Determination of Relative Humidity of air using Assman Psychrometer
3. Determination of cooling power of air using Kata Thermometer
4. Determination of CO% by MSA CO detector
5. Determination of percentage of CO and CO2 by Drager Multi Gas Detector (Model 21/31).
6. Determination of Methane % by MSA D-6 Methanometer.
7. Study of the construction and working of Flame Safety Lamp (VELOX GL-50, GL-60 and MSA type)
8. Gas Testing by Flame Safety Lamp in a Gas Testing Chamber
9. Measurement of Air Velocity by (i) Vane Anemometer (ii) Electric Analog Velometer
11. Measurement of dust concentration by (i) Gravimetric Dust Sampler, (II). Personal Dust Sampler
12. Measurement of dust concentration by High Volume Sampler
13. Measurement of Noise Level by Integrating Sound Level Meter (CEL-283)

MINERAL PROCESSING TECHNOLOGY LABORATORY

Course/Paper: 05 BMI-202
BMI Semester-V

LIST OF EXPERIMENTS:
1. Particle size analysis of different rocks and minerals.
2. Study of Jaw Crusher
3. Determination of Actual Capacity and Reduction Ratio of jaw crusher
4. Verification of Rettinger’s Law using jaw crusher.
5. Study of Hammer Mill
6. Determination of Actual Capacity and Reduction Ratio of Hammer Mill
7. Verification of Kick’s’ Law using Hammer Mill
8. Study of the effect of Ball Load and time on Grinding using Ball Mill
9. Study of Vibrating Screen and Determination of its Effectiveness.
10. Study of Magnetic Separator and Determination of its Efficiency
11. Study of Baum Jig and Determination of its Efficiency.
MATERIAL HANDLING SYSTEMS LABORATORY

Course/Paper: 05 BMI -203
BMI Semester-V

LIST OF EXPERIMENTS:
1. Study of bi-cable aerial rope-way
2. Study of headgear and pulleys
3. Study of cage & skip
4. Study of different types of keps
5. Study of scraper chain conveyor
6. Study of belt conveyor
7. Study of gate end box
8. Study of king detaching safety hook
9. Study of mechanism of shaft sinking
10. Study of winding shaft
11. Study of safety devices in haulage
12. Study of cage attachment to winding rope

COMPUTER APPLICATION IN MINING LAB

Course/Paper: 05 BMI -204
BMI Semester-V

Introduction to structure terminology and peripherals, algorithms, flow charts, programs, dedicated systems. Application in Mining: Exploration, rock topographic models, bore hole compositing, compositing, ore reserve calculation, interpolation and geostastical models. Open pit design: Ultimate pit design, introductory process control, underground mine design: Production scheduling; Operation Simulation: Introduction, Simulation overview, objective, understand the role of modeling, Understanding the basic concept in simulation; Example of simulation in mining aspects: Simulation of machine repair problems, Concepts of variability and prediction, Example with dumping time problem, fitting distribution with chi-square test; Random number generation: Methods of random number generation, Properties of random number, pseudorandom number; Random variates generation: Methods of random variates generation, inverse transformed method, acceptance rejection method, composition method, empirical method and rectangular approximation; Simulation languages: GPSS, SLAM; Logical flow diagram of different mining activities, Coding with GPSS and SLAM of different mining problems; Computer Control: Remote control, automatic control, application and limitations of control.

Essential Reading:

Supplementary Reading:
1. R.V. Ramani, Application of computer methods in the mineral industry.
MINE ENVIRONMENTAL ENGINEERING

Course/Paper: 06 BMI -101
BMI Semester-VI

Spontaneous Heating and Mine Fires: Spontaneous Heating : Causes, incubation period, detection, remedial measures. Mine Fires - Classification, causes, preventive measures, dealing with mine fires - direct and indirect methods, reopening of scaled off areas. ; Explosion: Fire-damp Explosion - Limits of inflammability of methane, causes of ignition, nature of fire damp explosion, propagation and prevention. Coal-dust Explosion - Index of inflammability, factors affecting explosibility of coal dust, causes and safeguards. Propagation of coal dust explosions, Investigation after an explosion. ; Mine Illumination: Its effects on safety, efficiency and health, Flame and electric safety lamps - their uses and lamp-room - lay out and organization, standards of illumination in mines, lighting from the mains, photometric illumination survey, Miners' diseases

Essential Reading:

Supplementary Reading:
UNDERGROUND MINING TECHNOLOGY

Course/Paper: 06 BMI -102
BMI Semester-VI

Development of Stratified Deposits: Choice of mine size, methods of entry and primary
development. ; Underground Coal Mining Methods: Classification and choice, Bord and Pillar
mining, development and extraction, Long-wall mining, face mechanization, production
equipment and face machinery used, viz. coal cutting machines, drills, mechanical loaders,
LHDS, shuttle car etc. - their performance and choice. Special coal mining methods. ;
Underground Metal Mining Methods: General Development of property level, crosscuts, raises
and winzes, drifting and tunneling, U/g metalliferrous mining methods - their classification and
choice. Stopping of ore bodies, supporting and development of stopes Special techniques of
mining mechanization. Mining equipment and production machine used below ground. Provision
of MMR 1961. ; Supports: Roadway and face supports, supports for junctions and special
conditions, setting and withdrawal of supports, roof bolting, roof stitching, systematic supporting,
protective of pillars. ; Stowing and Filling Methods, gathering and transportation arrangements,

Essential Reading:
1. T. N. Singh, Underground winning of Coal, Oxford and IBH New Delhi, 1992
2. Y. P. Chacharkar, A study of Metalliferous Mining Methods, Lovely prakshan Dhanbad, 1994

Supplementary Reading:
1. I.C.F. Statham, Coal Mining Practice, Caxton eastern agencies, Calcutta, Reprint, 1964
2. D.J. Deshmukh, Elements of Mining Technology, Vol - I & II, EMDEE publishers Ranchi,
Revised edition, 2000
3. S. K. Das, Modern Coal Mining Technology, Lovely prakshan Dhanbad, 1992
4. R. D. Singh, Principles & Practices of Modern Coal Mining, New age international New
Delhi, 1997
5. B. C. Arthur, SME Mining Engineers Hand Book, American Institute of Mining, Metallurgical
and Petroleum Engineers New York, 1973
GEOMECHANICS

Course/Paper: 06 BMI -103
BMI Semester-VI

**Rock Stress:** Stresses around mine openings of different cross-sections, Insitu Stress- Determination of insitu rock mass properties, insitu testing methods and instrumentations. ; **Design of underground workings:** Pillar Design including applicability of Wilson’s approach, Safety factors; **Slope Stability:** Slope failure types, mechanisms and theories. ; **Rock Reinforcement and Support:** Mechanisms of failure in rock structures-intact and anisotropy, Rock Load and stability, Supporting and reinforcement members, Design of support and reinforcement systems; **Mine Subsidence:** Subsidence mechanisms and control measures, Basics of numerical methods in geomechanics and applications

**Essential Reading:**

**Supplementary Reading:**
GROUND CONTROL INSTRUMENTATION

Course/Paper: 06 BMI-104
BMI Semester-VI

Deformation and Strain Measuring Instruments: Convergence meters, convergence recorders, convergence meters, convergence recorders, gauge, multipoint borehole extensometers and bore hole camera; Load and Pressure Measuring Instruments: Load cells, pressure measuring instruments – stress capsules, stress meters, borehole pressure, cells and flat jacks. Strain gauges and transducers, readout units, sensors, transmitters and data acquisition systems; Testing Equipment: UTM, MTS and acoustic emission equipment. Rock bolt pull tester, Monitoring and interpretation of the data; Applications: Mining Engineering applications; Instrumentation in underground mines and open cast mines; Civil Engineering applications; Instrumentation in Hydro electric projects and Tunnels, case studies.

Essential Reading:
2. M. L. Jeremic, Strata Mechanics in coal mining, A A Balkema, Rotterdam, Taylor and Francis, 1985,

Supplementary Reading:

REMOTE SENSING AND ITS APPLICATION

Course/Paper: 06 BMI-105
BMI Semester-VI

Elements of photogrammetry, Stereoscopic Vision, Photo interpretation techniques, Definition and components of remote sensing, Electromagnetic waves and radiation principles, Multispectral remote sensing, interaction of EMW with various ground components: vegetation, water, snow, soil and minerals; Sensors and platforms, False color composite, Digital image processing: geometric and radiometric correction, image enhancement, band ratio, edge detection, filtering, principal component analysis, and image classification, Normalized difference vegetation index, Application of remote sensing in hydrology, mineral exploration, natural hazards like landslide, flood, and earthquake, Identification of surface feature, drainage pattern, structural patterns.

Essential Reading:

Supplementary Reading:
4. B.Tso, P.M Mather, Classification Methods for Remotely Sensed Data, Taylor & 302
MINE ECONOMICS

Course/Paper: 06 BMI -106
BMI Semester-VI

Examination of Mineral properties, Mine sampling, estimation of reserves and grades, Impurities and quality control, commercial uses of minerals and ores; Mine valuation. Depreciation methods; decision trees, Mineral Industry of India, National Mineral Policies, conservation, taxation, trading, mining entrepreneurship, Principles of company law, shares and debentures; joint stock company and public company; partnership business, capital formation, ABC analysis and break-even analysis, budgetary control, wages and incentives, purchases, stores and inventory control, sales and despatches.

Essential Reading:

Supplementary Reading:
1. O.P. Khanna, Industrial Engineering and Management, Dhanpat Rai Delhi, 1993
2. R.N.P. Arogyaswamy, Courses in Mining Geology, Oxford and IBH Pub., 2nd ed, 1973

MINE ENVIRONMENTAL ENGINEERING LABORATORY

Course/Paper: 06 BMI -201
BMI Semester-VI

LIST OF EXPERIMENTS:
2. Study of MSA type Self Rescuer (Model: IW-65).
4. Study of Drager Pulmotor (Model: PT-60).
5. Study of Portable Fire Extinguishers
6. Study the construction and working of Explosion Proof Fire Stoppings.
7. Determination of susceptibility of coal by chemical method or by puff temperature method.
8. Study of stone dust barrier
9. Determination of flammability temperature of coal by using inflammability index apparatus
10. Study of layout of a self service type Lamp-room.
11. Measurement of Noise Level by Integrated Sound Level Meter (Model: CEL-283EX)
12. Measurement of Lux by Light Meter
GEOMECHANICS LABORATORY

Course/Paper: 06 BMI -202
BMI Semester-VI

LIST OF EXPERIMENTS:
1. Study of Universal Testing Machine
2. Evaluation of ground vibration using Blastmate
3. Determination of Explosive Strength by V.O.D.Monitor
4. Determination of rock hardness by Hardness Tester
5. Determination of Rock In-situ Stress by Flat Jack Unit
6. Determination of the relation between the moisture content and the dry density of the loose rock materials using light compaction
7. Study of Bore hole stress meter
8. To study the Permeability characteristics of coal specimens
10. Determination of Aggregate impact value of rock/ concrete by using Aggregate Impact Test Apparatus
11. Determination of Impact Strength with Pendulum Impact Tester
12. Introduction to a few numerical modeling software’s etc.

MODEL PREPARATION LABORATORY

Course/Paper: 06 BMI -203
BMI Semester-VI

LIST OF EXPERIMENTS:
1. Preparation of surface mining models
2. Preparation of underground coal mining models
3. Preparation of underground metal mining models
4. Preparation of underground mine ventilation models
5. Preparation of underground transport models
6. Preparation of underground excavation models
7. Preparation of underground man riding models
8. Preparation of underground support models
9. Preparation of opencast bench models
10. Preparation of reclamation models
11. Preparation of models on blasting in opencast mines
12. Preparation of models on blasting in underground mines
LIST OF EXPERIMENTS:
1. Simulation of underground openings - 2D continuum models
2. Simulation of underground openings - 3D continuum models
3. Simulation of underground openings - discontinuum models
4. Study of stability of underground opening – Mohr-Coulomb model
5. Study of stability of underground opening – Hoek-Brown model
6. Simulation of opencast workings
7. Study of stability of slopes – 2D continuum models
8. Study of stability of slopes – 3D continuum models
9. Study of stability of slopes – 2D discontinuum models
10. Design of supports for underground openings
11. Simulation of thick seam workings
12. Simulation of multiple seam work
ADVANCED SURFACE MINING

Course/Paper: 07 BMI -101
BMI Semester-VII

Introduction, Indian context of advance surface mines, Advancement in mine unit operation.
Planning of surface mines viz, Procedural steps of planning, Ore body description, Mining Systems,
Ultimate pit configuration. Design of surface mines, Feasibility Report & Detailed Project Report,
Modern surface mining equipments. ; Legislations related to surface mining, Mine Closure Planning.

Essential Reading:

Supplementary Reading:
MINE LEGISLATION AND SAFETY ENGINEERING

Course/Paper: 07 BMI -102
BMI  Semester-VII


Essential Reading:

Supplementary Reading:
INDUSTRIAL MANAGEMENT

Course/Paper: 07 BMI -103
BMI Semester-VII


Essential Reading:
1. O.P. Khanna, Industrial Engineering and Management, Khanna publishers, New Delhi.

TUNNELING

Course/Paper: 07 BMI -104
BMI Semester-VII

Design of tunnels: Rock mass classification, stability analysis of tunnels, elastic and plastic deformation; Ground control: stress conditions, behavior of ground, Geomechanics instrumentation, design of supports; Equipments, Tunnel Boring Machines, ventilation, tunnel economics.

Essential Reading:

Supplementary Reading:
1. R. V. Proctor, Rock Tunneling with Steel Supports
2. F. O. Franciss, Weak rock tunneling, Taylor and Francis, 1994
3. J. Johansen, Modern trends in tunneling and blast design, Taylor and Francis, 2000
4. F. D. Davidson, Tunneling and Transport, Elsevier APPLIED Science, 1987
5. Bieniawski Z.T, Rock Mechanics Design in Mining & Tunneling
ADVANCED COAL MINING

Course/Paper: 07 BMI -105
BMI Semester-VII

Extraction of thick seams: Problems and issues, recent experimental trials Chirimiri caving Method, Blasting Gallery Method, Integral Caving method, Sublevel caving method, Hydraulic Mining, Shield Mining. Extraction underneath surface features: Non-Effective width (NEW), Back filling methods, Wide stall mining. Extraction of multiple seams: Problems and issues, recent experimental trials, Parting failures and control, design of workings; Extraction of locked up pillars: Status of Bord and pillar mining in India, techniques of extraction and future requirements; Support systems: Strata behavior at greater depths, problems of strata control in high horizontal stress fields, design of support system.

Essential Reading:
3. R. D. Singh, Principles & Practices of Modern Coal Mining, New age international New Delhi, 1997
4. T. N. Singh, Underground winning of Coal, Oxford and IBH New Delhi, 1992

Supplementary Reading:
2. S. K. Das, Modern Coal Mining Technology, Lovely prakashan Dhanbad, 1992
3. S. P. Mathur, Coal Mining in India, M.S. Enterprises Bilaspur, 1999

MINE PLANNING-I

Course/Paper: 07 BMI -106
BMI Semester-VII

Principles of Mine Planning: Mining industry in comparison to other industries, Planning for mineral policy, Plans to be maintained in the mineral industry, Stages of planning of new mines, requirements of planning, Master Plan, Feasibility Report, Detailed project report; Technical considerations in Planning: Selection of method of mining, opening up of open cast mines and underground mines, development of open cast mines and underground mines, Division of mine lease area into mining Units, location of entries, Surface layout, pit bottom layout, Ventilation planning.

Essential Reading:
1. S. P. Mathur, Mine Planning for Coal, M.G. Consultants, Bilaspur, 1993

Supplementary Reading:
1. W. Hustrulid and M. Kuchta, Open Pit Mine Planning and Design, A.A.Balkema Rotterdam, 1995
3. PWJ Van Rensberg, Planning Open-pit mines, AA Balkema Cape Town, 1970
R D Singh, Principles and Practices of Modern Coal Mining, New age International Pvt limited Publishers, New Delhi, 1998
MINOR PROJECT

Course/Paper: 07 BMI -201
BMI  Semester-VII

PRACTICAL TRAINING  AND INDUSTRIAL VISIT

Course/Paper: 07 BMI -202
BMI  Semester-VII

Industrial visit (20 marks) is for the duration of 10 days at the end of V semester and Practical Training (80 marks) is for the duration of 30 days at the end of VI semester. Both will be evaluated during the VII semester and accordingly grade point will be awarded.
MINE PLANNING-II
Course/Paper: 08 BMI -101
BMI Semester-VIII

Essential Reading:

Supplementary Reading:
ADVANCED METALLIFEROUS MINING

Course/Paper: 08 BMI -102
BMI Semester-VIII

Methods: Techno-economic analysis on choice of stoping methods, high productivity methods: blasthole stoping, vertical retreat method of mining, block caving, raise stoping, underground bench blasting, stope design and production planning in the various methods of stopping; Special underground excavations: shaft pockets, ore bins, ore transfer, ramp, decline, step mining methods, stope fills: preparation, transportation and filling operation, stope design and production planning, methods of pillar extraction, solution mining: in situ leaching, underground retorting, under-sea mining, introduction to novel mining methods, Special underground excavation and system of supports; Pillar extraction: methods of pillar extraction, salt, potash and sulphur mining- their special problems.

Essential Reading:
1. Y. P. Chacharkar, A study of Metalliferous Mining Methods, Lovely prakshan Dhanbad,1994

Supplementary Reading:

ENVIRONMENTAL POLLUTION AND CONTROL IN MINES

Course/Paper: 08 BMI -103
BMI Semester-VIII


Essential Reading:

Supplementary Reading:
SAFETY ENGINEERING

Course/Paper: 08 BMI -104
BMI Semester-VIII


Essential Reading:

Supplementary Reading:

ECO-FRIENDLY MINING

Course/Paper: 08 BMI -105
BMI Semester-VIII


MINE PLANNING AND DESIGN LABORATORY

Course/Paper: 08 BMI-201
BMI Semester-VIII

LIST OF EXPERIMENTS:
1. Preparation of data base for mine evaluation
2. Create a geological data base and import all data files
3. Performing data compositing and statistical analysis
4. Create digital terrain model and surface contouring
5. Create section and digitization of individual sections
6. Create solid model using sections
7. Perform volume and area calculation of solid model, Union and intersection of different sections
8. Create block model; estimation of block models using inverse distance and polygonal method
9. Performing variogram analysis, fitting variogram, checking anisotropy
10. Intersection of block model and solid model; resource evaluation using ordinary kriging technique
11. Blast design using SURPAC software
12. Mine design using SURPAC software
13. Ultimate pit limit calculation
14. Determination of Grade tonnage curve and study the conditional biased in estimation

‘MAJOR PROJECT

Course/Paper: 08 BMI-202
BMI Semester-VIII

OBJECTIVE

The objective of the project work is to enable the students in convenient groups of not more than 3 members on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution.

The student should select any one of the topics offered from the department or select one on his own duly approved from the department. Candidate is required to submit the detailed synopsis of the work that he would complete in the part-II

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines.
SEMINAR

Course/Paper: 08 BMI-203
BMI Semester-VIII

OBJECTIVE

The students are to select one technical topic related its branch for Seminar. The student is to submit the synopsis for assessment and approval. Progress for preparation of the seminar topic would be continuously assessed from time to time. Two periods per week are to be allotted and students are expected to present the seminar Progress. A faculty guide is to be allotted and he/she will guide and monitor the progress of the student and maintain the attendance. Students have to give a final presentation for 15 minutes on his topic. Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews