

**3MI1 Strength of Materials**

**B.Tech. Mining 3<sup>rd</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Fundamentals:</b> Stress and strain, engineering properties, Saint-Venant's Principle. Stress strain diagram's   | 3             |
|      | mechanical properties of materials, elasticity and plasticity. Shear stress and strain, pure shear, Complementary shear.  | 2             |
|      | Linear elasticity and Hooke's law. Poisson's ratio, volumetric strain, bulk modulus of elasticity. Elastic constants and relation between elastic moduli. Stress and strain in axially loaded members. Temperature stresses and effects.  | 3             |
| II   | <b>Beam under Flexural Loads :</b> Beams – types and transverse loading on beams, Bending moment and shear force, relation between load, Shear force and bending moment.  | 3             |
|      | Bending moment and shear force diagrams for simply supported, Cantilever and overhang beams under static loading of different types viz. point loads, Uniformly distributed loads, linearly varying loads, Pure bending.  | 3             |
|      | Theory of simple bending of initially straight beams. Flexural stresses in beams. Built up and composite beams. Shear stresses in beams of rectangular, Circular and I-section. Shear formula, effect of shear strain.  | 2             |
| III  | <b>Deflection of Beams:</b> Double Integration method – Macaulay's method.  | 4             |
|      | Area moment theorems for computation of slopes and deflections in beams – Conjugate beam method   | 4             |
| IV   | <b>Torsion:</b> Torsion of solid and hollow circular shafts. Stresses and deformation in circular and hollow shafts – Stepped shafts- shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs.  | 4             |
|      | <b>Columns:</b> Buckling and stability, critical load. Euler's theory for initially straight column with different end conditions, equivalent length, Limitation of Euler's formula. Rankine's formula. column under concentric loading. Secant, Perry's and Indian standard Formulac | 4             |
| V    | <b>Energy Principles:</b> Strain energy and strain energy density – Strain energy due to axial loads , shear, flexure and torsion – Castigliano's and Engesser's energy theorems.   | 4             |
|      | Principle of virtual work – Application of energy theorems for computing deflection in beams – Maxwell's reciprocal theorems.   | 4             |
|      | <b>TOTAL</b>  | <b>40</b>     |

| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | Junarkar S.B. and Shah H.J. – Mechanics of Structures Vol.-I Charoter Publishing, Opp.- Amul Dairy, Court Road, Anand                      | 1997         |
| 2               | Punima B.C. – Strength of Materials and Mechanics of Structures, Vol-I edition, Standard publisher distributors, Nai Sarak, New Delhi – 19 | 1990         |
| 3               | S.C. Rangwala. Engineering Materials, Charotar Book Stall, Anand.  |              |

### 3MI2 Mechanical Engineering

**B.Tech. Mining 3<sup>rd</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT       | CONTENTS   | CONTACT HOURS |
|------------|--|---------------|
| <b>I</b>   | Thermodynamics: Thermodynamic properties, closed and open systems, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy.   | <b>3</b>      |
|            | Application of First Law in heating and expansion of gases in non-flow processes. First Law applied to steady flow processes. Second law of thermodynamics: Kelvin-Planck and Clausius statements.   | <b>3</b>      |
|            | Reversible processes, Carnot cycle, Carnot theorem. Entropy, physical concept of entropy, change of entropy of gases in thermodynamic processes.   | <b>2</b>      |
| <b>II</b>  | Steam Boilers: High pressure boilers of natural and forced circulation type, La Mont, Benson, Loeffler, Velox Boilers. Steam Turbines: Expansion of steam through nozzles with and without friction. Throat pressure for maximum discharge.  | <b>3</b>      |
|            | Working of impulse and reaction turbines. Compounding. Velocity diagrams. Governing of turbines. Emergency governing. Condensers: Types, classification and details. Vacuum efficiency.  | <b>3</b>      |
|            | Cooling towers and spray pounds. Gas Turbines: Basic principles, Simple gas turbine cycle, application of Gas turbine  | <b>2</b>      |
| <b>III</b> | Internal Combustion Engines: Introduction. Classification, terminology and description of IC Engines. Four stroke and two stroke petrol, gas and diesel engines. Valve timing diagrams. Comparison of petrol and diesel engines. Simple carburettor.   | <b>4</b>      |
|            | Ignition system of SI engine, diesel fuel pump and injectors. Governing of IC engines. Starting of engines. Measurement of IP, BP and heat balance calculations (not involving combustion). Engine efficiencies and performance  | <b>4</b>      |
| <b>IV</b>  | Transmission of Power: Belts, ropes and chains, tension in belts, power transmitted by belts. Gears and Gear trains. Brakes and Dynamometers: Band brake, block, band and block brake. Single and multiple disc clutches. Transmission and absorption type dynamometers.   | <b>4</b>      |
|            | Vibrations: Free, longitudinal, transverse and torsional vibrations, Critical speed.   | <b>4</b>      |
|            | Bearings and Couplings: Main types of bearings and coupling. Antifriction bearings.<br>Lubrication: Laws of friction for dry and lubricated surfaces, Methods of lubrication of bearings.  |               |
| <b>V</b>   | Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P. Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART). | <b>3</b>      |
|            | <b>Refrigerants:</b> Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants   | <b>2</b>      |
|            | <b>Air Conditioning:</b> Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Introduction to comfort air conditioning.  | <b>3</b>      |
|            | <b>TOTAL</b>   | <b>40</b>     |

| <b>TEXT BOOK</b>       |  |              |
|------------------------|--|--------------|
| <b>1</b>               |  |              |
| <b>REFERENCE BOOKS</b> |  |              |
| SN                     | Name of Authors /Books /Publisher  | Year of Pub. |
| <b>1</b>               | M. L. Mathur and F. S. Mehta: Thermal Engineering, (Vol. I & II, SI Edition), Jain Brothers, New Delhi |              |
| <b>2</b>               | R. K. Purohit: Thermal Engineering   |              |
| <b>3</b>               | R. S. Khurmi and J. K. Gupta: Theory of Machines, Eurasia Publishing House (Pvt.) Ltd., New Delhi      |              |

|   |  |  |
|---|--|--|
| 4 | P. L. Ballaney: Theory of Machines, Khanna Publishers, Delhi |  |
| 5 | Nagrath and Kothari: Electrical Machines                     |  |
| 6 | Ashfaq Hussain: Fundamentals of Electrical Engineering       |  |

### 3MI3 ELEMENTS OF MINING

B.Tech. Mining 3<sup>rd</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | Mineral resources of Rajasthan, India and World; Mining of important economic minerals in India;   | 3             |
|      | Various terms used in mining; Stages in the life of the mine,  | 3             |
|      | Introduction to unit operations, Economical, Social, Environmental and Health impacts of Mining.   | 2             |
| II   | <b>Prospecting:</b> Reconnaissance; principles and methods of prospecting - pit, shaft, trench and boreholes;  | 3             |
|      | Principle, method, Work schedule and application of Geologic, Geophysical, Geochemical, Electrical, Electromagnetic, Gravity methods of prospecting, | 3             |
|      | Sampling techniques; planning a prospecting programme Application of Remote Sensing and GIS in mineral prospecting.                                  | 2             |
| III  | <b>Exploration:</b> Boring, Principles of boring, Selection of sites for boreholes; Surface layout of boring; Details of equipment,                  | 3             |
|      | Core recovery, Borehole logging; Maintenance of records; Deflection of boreholes; Difficulties in boring; Fishing tools and their uses;              | 3             |
|      | Methods of exploratory drilling for oil; Interpretation of borehole data   | 2             |
| IV   | <b>Explosives:</b> Classification and comparative properties of explosive; Modern explosives, Mechanisms of rock blasting;                           | 3             |
|      | Blasting devices; Electric and non -electric methods; Delay blasting techniques; Priming; Charge distribution;                                       | 3             |
|      | Blasting with cut and solid blasting, General application and uses; Safety considerations.   | 2             |
| V    | <b>Pre mining, mining and post-mining:</b> ancillary mining operation,   | 3             |
|      | Types of entries to mineral deposits – Shaft, Incline, Adit –applicable conditions- limitations.   | 2             |
|      | Basic concepts of surface and underground mining, Comparison of underground and surface mining,  | 3             |
|      | TOTAL  | 40            |

| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | C.P. Chugh, High Technology in Drilling and Exploration. Pub: Oxford & IBH Publishing Co. Pvt.Ltd. New Delhi.                |              |
| 2               | C.P. Chugh, Diamond Drilling. Pub: Oxford & IBH Publisher  |              |
| 3               | Howard, L.Hartman, Introductory Mining Engineering, Pub: John Willey & Sons  |              |
| 4               | Dr.Sushil Bhandari, Engineering Rock Blasting Operations. Pub: A.A.Balkema Publisher Old post Road, Brook field, TO5036, USA |              |
| 5               | R.D. Singh, Principles & Practices of Modern Coal Mining Pub:-New Age International Pvt.Ltd. New Delhi                       |              |
| 6               | Dr. Calvin Konya; “Rock Blasting and Overbreak Control” Precision Blasting Services, Montville, Ohio                         |              |

**3MI4 MINE MACHINERY –I**

**B.Tech. Mining 3<sup>rd</sup> Semester**  
**3L+0T**

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | <b>Compressed Air:</b> Air Compressors; types, construction, installation & maintenance;   | 3             |
|      | Transmission and distribution of compressed air; Calculations of main parameters;  | 3             |
|      | Comparison of compressed air with other forms of power   | 2             |
| II   | <b>Wire ropes:</b> Usage, chemical composition, infield tests of wire, classification of wire ropes, Wire ropes used in mines- their applicability, construction, installation, maintenance, | 3             |
|      | causes of deterioration, precautions, selection parameters, Various tests, computation of numerical problems on size - Weight and strength of wire ropes, space factor,                      | 3             |
|      | Capping and recapping of wire ropes, classification - description of capping methods - splicing methods, description of splicing and change of ropes   | 2             |
| III  | <b>Aerial Ropeway:</b> Different types, their suitability, advantages, limitations, construction, installation, operation and maintenance,   | 4             |
|      | layouts and working of terminal, loading, unloading, change over, turning station ,  | 3             |
|      | rope tensioning arrangements   | 1             |
| IV   | <b>Rail Transportation:</b> Purpose of transportation, comprehensive classification of transportation – Various haulage systems, their applications, merits, and demerits,                   | 3             |
|      | safety devices in haulage system, laying and maintenance of track, gauge selection, constructional details of mine tub/car, factors of selection for rope/loco haulage,                      | 3             |
|      | computation problems for determination of loco parameters, rope haulage engine H.P. rope size, breaking strength, tub capacity, number of tubs   | 2             |
| V    | <b>Conveyor haulage:</b> Conveyor usage, different types and applicability, their construction, installation and maintenance, belt conveyor system, different types of belt constructions,   | 3             |
|      | safety devices merits, demerits and limitations of Belt conveying system, belt tensioning arrangements, sequentially controlled conveyors,   | 2             |
|      | compilation of numerical problems to find the material quantity, H.P., length and inclination of haulage, tensing strength, breaking strength of belt, amount of slip etc                    | 3             |
|      | <b>TOTAL</b>   | <b>40</b>     |

| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | Dr. G.B. Mishra, Surface Mining Pub:GeoMinetech Publisher, Bhubneshwar                                     |              |
| 2               | Amitosh Dey, Heavy Earth Moving Machinery. Available at Geeta book store, Dhanbad                          |              |
| 3               | M.A. Ramlu, Mine Hoisting. Pub: Oxford & IBH Publishing Co. Pvt.Ltd. New Delhi                             |              |
| 4               | Karelin, Mine Transport. Pub:- Orient Longmans Ltd. New Delhi  |              |
| 5               | M. A. Ramlu; “Mine Hoisting” Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi                               |              |
| 6               | C. P. Chug; “High Technology in Drilling and Exploration” Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi |              |
| 7               | Cummins & Givens; “SME Mining Engineering Handbook, Vol. I & II” A.I.M.M.New-York                          |              |
| 8               | R..D. Singh, Principles & Practices of Modern Coal Mining Pub:-New Age International Pvt.Ltd. New Delhi    |              |

### 3MI5 MINING GEOLOGY - I

**B.Tech. Mining 3<sup>rd</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT       | CONTENTS   | CONTACT HOURS |
|------------|--|---------------|
| <b>I</b>   | <b>General Geology:</b> Branches and Scope of Geology in Mining, Internal Structure of the Earth,  | 3             |
|            | Types of Weathering & Geological work of natural agencies like River & Wind.   | 3             |
|            | Geological Time Scale. Theory of Plate Tectonics   | 2             |
| <b>II</b>  | <b>Mineralogy:</b> Physical, Chemical & Optical Properties of Minerals.  | 3             |
|            | Polymorphism and Isomorphism; Crstallography and Its definition; Crystal Systems in brief; Classification of rock forming minerals;                                    | 3             |
|            | Description of mineral families i.e. Feldspar group, mica group, pyroxene group, amphibole group   | 2             |
| <b>III</b> | <b>Petrology:</b> Formation, Texture, Structure and Classification of Igneous, Sedimentary and Metamorphic Rocks.  | 3             |
|            | Engineering Properties of Rocks for Building & Road Material.  | 3             |
|            | Laboratory and Field & in-situ Test for Site Construction  | 2             |
| <b>IV</b>  | <b>Structural Geology:</b> Structural features of rocks, attitude of rocks; Folds and faults- definition, mechanism, classification, recognition and impact in mining; | 3             |
|            | Joints, definition, classification and impact in mining; Unconformities, outlier and inlier.   | 3             |
|            | Stereographic plotting of geological features  | 2             |
| <b>V</b>   | <b>Remote Sensing :</b> Remote Sensing System, Nature of Electromagnetic Radiation, Electromagnetic Spectrum, Energy   | 3             |
|            | Interactions with Earth's Surface Materials, Remote Sensing Platforms & Sensor's Characteristics.  | 2             |
|            | Application, Advantages and Limitations of Remote Sensing in Various fields of Mining Engineering  | 3             |
|            | <b>TOTAL</b>   | <b>40</b>     |

| <b>TEXT BOOK</b>       |   |              |
|------------------------|---|--------------|
| <b>1</b>               |   |              |
| <b>REFERENCE BOOKS</b> |   |              |
| SN                     | Name of Authors /Books /Publisher   | Year of Pub. |
| 1                      | Parbin Singh-A Text Book of Engineering & General Geology- S.K.Kataria & sons                     |              |
| 2                      | N Chenna Kesavulu- A Text book of Engineering Geology- Macmillan India Ltd.                       |              |
| 3                      | M.T.Maruthesha Reddy- A Text book of Applied Engineering Geology- New Age International Publisher |              |
| 4                      | Mukerjee P.K. , A Textbook of Geology, The World Press Pvt.LtD Calcutta.                          |              |
| 5                      | Tyrell G.W.,The Principles of Petrology, B.I.Publications Pvt. Ltd                                |              |
| 6                      | H.H.Read ,Textbook of Minerology Oxford University Press.Delhi                                    |              |
| 7                      | Pettijohn F.J.,Sedimentary Rocks, C.B.S.Publishers & Distributors                                 |              |
| 8                      | Billings M.P, Structural Geology, Prentice Hall of India Pvt. Ltd New Delhi                       |              |

### 3MI6 Advanced Engineering Mathematics - I

**B.Tech. Mining 3<sup>rd</sup> Semester**  
3L+1T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT     | CONTENTS  | CONTACT HOURS |
|----------|---|---------------|
| <b>I</b> | <b>Interpolation:</b> Finite differences, various difference operators and their relationships, factorial notation. Interpolation with equal intervals; | 3             |

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|     | Newton's forward and backward interpolation formulae, Lagrange's interpolation formula and unequal intervals.  | 3  |
|     | Gauss forward and backward interpolation formulae, Stirling's and Bessel's central difference interpolation formulae   | 2  |
| II  | <b>Numerical Differentiation:</b> Numerical differentiation based on Newton's forward and backward, Gauss forward and backward interpolation formulae.               | 3  |
|     | <b>Numerical Integration:</b> Numerical integration by Trapezoidal, Simpson's rule.  | 2  |
|     | <b>Numerical Solutions of Ordinary Differential Equations:</b> Picard's method, Taylor's series method, Euler's method, modified Euler's method, Runge-Kutta methods | 3  |
| III | <b>Laplace Transform:</b> Laplace transforms of elementary functions; Basic properties of Laplace transform;   | 3  |
|     | Initial value theorem, final value theorem and convolution property of Laplace transform; Inverse Laplace transform.   | 3  |
|     | Applications of Laplace transform to solve ordinary differential equations   | 2  |
| IV  | <b>Roots of Nonlinear (Algebraic and Transcendental) Equations:</b> Bisection method, False position method, Newton Raphson method;                                  | 3  |
|     | Convergence of False position and Newton Raphson method. Complex roots of polynomials by Bairstow's method.  | 3  |
|     | Fourier series: Fourier Series, even and odd functions; Half range series; Change of interval; Exponential form of Fourier series; Harmonic analysis                 | 2  |
| V   | <b>Statistics:</b> Correlation and regression; Principle of least square method and curve fitting.   | 3  |
|     | <b>Probability Distribution Functions:</b> Random variable; Mathematical expectations; Moment generating functions; Discrete and continuous distribution functions;  | 2  |
|     | Binomial, Poisson and Normal distributions   | 3  |
|     | TOTAL  | 40 |

| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | H.C. Saxena. Text Book of Finite Differences and Numerical Analysis, S. Chand and Co   |              |
| 2               | M.K. Jain, S.R.K. Iyengar and R.K. Jain. Numerical Methods for Scientific and Engineering computation, New Age International (P) Ltd |              |
| 3               | N.P. Bali and Manish Goyal. A Text book of Engineering Mathematics, Laxmi Publication Pvt. Ltd., New Delhi (VII Edition)             |              |
| 4               | S.P. Goyal and A.K. Goyal, Integral Transformations, Jaipur Publishing House, Jaipur   |              |
| 5               | J.L. Bansal and H.S. Dhami. Differential Equations (Vols.-II), Jaipur Publishing House, Jaipur                                       | 2005         |
| 6               | N.P. Bali and Manish Goyal. A Text book of Engineering Mathematics (VII Edition), Laxmi Publication Pvt.Ltd. , New Delhi             |              |
| 7               | S.C. Gupta and V.K. Kapoor. Mathematical Statistics, Sultan Chand and Sons, New Delhi  |              |

### 3MI7 Strength of Material

B.Tech. Mining 3<sup>rd</sup> Semester  
0L+0T+3P

Max. Marks: 75  
Exam Hrs: 3

| SN | CONTENTS  | CONTACT HOURS |
|----|---|---------------|
| 1  | Study of Universal Testing Machine, its part and functions  |               |
| 2  | Operation of U.T.M, fixing of specimen for different testing  |               |
| 3  | Tensile test on mild steel specimen to failure and computing, Stresses, % elongation, Contraction etc |               |

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| 4  | Compression test on timber   |  |
| 5  | Compression test on mild steel   |  |
| 6  | Compression test on concrete cube  |  |
| 7  | Determination of toughness test of mild steel, Brass and Aluminum by Charpy test |  |
| 8  | Determination of toughness by Izod test for wood, Aluminum & Brass               |  |
| 9  | Study of torsion testing machine   |  |
| 10 | Performance of torsion test on circular shaft specimen                           |  |
| 11 | Bending test on wooden beam and determination of modulus of rupture              |  |
| 12 | Deflection test on wooden beam   |  |
| 13 | Strength determination of Mortar   |  |
| 14 | Study of Stones  |  |
| 15 | Study of water cement ratio on Cement concrete                                   |  |

### 3MI8 Mechanical Engineering

B.Tech. Mining 3<sup>rd</sup> Semester  
0L+0T+2P

Max. Marks: 50  
Exam Hrs: 3

| SN | CONTENTS   | CONTACT HOURS |
|----|--|---------------|
| 1  | Study of steam engine, boilers                               |               |
| 2  | Dryness fraction measurement                                 |               |
| 3  | Study of IC engines  |               |
| 4  | Study of simple carburetors                                  |               |
| 5  | Determining valve timing diagrams                            |               |
| 6  | Engine testing   |               |
| 7  | Study of various transmission systems                        |               |
| 8  | Gearing ratio and no. of teeth on gear                       |               |
| 9  | Study of gears, brakes and dynamometers                      |               |
| 10 | Study of various types of clutches and antifriction bearings |               |
| 11 | Refrigeration cycle  |               |
| 12 | Study and experiments on refrigeration systems               |               |
| 13 | Study of air conditioner                                     |               |
| 14 | Refrigeration and Air Conditioning in Mines                  |               |

### 3MI9 Elements of Mining

B.Tech. Mining 3<sup>rd</sup> Semester  
0L+0T+3P

Max. Marks: 75  
Exam Hrs: 3

| SN | CONTENTS  | CONTACT HOURS |
|----|---|---------------|
| 1  | Mapping of different mineral resources of (i) Rajasthan (ii) India and (iii) world.   |               |
| 2  | Illustration of Mining Terminology  |               |
| 3  | Various types of fishing tools used in exploratory boring for mineral and oil   |               |
| 4  | Bore-hole logging and interpretation of bore hole data and numerical problems related to it                                     |               |
| 5  | Designing of explosive magazine   |               |
| 6  | Preparation of prospecting scheme   |               |
| 7  | Study of portable borehole machine  |               |
| 8  | Study of various types of bits used in borehole coring  |               |
| 9  | To feed the bore hole data in computer software and to take results related with the formation and quantum of mineral resources |               |
| 10 | Selection of various types of blasting accessories used in mines  |               |
| 11 | PMS Plants with various capacities for surface mines  |               |

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|----|---|--|
| 12 | SMS Plants with various capacities for surface mines            |  |
| 13 | Preparation of series and parallel blasting circuit connections |  |
| 14 | Study of portable magazine                                      |  |
| 15 | Study of exploder   |  |

### 3MI10 MINING MACHINERY-I

**B.Tech. Mining 3<sup>rd</sup> Semester**  
0L+0T+3P

**Max. Marks: 75**  
**Exam Hrs: 3**

| SN | CONTENTS   | CONTACT HOURS |
|----|--|---------------|
| 1  | Transmission and distribution of compressed air for surface and underground mines with pressure losses and remedial measures |               |
| 2  | Wire ropes construction and determination of space factor  |               |
| 3  | Rope splicing  |               |
| 4  | Different types of rope capels and method of recapping   |               |
| 5  | Design and application of rope capels  |               |
| 6  | Various stations in aerial rope way e.g. Loading, Unloading, Transfer, Turning, Terminal stations                            |               |
| 7  | Laying of tracks and different crossings   |               |
| 8  | Safety devices used on haulage system  |               |
| 9  | Battery charging station   |               |
| 10 | Loco garage  |               |
| 11 | Conveyor systems   |               |
| 12 | High angled conveyor   |               |
| 13 | Belt tensioning arrangement and Loop take up arrangements  |               |
| 14 | Sequentially controlled belt conveyor system   |               |

### 3MI11 Mining Geology – I

**B.Tech. Mining 3<sup>rd</sup> Semester**  
0L+0T+3P

**Max. Marks: 75**  
**Exam Hrs: 3**

| SN | CONTENTS  | CONTACT HOURS |
|----|---|---------------|
| 1  | Minerals under handspecimen   |               |
| 2  | Rocks under handspecimen  |               |
| 3  | Geomorphic models   |               |
| 4  | Crystal models under handspecimen   |               |
| 5  | Geological succession of India and available minerals                             |               |
| 6  | Plotting of geological section along given section line in the given geologic map |               |
| 7  | Plotting Indian geological formations & mineral deposits                          |               |
| 8  | Plotting of earthquake/ seismic belts of world and India                          |               |
| 9  | Plotting of volcanic belts of World and India                                     |               |
| 10 | Plotting of Physiographic maps of India   |               |
| 11 | Plotting of structure/ tectonic map of India                                      |               |
| 12 | Structural models under hand specimen   |               |
| 13 | Interpretation of Ariel photographs with the help of stereoscope                  |               |
| 14 | Interpretation of the satellite imagery   |               |
| 15 | Ore body outcrop compilation in given geologic map                                |               |



### 4MI 1 ELECTRICAL ENGINEERING

**B.Tech. Mining 4<sup>th</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | <b>D.C. Machines</b> : Characteristics curves of d. c. generators and motors.                                    | 4             |
|      | Application of motors for different uses, starting and speed control of motors                                   | 4             |
| II   | <b>Transformers</b> : Phasor diagram and equivalent circuits, regulation efficiency and their determination ,    | 5             |
|      | open circuit, short circuit and sumpeners's test   | 3             |
| III  | <b>Induction Motors</b> : Poly phase induction motors- Starters, equivalent circuit, effect of rotor resistance, | 3             |
|      | torque slip curves, speed control by rotor resistance, pole changing and cascading, use in industry;             | 3             |
|      | Single –phase induction motor- starting methods  | 2             |
| IV   | <b>Alternators</b> : Elementary idea of armature winding- calculation of induced e. m. f.                        | 3             |
|      | factors affecting generating e. m. f. open circuit, short circuit and load characteristics.                      | 3             |
|      | Voltage regulation and its determinations by synchronous impedance methods, synchronizing                        | 2             |
| V    | <b>Synchronous Motors</b> : Methods of starting, power angle characteristics of cylindrical rotor machine,       | 3             |
|      | operation of synchronizing motor as a condenser and as a reactor   | 2             |
|      | Application in Industries  | 3             |
|      | <b>TOTAL</b>   | <b>40</b>     |

| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher                      | Year of Pub. |
| 1               | Nagrath and Kothari: Electrical Machines               |              |
| 2               | Ashfaq Hussain: Fundamentals of Electrical Engineering |              |

### 4MI2 FLUID MECHANICS

**B.Tech. Mining 4<sup>th</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | <b>Hydrostatics</b> : Fluid Properties, Measurement of liquid pressure.  | 3             |
|      | Pascal's law fluid pressure on plane and curved stationery surface, Centre of pressure,  | 3             |
|      | Principal applications ( preliminary ) in simple gales and tanks   | 2             |
| II   | <b>Fluid motion</b> : type and patterns, velocity and acceleration of fluid, continuity equation, elementary concept of velocity potential. Stream function and flow nets. Euler's equation of motion. | 3             |
|      | Euler's equation of motion, integration of Euler's equation to give Bernoulli's equation for compressible and incompressible fluids.   | 2             |
|      | Integration of Euler's equation to give Bernoulli's equation for compressible and incompressible fluids, applications of Bernoulli's equation.   | 3             |
| III  | <b>Impulse momentum equation</b> : introduction, momentum correction factor force on pipe bends.   | 3             |

|    |  |    |
|----|--|----|
|    | Flow through sharp edged orifices, flow through mouth pieces (steady flow condition).  | 2  |
|    | <b>Discharge measurement in pipes and open channels:</b> Venturimeter, orificemeter. Nozzle and Pitot tube (steady flow condition). Flow over weirs, and notches (steady flow condition) | 3  |
| IV | <b>Flow through pipes:</b> Various types. Velocity distribution. Loss of head due to friction.   | 3  |
|    | Minor losses, hydraulic gradient, pipes in series and parallel. Open channel flow:   | 2  |
|    | Various types, flow equation, geometrical properties of sections. Most economical section. Introduction of specific energy and force   | 3  |
| V  | <b>Open Channel Flow:</b> Various types, flow equations,   | 3  |
|    | geometrical properties of sections, Most economical section.   | 2  |
|    | Introduction of specific energy and force  | 3  |
|    | TOTAL  | 40 |

|                        |  |              |
|------------------------|--|--------------|
| <b>TEXT BOOK</b>       |  |              |
| 1                      |  |              |
| <b>REFERENCE BOOKS</b> |  |              |
| SN                     | Name of Authors /Books /Publisher  | Year of Pub. |
| 1                      | Jadish Lal, Hydraulics, Metropolitan Book Co. Pvt. Ltd., Delhi                         | 1986         |
| 2                      | Modi P.N. and Seth, S.M. – Hydraulic and Fluid Mechanics, Standard Book House, Delhi-6 | 1995         |
| 3                      | R.K. Bansal, Fluid Mechanics & Machine   |              |

#### 4MI3 STRATA CONTROL

B.Tech. Mining 4<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | <b>Strata and ground movements:</b> Strata conditions before and after mining operations – Theories of mechanics of Strata behaviour   | 3             |
|      | Strata pressure redistribution in and around Bord and pillar and long wall workings.   | 3             |
|      | Surface Movements and Deformation during Bord and pillar and Longwall Mining   | 2             |
| II   | <b>Subsidence:</b> Causes and impact, Mechanics and theory of subsidence, Angle of draw and angle of fracture, factors affecting subsidence,   | 3             |
|      | Protective measures, Subsidence measurements, Estimation of vertical and lateral movements,  | 2             |
|      | Subsidence monitoring and prediction, Sub-critical, critical and super-critical widths of extraction   | 3             |
| III  | <b>Supports:</b> Necessity, Materials used, Classification of supporting Systems, Applicability of various types of supports, Size and Shape of supports,  | 3             |
|      | Rigid and Yielding props, constructional details of Friction and Hydraulic props, Principle of roof bolting, stitching – Merits and demerits of bolting,   | 3             |
|      | Self advancing powered supports, Method of setting various supports at different locations, Systematic Supporting, Clearance of roof Collapse, withdrawal of supports  | 2             |
| IV   | <b>Stowing:</b> Applicability conditions, classification, advantages & limitation, factors influencing and description of various methods of goaf stowing,   | 3             |
|      | Surface and underground arrangements and precautions with stowing, Sand gathering methods- manual, shovel, pontoon, pumping of sand slurry, transportation of sand, mixing chambers, hydraulic profile, face arrangements. | 3             |
|      | Pneumatic and hydraulic stowing, their applicability, merits and demerits. Comparison of Various Mining Methods  | 2             |
| V    | <b>Mine Openings:</b> Stress distribution around narrow and wide openings.   | 3             |
|      | Extent of failure around mine openings. Determination of size of opening and extent of failure.  | 2             |
|      | Determination of shape and size of pillars in coal and hard rock mines, shaft pillars, barrier pillars   | 3             |
|      | TOTAL  | 40            |

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| TEXT BOOK       |   |              |
|-----------------|---|--------------|
| 1               |   |              |
| REFERENCE BOOKS |   |              |
| SN              | Name of Authors /Books /Publisher   | Year of Pub. |
| 1               | R.D. Singh, Principles & Practices of Modern Coal Mining Pub:-New Age International Pvt.Ltd. New Delhi      |              |
| 2               | Obert & Duall, Rock Mechanics and design of structures in rock. Pub: John Willey & Sons                     |              |
| 3               | Railey & Dalley, Experimental stress analysis. Pub: McGraw Hill Book Company                                |              |
| 4               | B.S. Verma, Elements of Mechanics of Mining Ground. Pub. Tuhin & Co., E-1898(MIG) Rajajipuram, Lucknow, U.P |              |
| 5               | Vutukuri & lama, Handbook of Mechanical properties of rock Vol.I&II. Pub: Transtech, Germany                |              |
| 6               | S.S.Peng, Coal Mine Ground Control. Pub: John Willey & Sons   |              |

#### 4MI4 MINING GEOLOGY - II

B.Tech. Mining 4<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | <b>Stratigraphy:</b> Introduction, standard stratigraphic scale, principle of stratigraphic correlation;               | 3             |
|      | Geology of India in brief; Review of major geological formations of minerals of India                                  | 3             |
|      | Fossil Fuels   | 2             |
| II   | <b>Geology of Rajasthan:</b> with emphasis on economic importance;   | 3             |
|      | Precambrian stratigraphy of Rajasthan, Central India, Bihar, Orrisa, Eastern and Western Ghats, and South India;       | 2             |
|      | Middle and late Proterozoics i.e Cuddapah, Vindhyan and its equivalents; Gondwana system                               | 3             |
| III  | <b>Economic Geology:</b> Definition of ore, gangue, tenore and grade and classification of mineral deposits;           | 3             |
|      | Study of occurrence, shape, form, size, mineral composition and texture of various process generated mineral deposits; | 3             |
|      | Controls of localization of mineral deposits   | 2             |
| IV   | <b>Engineering Geology and Hydrogeology:</b> Criteria of site selection for shaft, incline, tunnels, dams and wells;   | 3             |
|      | Terminology and classification, Hazards and influence of geological factors at tunnel sites.                           | 3             |
|      | Introduction to hydrogeology and its impact on mining  | 2             |
| V    | <b>Geotechnical Engineering:</b> Geophysical methods for Subsurface Aanalysis (Electrical and Seismic methods),        | 3             |
|      | Grouting, Backfilling, Rock Bolting,   | 2             |
|      | Soil Stabilization, Slope Stabilization  | 3             |
|      | TOTAL  | 40            |

| TEXT BOOK       |   |              |
|-----------------|---|--------------|
| 1               |   |              |
| REFERENCE BOOKS |   |              |
| SN              | Name of Authors /Books /Publisher   | Year of Pub. |
| 1               | Krishnan M.S, Geology of India & Burma, C.B.S.Publishers&DistributorsDelhi                              |              |
| 2               | Ravindra Kumar, Fundamentals of Historical Geology & Stratigraphy of India, Wiley Eastern Pvt Ltd Delhi |              |
| 3               | Rogers J.J.W, Precambrian Geology of India, Oxford University Press                                     |              |

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|   |  |  |
|---|--|--|
| 4 | Lemon R.R, Principles of stratigraphy, Meril publishing Co. London           |  |
| 5 | Weller J.M, Stratigraphic principles and Practice, Universal Bookstall Delhi |  |

#### 4MI5 MINE DEVELOPMENT

B.Tech. Mining 4<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Introduction to primary and secondary mine development.</b>  | 3             |
|      | <b>Mine Entries:</b> Choice, location and size of mine entries- shafts, inclines, declines and adits; their merits and applicability                            | 3             |
|      |   | 2             |
| II   | <b>Mine Structures:</b> Construction and layouts of structures -  | 3             |
|      | Shaft insets, ore and waste bins, skip-pockets,   | 2             |
|      | engine chambers, ore passes, chutes, garages, grizzlies and sumps   | 3             |
| III  | <b>Shaft Sinking:</b> Conventional methods; Preparatory arrangement; Drilling, blasting, loading and hoisting of muck;  | 3             |
|      | Lining, ventilation, drainage and lighting; Sinking through loose, fractured, flowing and water bearing ground;   | 3             |
|      | Widening and deepening of shafts; Shaft boring; staple shaft  | 2             |
| IV   | <b>Drifting:</b> Conventional methods, different types of drilling patterns, blasting, loading, transport of muck, support, ventilation, drainage and lighting; | 3             |
|      | Drifting through loose, fractured, flowing and water bearing ground; Drifting by road headers and tunnel boring machines.                                       | 3             |
|      | Cross- measure drifts and laterals  | 2             |
| V    | <b>Stope Development:</b> Conventional methods of raising and winzing;  | 4             |
|      | Modern methods of Raising - Raise climbers, Long hole raising and Raise borers; Slot preparation  | 4             |
|      | <b>TOTAL</b>  | <b>40</b>     |

| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | Howard, L.Hartman, Introductory Mining Engineering, Pub: John Willey & Sons            |              |
| 2               | Cummins & Givens, SME Mining Engineering Handbook, Vol. I & II, Pub: A.I.M.M. New-York |              |
| 3               | Ray Lowrie; "SME Mining Reference Handbook" SME Publication                            | 2002         |
| 4               | William A. Hustrulid, Rechar Bullock; "Underground Mining Methods" SME Publication     |              |

#### 4MI6 MINE-SURVEYING – I

B.Tech. Mining 4<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | Principle and purpose of plane surveying  | 2             |
|      | <b>Chain Surveying:</b> Instrument for chaining, Direct & indirect ranging. Methods of chain along plane & sloping ground, Base line, check line, Tie line, Offset, Chain angle & recording in field book | 3             |
|      | <b>Compass Surveying:</b> True & Magnetic meridian, whole circle bearing & quadrantal bearing system, construction & use of Prismatic & Surveyor Compass, Local attraction                                | 3             |

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|     |   |    |
|-----|---|----|
| II  | <b>Level and leveling</b> : Definition of various terms used in leveling. Types of Bench mark and their uses. Construction and use of Dumpy and Tilting levels, Leveling staves.  | 3  |
|     | Temporary adjustment of Dumpy level. Simple, differential leveling, fly leveling, longitudinal and cross sectioning, plotting of profile leveling. Determination of level by line of collimation and rise and fall method, Arithmetical checks. | 2  |
|     | Level book and record keeping, leveling difficulties and errors in leveling   | 3  |
| III | <b>Theodolite</b> : Various types; Principles of construction; Temporary and permanent adjustments; Measurement of horizontal angles; Tubular and trough compass.   | 3  |
|     | <b>Traversing</b> : Theodolite traversing; Closing error and its adjustment; Calculation of coordinates; Problems in traverse surveying; Area of closed traverse;   | 3  |
|     | Omitted measurements and their calculations   | 2  |
| IV  | <b>Tacheometric Surveying</b> : Principles; Types of tacheometer; Additive and multiplying constants; Tangential tacheometry; Anallactic lens; General procedure for field work; Degree of accuracy.  | 3  |
|     | <b>Mine Levelling</b> : Shaft plumbing and measurement of depth of shaft; Subsidence survey; Underground levelling and grading,   | 3  |
|     | Giving and maintaining direction & gradient for inclined shaft, slopes, levels and tunnels; Maintaining alignment   | 2  |
| V   | <b>Curve Ranging</b> : Definition; Elements of curves; Degree of curvature; Different methods of setting out curves (apex accessible and apex inaccessible); Underground curve laying;  | 4  |
|     | <b>Contouring</b> : Definitions; Characteristics of contours; Tacheometric Contouring - Fieldwork, Interpolation of contours; Plotting and interpretation of contours   | 4  |
|     | TOTAL   | 40 |

|                        |  |                     |
|------------------------|--|---------------------|
| <b>TEXT BOOK</b>       |  |                     |
| 1                      |  |                     |
| <b>REFERENCE BOOKS</b> |  |                     |
| <b>SN</b>              | <b>Name of Authors /Books /Publisher</b>                                   | <b>Year of Pub.</b> |
| 1                      | Dr.B.C.Punmia, Surveying Vol. I & II, Pub: Laxmi Publication New-Delhi     |                     |
| 2                      | T.P. Kanetkar, Surveying & Levelling, Vol I & II, Geeta book store Dhanbad |                     |
| 3                      | Mc Adam; "Colliery Surveying"  |                     |
| 4                      | Holland; Surveying Vol. I & II   |                     |

#### 4MI7 Fluid Mechanics

B.Tech. Mining 4<sup>th</sup> Semester  
0L+0T+2P

Max. Marks: 50  
Exam Hrs: 3

| SN | CONTENTS                                       | CONTACT HOURS |
|----|--|---------------|
| 1  | Study and use of pressure gauge                |               |
| 2  | Study & use of manometer                       |               |
| 3  | Determination of $C_C$ for orifices            |               |
| 4  | Determination of $C_V$ for orifices            |               |
| 5  | Determination of $C_d$ for orifices            |               |
| 6  | Calibration of a Venturimeter                  |               |
| 7  | Calibration of V notch                         |               |
| 8  | Calibration of Rectangular notch               |               |
| 9  | Determination of friction for pipe             |               |
| 10 | Velocity distribution in channel cross section |               |
| 11 | Field visit                                    |               |
| 12 | Field visit                                    |               |
| 13 | Field visit                                    |               |

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|    |             |  |
|----|-------------|--|
| 14 | Field visit |  |
| 15 | Field visit |  |

#### 4MI8 Mining Geology II

**B.Tech. Mining 4<sup>th</sup> Semester**  
0L+0T+3P

**Max. Marks: 75**  
**Exam Hrs: 3**

| SN | CONTENTS  | CONTACT HOURS |
|----|---|---------------|
| 1  | Exercises related to ore reserve estimation   |               |
| 2  | Metallic minerals under hand specimen   |               |
| 3  | Non-metallic economic minerals under hands pecimen  |               |
| 4  | Find the width of ore body with the help of outcrop observations in the following topographic conditions:<br>a. On horizontal ground<br>b. Slope of ground opposite to the dip of the ore body.<br>c. Ground slopping in the same direction as dip of the ore body. |               |
| 5  | Stereo-net plotting of ore body planes with the help of dip and strike data obtained by borehole drilling   |               |
| 6  | Find the apparent dip in given direction with the help of stereo-net  |               |
| 7  | Find the amount and direction of plunge of the ore body by given strike-dip data with the help of stereo-net  |               |
| 8  | Construction of Clinometers and Brunton compass   |               |
| 9  | Determination of volumetric joint count   |               |
| 10 | T.V.I calculation with the help of given data   |               |
| 11 | Calculation of specific yield of a well   |               |
| 12 | Calculation of a cone of depression   |               |
| 13 | Plotting of dip isogons   |               |
| 14 | Calculation of T/W ratio for dams (T= pressure of reservoir water tends to displace the dam horizontally & W = the weight of the dam which acts downwards and tends to key the dam in position, R= resultant forces)  |               |
| 15 | Find out inclination and slope of ore body with the help of three-point method  |               |
| 16 | Determination of apparent dip of ore body from true-dip with the help of stereo-net   |               |

#### 4MI9 Mine Development

**B.Tech. Mining 4<sup>th</sup> Semester**  
0L+0T+3P

**Max. Marks: 75**  
**Exam Hrs: 3**

| SN | CONTENTS   | CONTACT HOURS |
|----|--|---------------|
| 1  | Design a drift taking into consideration different options available for given set of conditions |               |
| 2  | Tunnel boring machine used in India and Abroad & various application parameters                  |               |
| 3  | Ordinary method of shaft sinking   |               |
| 4  | Piling methods of shaft sinking and their applicability  |               |
| 5  | Drop shaft methods of shaft sinking and their applicability                                      |               |
| 6  | Designing the Cementation method of shaft sinking  |               |
| 7  | Designing the Freezing method of shaft sinking for watery conditions                             |               |
| 8  | Alimak raise climber and procedure of driving a raise by it                                      |               |
| 9  | VCR method (drop shaft) of raising in hard rock and fracture zone                                |               |
| 10 | Procedure of shaft deepening in a working mine upto 300mts depth                                 |               |
| 11 | Shaft widening for raising the daily production from 1500 tonnes to 5000 tonnes in metal mines   |               |

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|    |  |  |
|----|--|--|
| 12 | Modern tunneling techniques                  |  |
| 13 | Raise borers                                 |  |
| 14 | Cast iron tubbing - English & German tubbing |  |
| 15 | Various types of mine structures             |  |

#### 4MI10 Mine Surveying – I

**B.Tech. Mining 4<sup>th</sup> Semester**  
0L+0T+3P

**Max. Marks: 75**  
**Exam Hrs: 3**

| SN | CONTENTS   | CONTACT HOURS |
|----|--|---------------|
| 1  | Ranging Direct and indirect and use of chain and tape  |               |
| 2  | Chain surveying, field book recording and taking offsets for location details  |               |
| 3  | Study of prismatic and surveying compass and taking bearings   |               |
| 4  | Study of Dumpy level, Tilting level, temporary adjustment and R.L. calculations  |               |
| 5  | Constructional details and measurement of horizontal angles with the help of vernier theodolites & its temporary adjustments   |               |
| 6  | Traversing of given area with the help of vernier theodolite and its plotting with co-ordinate method                          |               |
| 7  | Constructional details and measurement of horizontal angles with the help of microptic theodolites & its temporary adjustments |               |
| 8  | Traversing of given area with the help of theodolite and its plotting with co-ordinate method                                  |               |
| 9  | Determine the height of inaccessible points, distance between two inaccessible points with tacheometer                         |               |
| 10 | Exercise on tacheometric contouring and plotting of contour map for flat and hilly area  |               |
| 11 | To prepare topographic map by co-ordinate plotting of given area at a scale of 1:1000, 1:2000 as per mining regulation         |               |
| 12 | G.T. sheet and its application   |               |
| 13 | Elements of a curve and design a curve for underground roadways meeting at an angle of 90, 120,150 degree etc                  |               |
| 14 | Use of theodolite in maintaining the gradient of drivage, laying of drainage system  |               |
| 15 | Transferring of T. I. points level to B. M   |               |

#### 4MI11 Mine Computing Lab - I

**B.Tech. Mining 4<sup>th</sup> Semester**  
0L+0T+3P

**Max. Marks: 75**  
**Exam Hrs: 3**

| SN | CONTENTS   | CONTACT HOURS |
|----|--|---------------|
| 1  | Exercises related to Word processing: MS Word and Preparation of technical report  |               |
| 2  | Exercises related to Word processing: MS Excel                                     |               |
| 3  | Exercises related to Word processing: Powerpoint                                   |               |
| 4  | Exercises related to Acrobat reader  |               |
| 5  | Introduction to software packages related to mining                                |               |
| 6  | Introduction to Datamine software  |               |
| 7  | Introduction to ore body modeling with Datamine software                           |               |
| 8  | <b>Practical based on 'C' language</b>   |               |
| 9  | Programs related to calculate explosive quantity and powder factor                 |               |
| 10 | Program to determine distances and reduced levels of various points in tacheometry |               |
| 11 | Program to determine co-ordinates of surface mine survey                           |               |

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|    |   |  |
|----|---|--|
| 12 | Program related to calculation of area of closed traverse                           |  |
| 13 | Program to calculate bucket capacity of a excavator for given production parameters |  |
| 14 | Program based on drill parameters: rate of penetration, drilling rate etc           |  |
| 15 | Program related to contouring   |  |
| 16 | Program related to trigonometry   |  |

### 5MI1 MINE VENTILATION

**B.Tech. Mining 5<sup>th</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | <b>Mine Gases:</b> Occurrence, properties, detection, measurement and monitoring; Methane layering; Methane drainage.  | 3             |
|      | <b>Heat and Humidity:</b> Sources; Geothermic Gradient, Different ways of expressing humidity, measurement, Effect and control of heat and humidity in mines; Climatic conditions, Comfort Conditions and assessment;  | 3             |
|      | Cooling power of mine air; refrigeration and Air conditioning  | 2             |
| II   | <b>Air Flow in Mine Workings:</b> , Reynold's number; Laminar and turbulent flow; Pressure losses due to friction and shock resistances; Pressure across the mine; Equivalent orifice of the mine;   | 3             |
|      | Resistances in series and parallel; Air quantity requirements; Leakages; Splitting in underground workings, Forcing and exhaust ventilation; ascensional and descensional ventilation, Homotropical and Antitropical ventilation;  | 2             |
|      | Central and boundary ventilation. Network analysis, ventilation of dead ends   | 3             |
| III  | <b>Ventilation:</b> Necessity and standard of ventilation, Laws of ventilation, rules and regulations, Chezy's and Atkinson's equation, Thermodynamics of ventilation and determination of pressure volume diagram.  | 3             |
|      | <b>Natural Ventilation:</b> Mechanism; Estimation and measurement of natural ventilation pressure; Restarting and Reversal of natural ventilation, motive column, natural ventilating pressure and problems on these.  | 3             |
|      | <b>Mechanical Ventilation:</b> Mine fans: Types, Construction and working, Characteristics and suitability, Pressure developed, series and parallel operations; characteristic curves, Installation and testing; Reversal of air flow.   | 2             |
| IV   | <b>Auxiliary Ventilation:</b> Types of Auxiliary Ventilation: Forcing, Exhaust, Overlap, Reversible and Line Brattices System. Booster Fans, Purpose of Booster Fans, Disadvantage of Booster Fans,  | 3             |
|      | Critical Pressure of Booster Fan, Pressure required to be developed by Booster Fan, Installation of Booster Fans, Auxiliary fans- Types, construction, characteristics, location and installation; Comparison of booster and auxiliary fans, Air ducts; Risk of re-circulation   | 3             |
|      | <b>Ventilation Devices:</b> Stopping, doors, air locks, Fan drift, evasee and their design, air crossings, regulators and boosters for the regulation of air flow- Construction, location installation and their effect on the air flow in the panel and the entire mine; Risk of re-circulation; Controlled re-circulation for ventilating extensive mine workings. | 2             |
| V    | <b>Ventilation Survey:</b> Purpose, Ventilation survey, pressure-quantity survey (P/Q survey), Organisation of P/Q survey, instruments, procedure, tabulation and calculation, Preparation and interpretation of ventilation plans.  | 3             |
|      | <b>Illumination:</b> Introduction, Light Intensity, Mean spherical candle power, Mean horizontal candle power, Illumination, Lumen, Luminous efficiency, Reflection. General lighting arrangements,  | 2             |
|      | Standards for mine lighting, Important guidelines with respect to luminance, Mine lighting and its effects on accidents, production and health, Miner's Cap lamp construction, maintenance and use, Lamp room.   | 3             |
|      | <b>TOTAL</b>   | <b>40</b>     |

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| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | G.B. Mishra, Mine Environmental Engineering. Pub: Dhanbad Publisher, Dhanbad   |              |
| 2               | L.C. Kaku, Numerical Problems on Mine Ventilation. Pub: Punam Publisher        |              |
| 3               | Howard, L.Hartman, Introductory Mining Engineering, Pub: John Willey & Sons    |              |
| 4               | Mutmansky & Weng, Mine ventilation & Air conditioning. Pub: John Willey & Sons |              |
| 5               | Prof. S. P. Banerjee; "Mine Ventilation" Lovely Prakashan, Dhanbad             |              |

### 5MI2 SURFACE MINING

B.Tech. Mining 5<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | <b>Applicability:</b> Applicability, advantages and limitations of surface mining.   | 2             |
|      | <b>Basic Parameters:</b> Size of mine area, Pit depth; Annual production and life of mine; Bench height, width and slope, Pit slope; Cut-off grade; Stripping ratio, Determination of mine parameters.   | 3             |
|      | <b>Opening of Deposits:</b> Box cut, site selection and driving, Formation of benches. Trenches, Driving of entry and opening trenches; lying of communication routes, Different methods of opening up the deposits  | 3             |
| II   | <b>Overburden Removal:</b> Systems of overburden removal and disposal; Site selection for disposal, Design of waste dumps, Overcasting, haulage and combination methods.   | 3             |
|      | <b>Layouts:</b> Basic layouts for flat, horizontal, inclined and steep deposits; Strip mining layouts; Layout for hilly deposits. Management of layouts (Pushback operation for rearrangement of existing layouts)   | 2<br>3        |
| III  | <b>Blast hole drilling:</b> Types of drilling equipment, Selection of Drills; Drilling concepts - Operation and performance, Drilling patterns, Inclined drilling, Computation of Productivity of Drill Machines; Control of dust.   | 3             |
|      | <b>Blasting:</b> Choice of explosive; Blast round design, Blasting calculation for charges, Mode and points of initiation; Sequence of blasting and delay interval; Multi row blasting, Blast hole deviation, Inclined hole blasting;  | 3             |
|      | Fragmentation monitoring; Secondary blasting; Blasting hazards - noise, ground vibration, fly rock, dust & air over pressure and their remedial measures   | 2             |
| IV   | <b>Excavation Machinery:</b> Different Types of Excavators used in Open Pits; Shovel, Dragline, Hydraulic Excavators, Multi Bucket Excavators, Front end loaders, Selection criteria, Their Construction, Operation, Suitability and Applicability; Calculation of Their Productivity. | 3             |
|      | <b>Transportation:</b> Rail, Road, Pipe line, Conveyors and aerial ropeway transportation systems; Their Suitability, limitations and comparative study; Computation of Their Productivity, Optimization of shovel- dumper combination;  | 3             |
|      | Computerized truck dispatch system; Haul road design, construction and safety measures, Steep angle conveyor, high angle conveyor, in pit crushing and conveying, Layouts.   | 2             |
| V    | <b>Reclamation:</b> Different Types, Applicability, Planning.  | 3             |
|      | <b>Drainage:</b> Assessment of water make; Drains, sumps and pumping systems; Pre-drainage through diversion channels and boreholes.   | 3             |
|      | <b>Storage:</b> Stockpiling and blending. Spreaders. Reclaimers  | 2             |
|      | TOTAL  | 40            |

| TEXT BOOK       |   |              |
|-----------------|---|--------------|
| 1               |   |              |
| REFERENCE BOOKS |   |              |
| SN              | Name of Authors /Books /Publisher   | Year of Pub. |
| 1               | Dr. G.B. Mishra, Surface Mining Pub: GeoMinTech Publisher, Bhubneshwar  |              |
| 2               | Howard, L.Hartman, Introductory Mining Engineering, Pub: John Willey & Sons   |              |
| 3               | Surface Mining Handbook   |              |
| 4               | Dr.Sushil Bhandari, Engineering Rock Blasting Operations. Pub: A.A.Balkema Publisher Old post Road, Brook field, VTO5036, USA |              |

### 5M13 UNDERGROUND COAL MINING

B.Tech. Mining 5<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Introduction:</b> Origin of Coal, Theories of Coal Formation, Classification of Coal, Distribution of Coal in India, Indian Coal Mining Industry;  | 3             |
|      | Coal Seam and its Classification, Coal Seam Structures and Abnormalities like Faults, Joints, Cleats, Folds etc., Characteristic of roofs, floors and associated rocks, Factors influencing choice of methods; Classification of mining systems-their relative merits and application.    | 3             |
|      | Global and Indian status of different under ground coal mining methods. Trend of change in technology of mining coal vis-vis demand   | 2             |
| II   | <b>Bord And Pillar Method:</b> Important Terminology, Size and Shape of The Pillar, Galleries, Division of mine area into panels on district and level patterns, Size of Panel,   | 3             |
|      | Panel System and Without Panel System of Development, Development of panels by drivage of group of headings to strike, dip and rise with V, diagonal and straight fronts,   | 2             |
|      | Mechanised B&P development, Cutting, drilling, blasting and transportation; Support, ventilation, drainage and lighting, manpower, Cycle of operations, layouts   | 3             |
| III  | <b>Depillaring:</b> Problems in Depillaring, Preparatory Arrangements, Depillaring of panels with V, straight and diagonal fronts.  | 3             |
|      | Conventional and mechanized depillaring schemes with emphasis on coal, water, air routes and supports. Pillar Extraction Techniques, Depillaring by Stowing   | 3             |
|      | Depillaring by Caving Methods, Depillaring by continuous miner, Dangers Associated with Depillaring   | 2             |
| IV   | <b>Longwall Mining:</b> Important Terminology, Types of Longwall Faces and Their Choice, Merits and Demerits of Longwall Mining, size of panel, development of panel with single and multiple heading gate roads, various orientations of longwall face, single and double unit longwall, | 3             |
|      | Longwall Advancing Method, Longwall Retreating Method, Length of Longwall Faces, Rate of Face Advance, Double Unit Longwall Faces, Extraction of longwall panels with conventional and fully mechanized methods, length of face, daily advance, cycle of operations,                      | 3             |
|      | Face organisation, scheduling and layouts with special reference to coal, water and air routes, Gate, goaf and face area support in conventional and fully mechanised longwalls   | 2             |
| V    | <b>Thick/steeply inclined/Thin Seam Mining:</b> Problem in Mining of Thick Seams, Choice of Thick Seam Mining Methods, Inclined Slicing, Horizontal Slicing, Diagonal Slicing, Transverse Slicing, Sublevel Caving, Blasting Gallery Method and wide-stall method,                        | 3             |
|      | Cable-Bolting Method of Thick Seam Extraction. Winning of thin seams – methods, equipment and associated problems.  | 2             |
|      | <b>Room And Pillar Mining:</b> Suitability, Different methods viz. Vermelles Method, Slant Method, Sublevel Method, Coal Saw Method, Performance and limitations of the method, Mechanisation   | 3             |
|      | TOTAL   | 40            |

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| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | R.D. Singh, Principles & Practices of Modern Coal Mining Pub:-New Age International Pvt.Ltd. New Delhi |              |
| 2               | T.N. Singh, Underground winning of coal. Pub: Oxford & IBH, New-Delhi                                  |              |
| 3               | Singh & Dhar, Thick Seam Mining, Pub: : Oxford & IBH, New-Delhi  |              |
| 4               | Samir Kumar Das, Modern coal mining. Geeta book store, Dhanbad   |              |
| 5               | Prof. J. G. Singh; “Underground Coal Mining Method” Braj-Kalp Publisher, Varansi                       |              |
| 6               | William A. Hustrulid, Recharad Bullock; “Underground Mining Methods” SME Publication                   |              |
| 7               | MSHA; “Underground Coal Mine Blasting” ISEE Publication Cleveland, Ohio                                |              |

### 5MI4 COMPUTER APPLICATION IN MINING

B.Tech. Mining 5<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | Importance of computer application in mining, Different areas of application.  | 3             |
|      | Introduction to Computers and hardware for application in mining industry.   | 3             |
|      | Programming with ‘C’ computer language for mining related problems.  | 2             |
| II   | <b>Basic Introduction for application of Computers in areas of :<br/>Exploration-</b> Data generation, collection and analysis through computers for exploration and reserve estimation  | 4             |
|      | <b>Surface Mining-</b> Bench geometry design, Haul road design, Drainage, Waste dump design and monitoring   | 4             |
| III  | <b>Basic Introduction for application of Computers in areas of :<br/>Mine Planning &amp; Design-</b> Introduction of mine planning concept through mining software. Introduction to numerical methods in Mining.   | 4             |
|      | <b>Environmental Engineering</b> Basic concept of data generation, collection and analysis through computers for environment management. Relevant software application   | 4             |
| IV   | <b>Basic Introduction for application of Computers in areas of :<br/>Mine Surveying</b> Introduction to mapping, Estimation of area and volume, Preparation of plans & sections, Tonnage/ Volume calculation for contractual billing and relevant software application.  | 4             |
|      | <b>Project Monitoring</b> Systems & tools of monitoring of different mining operations, data collection, analysis and online monitoring. Inventory control and management  | 4             |
| V    | <b>Mining Software</b><br><b>Mine Planning Software</b> Basic introduction, salient features, planning by different mining software like DATAMINE, SURPAC<br><b>Software for various applications</b> Basic introduction, salient features and application of software like BLASTWARE, FRAGLYST, GALENA, FLAC, VENTetc | 3             |
|      |  | 2             |
|      | TOTAL  | 40            |

The detailed Syllaby of the subject will be announced at the beginning of the session every year, in light of the continuous changing nature of the subject and its application in the mining industry.

| TEXT BOOK       |  |  |
|-----------------|--|--|
| 1               |  |  |
| REFERENCE BOOKS |  |  |
|                 |  |  |

Syllabus for B.Tech (Mining Engineering) Rajasthan Technical University Kota

| SN | Name of Authors /Books /Publisher   | Year of Pub. |
|----|---|--------------|
| 1  | Sukumar Bandopadhyay; “Application of the Computers and Operation Research in the Mineral Industry” Proceedings of the 30 <sup>th</sup> international Symposium SME Publication | 2002         |
| 2  | Manuals of different softwares  |              |

### 5MI5 MINE SURVEYING – II

B.Tech. Mining 5<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Correlation:</b> Methods of correlation of surface and underground surveys through - adits, inclines, and shafts ;   | 4             |
|      | Correlation by magnetic needle; Precautions and accuracy, Surveying for tunnels and open pits, Use of Gyro theodolite   | 4             |
| II   | <b>Triangulation Surveying:</b> Definition; Reconnaissance; Selection of signals and stations; Triangulation system with primary, secondary and tertiary orders;;   | 3             |
|      | Measurement of base line and angles; Booking of observations; Auxiliary stations; Satellite stations; Computation;  | 2             |
|      | Calculation of coordinates; Errors and their distribution and plotting  | 3             |
| III  | <b>Stope and face surveying:</b> Theodolite in stope surveying; Auxiliary telescope, Tape triangulation; Traversing; Radiation and other methods, Hanging compass   | 3             |
|      | <b>Plans and Sections:</b> General and legal 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; limits of accuracy Planimeter and its uses; Enlargement & reduction of plans. Use of ediograph, and pentagraph, Mines Regulations concerning above topics. | 3             |
|      | <b>Errors:</b> Sources, classification and relative importance of errors, Propagation and growth of errors; theory of errors, Prevention of errors, Treatment of non-systematic errors by the method of least squares; Probable errors; Most probable value; Probable error and weight; Limits of errors in drift surveys.  | 2             |
|      | <b>Photogrammetry and Aerial Surveying:</b> Terrestrial and aerial photogrammetry; Flight planning, Photo-theodolite & its construction;  | 3             |
| IV   | Method of field work and plotting from horizontal photographs with determination of elevations; Elementary perspective as applied to aerial photographic surveying, Applications in mine surveying.   | 3             |
|      | <b>Field Astronomy:</b> Important definitions; Determination of Azimuth by astronomical observations  | 2             |
|      | <b>Subsidence Surveying:</b> Construction and layout of subsidence monitoring stations. Subsidence measurements.  | 3             |
| V    | <b>Borehole Surveying:</b> Laser Types, characteristics and mining applications of Laser.   | 2             |
|      | <b>Modern Surveying Techniques:</b> Electronic distance measuring equipment; Geodimeter, Tellurometer, Total Station, Distomat, Global Positioning System, Softwares  | 3             |
|      | TOTAL   | 40            |

| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | Dr.B.C.Punmia, Surveying Vol. I,II & III, Pub: Laxmi Publication New-Delhi |              |
| 2               | Kanetkar, Surveying & Levelling, Vol I & II, Geeta book store Dhanbad      |              |

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|   |   |  |
|---|---|--|
| 3 | D.K. Jain, Mine Surveyors Competency Examination, Geeta book store, Dhanbad |  |
| 4 | Winiberg, Metalliferous Mine Surveying                                      |  |

### 5MI6 ROCK MECHANICS

B.Tech. Mining 5<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Status of Rock Mechanics:</b> Role and status of rock mechanics in mining engineering; Definitions & terms used in Rock Mechanics.   | 3             |
|      | <b>Stresses and Strains:</b> Stresses in two and three dimensions; Stress tensors; Principal stresses; Stress invariants; Displacements and strains; Stress- Strain relations; Equilibrium and compatibility equations.   | 3             |
|      | <b>Stress State:</b> Stress distribution around narrow and wide openings (single and multiple).   | 2             |
| II   | <b>Geological Investigation of Rock mass:</b> Classification, identification and survey of joints; Basic geological description of rock mass; Graphical representation of joint systems; Geophysical investigation of rock mass;  | 3             |
|      | Rock mass classification- RQD, RSR, RMR, Q-system   | 2             |
|      | <b>Rock Indices:</b> Specific gravity, hardness, porosity, moisture content, permeability, swell index, slake durability, thermal conductivity, point load strength index, protodyakonov strength index, impact strength index.   | 3             |
| III  | <b>Mechanical Properties of Rocks:</b> Compressive, tensile and shear strengths; Modulus of elasticity; Poisson's ratio and tri-axial strength; Field and laboratory determination.   | 3             |
|      | Determination of in-situ strength and in situ stresses – methods and instrumentation  | 3             |
|      | <b>Deformation and related instrumentation:</b> Measurement of rock movements and interpretation of data; Load cells, convergence recorders, bore hole extensometers and borehole cameras. Insitu and induced stresses and their measurement. Basics of numerical methods in geomechanics with applications | 2             |
| IV   | Theories of rock failure. Elastic and time dependent properties of rocks,   | 3             |
|      | Dynamic properties, Post-failure phenomenon;  | 3             |
|      | <b>Slopes:</b> Types of slope failure; Analysis of slope failure; Factors affecting slope stability; Drainage and reinforcement of slopes; Monitoring of slopes, Stability of waste dump, Slope stability radar.  | 2             |
| V    | <b>Caving:</b> Mechanics of caving. Caveability of rocks. Induced caving  | 2             |
|      | <b>Subsidence:</b> Mechanics of surface subsidence; Theories of subsidence. Factors affecting subsidence; Sub-critical, critical and super-critical widths of extraction; Discontinuous and continuous subsidence; monitoring, prediction, control and management of subsidence.                            | 3             |
|      | <b>Rock Bursts:</b> Rock bursts and bumps; Mechanism of occurrence, prediction and control  | 3             |
|      | TOTAL   | 40            |

| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | Obert & Duall, Rock Mechanics and design of structures in rock. Pub: John Willey & Sons                      |              |
| 2               | Railey & Dalley, Experimental stress analysis. Pub: McGraw Hill Book Company                                 |              |
| 3               | B.S. Verma, Elements of Mechanics of Mining Ground. Pub. Tuhin & Co., E-1898(MIG) Rajajipuram, Lucknow, U.P. |              |
| 4               | Vutukuri & lama, Handbook of Mechanical properties of rock Vol.I&II. Pub: Transtech, Germany                 |              |
| 5               | S.S.Peng, Coal Mine Ground Control. Pub: John Willey & Sons  |              |

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|   |   |  |
|---|---|--|
| 6 | J.C. Jaeger & NGW Cook, Fundamentals of Rock Mechanics. Pub: Chapman & hall, London             |  |
| 7 | Charles Jaeger, Rock Mechanics & Engineering. Pub: Cambridge University Press, Cambridge London |  |

#### 5MI7 Mine Ventilation

**B.Tech. Mining 5<sup>th</sup> Semester**  
0L+0T+3P

**Max. Marks: 75**  
**Exam Hrs: 3**

| SN | CONTENTS   | CONTACT HOURS |
|----|--|---------------|
| 1  | Different gases found in coalmines, metal mines and their permitted limits as per the mining regulations. Effect of these gases when found in excess |               |
| 2  | Various types of Methanometers used in mines and their selection criteria  |               |
| 3  | Various types of CO-detectors used in mines and their selection criteria   |               |
| 4  | Measurement of relative humidity with the help of various types of hygrometer  |               |
| 5  | To find the effect of heat, humidity and air velocity with the help of Kata-thermometer  |               |
| 6  | Various air circuits with resistance in series and parallel  |               |
| 7  | Calculation for the installation of main ventilation fan and its reversal arrangement  |               |
| 8  | Design the evasee of ventilation fan in different working conditions   |               |
| 9  | Designing auxiliary ventilation system and their comparative performance   |               |
| 10 | Measurement of air velocity with the help of anemometer, velometer etc, measurement of temperature, pressure etc                                     |               |
| 11 | To prepare complete ventilation plan and indicating air direction and other ventilation devices as per the regulation in various colour codes        |               |
| 12 | Air conditioning problem   |               |
| 13 | Ventilation survey problem   |               |
| 14 | Auxiliary fan problem  |               |
| 15 | Networking problems  |               |

#### 5MI8 Method of Mining

**B.Tech. Mining 5<sup>th</sup> Semester**  
0L+0T+3P

**Max. Marks: 75**  
**Exam Hrs: 3**

| SN | CONTENTS  | CONTACT HOURS |
|----|---|---------------|
| 1  | Designing an approach road/ramp to open a deposit by surface mining                           |               |
| 2  | Various techniques used in over cast from cost benefit point of view                          |               |
| 3  | Designing various layouts for hilly deposits of vein and bedded forms                         |               |
| 4  | Designing various types of layouts for deposits below the general ground level                |               |
| 5  | Performance and choice of drilling equipment in surface mine working                          |               |
| 6  | Designing the blast hole charging, taking into consideration various parameters               |               |
| 7  | Measurement of blasting vibrations with Blastmate series III equipment and its analysis       |               |
| 8  | Design problem for opencast mine-Coal, Lime stone   |               |
| 9  | Bord and pillar method of mining with caving technique  |               |
| 10 | Bord and pillar method of mining with stowing technique                                       |               |
| 11 | Various layouts of longwall advancing method and its suitability in Indian conditions         |               |
| 12 | Designing longwall retreating method for a coal seam of thickness 2.4m and dipping at 1 in 15 |               |
| 13 | Blasting gallery technique for excavation of coal deposits                                    |               |
| 14 | U/g Gasification of coal  |               |
| 15 | Problems of Thick seam mining   |               |

### 5MI9 Computer Applications in Mining

**B.Tech. Mining 5<sup>th</sup> Semester**  
0L+0T+2P

**Max. Marks: 50**  
**Exam Hrs: 3**

| SN | CONTENTS  | CONTACT HOURS |
|----|---|---------------|
| 1  | Computer programming for mining problem with C++  |               |
| 2  | Introduction to different hardware application related to mining  |               |
| 3  | Introduction to Mine planning by DATAMINE   |               |
| 4  | Introduction to Mine planning SURPAC  |               |
| 5  | Introduction to BLASTWARE software  |               |
| 6  | Calculation of production tonnage of an opencast mine for contractual billing with Total station & Datamine |               |
| 7  | Introduction of "VENT" software of simulation of ventilation network of a mine                              |               |
| 8  | Introduction to "FRAGLYST 2.0" software   |               |
| 9  | Introduction to "SINET" software of design of U/g mine ventilation system                                   |               |
| 10 | Introduction to "PSYCHRO" software  |               |
| 11 | Introduction to "AWQEFA" software   |               |
| 12 | Introduction to "FLAC/ FLAC 3D software   |               |
| 13 | Introduction to "N-Fold" software   |               |
| 14 | Introduction to "GALENA" software related to slope stability  |               |
| 15 | Introduction to "Solid works" software  |               |

### 5MI10 Mine Surveying – II

**B.Tech. Mining 5<sup>th</sup> Semester**  
0L+0T+3P

**Max. Marks: 75**  
**Exam Hrs: 3**

| SN | CONTENTS  | CONTACT HOURS |
|----|---|---------------|
| 1  | Various methods of correlation and its practical applicability assuming the underground mining conditions |               |
| 2  | Gyroscope and its use in correlation  |               |
| 3  | Measurement of Base-line for triangulation survey in difficult ground conditions                          |               |
| 4  | Triangulation of a hilly terrain  |               |
| 5  | Various stope surveying methods   |               |
| 6  | Planimeter and calculation of areas with its help   |               |
| 7  | Determination of elevation from aerial photographs  |               |
| 8  | Determination of azimuth by observation star at equal altitude  |               |
| 9  | Problems on dip-strike, bore-hole, faults & drifts  |               |
| 10 | Exercise with the help of EDM, Total station  |               |
| 11 | Exercise with the help of GPS, and other latest instruments   |               |
| 12 | Exercise of triangulation in flat & large area  |               |
| 13 | Study and problem with Pentograph   |               |
| 14 | Preparation and preservation of plans   |               |
| 15 | Problems related to errors  |               |

**5MI11 Rock Mechanics**

**B.Tech. Mining 5<sup>th</sup> Semester**  
**0L+0T+3P**

**Max. Marks: 75**  
**Exam Hrs: 3**

| SN | CONTENTS   | CONTACT HOURS |
|----|--|---------------|
| 1  | Preparation of core samples as per ISRM standards                                |               |
| 2  | Determination of compressive strength and point load index of given rock samples |               |
| 3  | Measurement of Schmidt rebound hardness and its application                      |               |
| 4  | Determination of slake durability index of given rock samples                    |               |
| 5  | Determination of elastic properties of given rock samples                        |               |
| 6  | Determination of tensile strength of given rock samples of by Brazilian test     |               |
| 7  | Determination of shear strength and triaxial properties of rock                  |               |
| 8  | Measurement of core recovery and RQD from the various data collected             |               |
| 9  | Determination of RMR of given field data   |               |
| 10 | Determination of Protodykonov index of given rocks                               |               |
| 11 | Determination of impact strength index   |               |
| 12 | Determination of Schmidt hammer rebound number of various rocks                  |               |
| 13 | Determination of moisture contents of various rocks                              |               |
| 14 | Measurement of insitu stress with Flatjack                                       |               |
| 15 | Determination of triaxial properties of various compositions of spoil dumps      |               |

**6MI1 UNDERGROUND MINE HAZARDS**

**B.Tech. Mining 6<sup>th</sup> Semester**  
**3L+0T**

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Fires:</b> Classification of fires; Causes, detection, monitoring and control of surface and underground fires; fire extinguishers, Preventive measures;   | 3             |
|      | Fire fighting – direct methods, sealing off and intersection, fire fighting organisations Monitoring of atmosphere behind sealed- off areas;  | 3             |
|      | Precautions to be taken before reopening. Methods of reopening, Case histories  | 2             |
| II   | <b>Spontaneous Heating:</b> Physical and chemical characteristics of coal liable to spontaneous heating, Mechanism, susceptibility indices, Incubation period and its determination,                | 3             |
|      | Causes, detection, monitoring and control of spontaneous heating in underground mines, on surface and in coal stacks and dumps; Incubation period; Preventive measures                              | 2             |
|      |   | 3             |
| III  | <b>Explosions:</b> Types, causes and mechanism of firedamp and coal dust explosions;  | 3             |
|      | limits of explosibility, inflamaability and factor affecting these, sources of initiation, Preventive measures; Water spraying, Stone dusting, stone-dust and water barriers;                       | 3             |
|      | Investigations after an explosion; Case histories   | 2             |
| IV   | <b>Mine Rescue and Recovery work:</b> Different types of rescue equipment- constructional features, functions and uses; Test on rescue apparatus;   | 3             |
|      | Rescue stations and rescue room; Organisation of rescue work. Fresh air base and its advancing. Rescue rules.   | 3             |
|      | Recovery and first-aid appliances; Training of personnel and organization of rescue station; Rescue and recovery work in connection with mine fire, explosions and other conditions. Safety chamber | 2             |
| V    | <b>Mine Inundation:</b> Causes and precautionary measures, Precautions to be taken while approaching old workings and while working under water bodies;   | 3             |
|      | Burnside boring apparatus; Design and construction of bulk head doors, water dams and barriers;   | 2             |
|      | Recovery of flooded mines; Dewatering of old working; Water blast: dangers and precautions, Enquiry Report Preparation  | 3             |
|      | <b>TOTAL</b>  | <b>40</b>     |



| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | G.B. Mishra, Mine Environmental Engineering. Pub: GeoMinTech Publisher, Bhubneshwar                              |              |
| 2               | Donald Mitchell; "Mine Fires, Prevention, Detection fighting" ISEE Publication Cleveland, Ohio                   |              |
| 3               | Ramlu M. R.; "Mine Fires, Explosion, Recovery & Innundation", Dahnbad Publisher, Dhanbad                         |              |
| 4               | David Stone; "Minefill 2001" Proceedings of the International Symposium on Mining with Backfill" SME Publication | 2001         |

### 6MI2 DIMENSIONAL STONE TECHNOLOGY

B.Tech. Mining 6<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Resources</b> of Marble, Granite, Slate, Sandstone and Limestone as Dimensional stones in India vis a vis world, uses, marketing, export.,                                 | 3             |
|      | Geological, mineralogical and physico-mechanical properties of dimensional stones, Criteria for selection of dimensional stone deposit  | 3             |
|      | Procedure for obtaining mining lease and preparation of project proposal.   | 2             |
| II   | <b>Mining:</b> Conventional mining of Sandstone, Limestone, Marble and Granite;   | 3             |
|      | Recent developments- wire saw including blind cut technique, chainsaw, belt saw, hydraulic splitting, flame jet cutting, water channeling etc;                                | 2             |
|      | Blasting techniques in dimensional stone mines: various types of explosives used, controlled blasting for providing horizontal & vertical cut; Splitting by swelling material | 3             |
| III  | In situ splitting technique used in compact limestone (Kota stone) for utilization of waste as dimensional stone.   | 3             |
|      | Various types of loaders cranes and hydraulic excavator used in dimensional stone mines;  | 3             |
|      | Quarry layouts. Hole making technique using hole-finder and laser beam. Application and development of diamond tools, formation of stone block and their handling             | 2             |
| IV   | <b>Processing:</b> Dressing- Mono block dresser; Sawing- gang saws, circular saws; Preparation and mounting of blades/discs and segments;                                     | 3             |
|      | slab repair by resin Polishing - Manual, Mechanical; Various types of polishing machines; Abrasives- type, use and selection, shaping;  | 3             |
|      | Tile preparation; Automatic tiling plant, slurry handling and treatment including water supply. Multiwire technology  | 2             |
| V    | Environmental impacts of mining and processing of dimensional stones; Secondary use of quarried land and waste of the industry;   | 4             |
|      | Land reclamation, Environmental management plan, Environment Protection measures  | 4             |
|      | TOTAL   | 40            |

| TEXT BOOK       |   |              |
|-----------------|---|--------------|
| 1               |   |              |
| REFERENCE BOOKS |   |              |
| SN              | Name of Authors /Books /Publisher   | Year of Pub. |
| 1               | Rathore S. S., Bhardwaj G. S., Jain S. C; "Dimensional Stone Technology" Himanshu Publication New Delhi |              |
| 2               | Rathore S. S., Laxminarayana V.; "Safety and Technology in Marble Mining and Processing in              | 2000         |

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|   |   |      |
|---|---|------|
|   | New Millennium” Proc. Of National Workshop held march 10-11 2000 Udaipur  |      |
| 3 | Rathore S. S., Gupta Y. C., Parmar R. L.; “Recent Development in Machinery and Equipment for Dimensional Stone Mining” held Dec. 13-14, 2003 at Udaipur             | 2003 |
| 4 | India Stones, Business Magazine on Indian Stone Industry, Pub. ICONZ Communications, 203, Mahaveer Residency, 15 Main J. P. Nagar, 5 <sup>th</sup> phase, Bangalore |      |

### 6MI3 UNDERGROUND METALLIFEROUS MINING

B.Tech. Mining 6<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Introduction</b> - Historical development; present status of metal mining industry in India and world, Trend of mining non-coal deposit in India during the last ten years; Geographical distribution of important economic non-coal mineral in India. | 4             |
|      | <b>Overview of various stoping Methods:</b> Definitions of important terms used in underground metal mining methods Classification of different stoping methods, Factors influencing selection of stoping methods   | 4             |
| II   | <b>Development:</b> Opening of deposits – shafts (vertical and inclined), declines and adits. Cross-cuts. Division of orebody into levels and blocks  | 3             |
|      | Level interval. Variables affecting the choice of mode of access, Driving of raises – conventional and raise boring machines methods  | 3             |
|      | Introduction to Raise boring and introduction to tunnel boring  | 2             |
| III  | <b>Open Stoping Method:</b> Overhand, Underhand and Breast stoping methods; Open stoping; Vertical,   | 3             |
|      | Crater Retreat method; Sub level stoping, Room and Pillar method, Pillar Recovery Methods   | 3             |
|      | Stull mining; Shrinkage; Blast hole and their variations  | 2             |
| IV   | <b>Caving stoping methods:</b> Sublevel caving, Block caving,   | 3             |
|      | Top slicing and their variations  | 3             |
|      | spontaneous and induced. Dilution and recovery. Productivity  | 2             |
| V    | <b>Supported stoping methods:</b> Timber, Post pillar; Cut and fill and their variations; Square set; Different types of support used.  | 4             |
|      | <b>Support Systems:</b> Unit supports and mass support systems, Pillars; Back fill, Cable bolting, Steel Rock bolts, Grouting, Shotcreting etc.,code of timbering rules   | 4             |
|      | <b>TOTAL</b>  | <b>40</b>     |

| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | Howard, L.Hartman, Introductory Mining Engineering, Pub: John Willey & Sons  |              |
| 2               | Cummins & Givens, SME Mining Engineering Handbook, Vol. I & II, Pub: A.I.M.M. New-York   |              |
| 3               | Ramlu et al, Computer in mineral industry. Pub: Oxford & IBH, New-Delhi  |              |
| 4               | W.A. Hustrulid, Underground mining methods handbook, Pub: Society of mining engineers of the American Institute of Mining Metallurgical and Petroleum Engineers, Inc. New-York |              |

Syllabus for B.Tech (Mining Engineering) Rajasthan Technical University Kota

**6MI4 MINE MACHINERY – II**

**B.Tech. Mining 6<sup>th</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Winding I:</b> Head gear arrangement, Shaft fittings and head gear design;, rigid and rope guides; cages types & Construction, their suspension arrangements,  | 3             |
|      | Location of winding engine. Electric winders, winding drums, types of construction, duty cycle, Methods of counterbalancing loads; Torque- time & power- time diagram;  | 3             |
|      | Pit top and pit bottom arrangements, Types of koepe Winder, Advantages and disadvantages , Koepe wheel, floating platforms  | 2             |
| II   | <b>Winding II:</b> Mechanical and electrical braking; Electrical & Electronic methods of speed control, Safety devices on winders - depth indicators, Detaching hooks, over speed and overwind preventors, keps, slow banking and other safety devices, | 3             |
|      | Ward Leonard control; Automatic winding;, Multi rope winding, Winding from different horizons, two winders working in the same shaft, winding with side by side and up and down sheaves.skips types & Construction, their suspension arrangements.      | 3             |
|      | Design calculation for different types of winding systems; Signaling system used in winding   | 2             |
| III  | <b>Loader And Transporting Machine:</b> Rocker shovel, gathering arms loaders, LHD and SDL machines- their construction and operation and maintenance   | 3             |
|      | cavo loader, shuttle car and underground trucks, its construction, operation and application  | 3             |
|      | Layout of faces for working with power loaders under varied conditions  | 2             |
| IV   | <b>Cutter Loaders:</b> Basic principles of cutting and ploughing. Different types of cutter loaders suitable for long wall and short wall faces, their constructions, operation and maintenance,  | 3             |
|      | different types of road headers and continuous miners, their construction, operation and conditions of applicability,   | 3             |
|      | Mechanics of rock cutting, rock cutting tools and their performance. Layout of faces working with cutter loaders  | 2             |
| V    | <b>Mine Pumps:</b> Sources of mine water types of pumps, construction, characteristics and operation, maintenance and selection, pump fittings,   | 3             |
|      | Design, installation and maintenance of pumping systems. Series and parallel operations of pumps.   | 2             |
|      | Borehole and submersible pumps. Slurry pumps. Airlift pumps. Automatic pump control, special types of pumps used in mines, Design calculations  | 3             |
|      | <b>TOTAL</b>  | <b>40</b>     |

| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | M.A. Ramlu, Mine Hoisting. Pub: Oxford & IBH Publishing Co. Pvt.Ltd. New Delhi |              |
| 2               | Kerelin, Mine Transport. Pub:- Orient Longmans Ltd. New Delhi                  |              |

**6MI5 MINING GEOLOGY - III**

**B.Tech. Mining 6<sup>th</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Geological Mapping:</b> Definition of map, scale of map, types, map symbols; | 3             |
|      | Surface and underground geological mapping.                                     | 3             |

|     |  |    |
|-----|--|----|
|     | Computer based geological data plotting and preparation of map   | 2  |
| II  | <b>Environmental Geology:</b> Environment Impact Assessment and Environment Management Plan before mining activities.  | 4  |
|     | Geological investigations for preventive measures of landslides, slope instability & Hazard zonation   | 4  |
| III | <b>Sampling and reserves estimation:</b> Definition of sampling, methods and importance in mining; Mine sample reduction;  | 3  |
|     | Quality control; Total Quality. Definition of reserve, classification and estimation by conventional and geo-statistical techniques.   | 3  |
|     | Role of geological parameters for physical scale and mathematical modeling for maintaining the slope   | 2  |
| IV  | <b>Prospecting and Exploration:</b> Definition, kind and degree of exploration; Geological, geophysical, geo-chemical and remote sensing methods.  | 3  |
|     | Geological factors consider for excavation viz rock related factors, structures, seismicity, special effects of faults i.e fault act as a ground water barrier,  | 3  |
|     | ground water conduit, sub surface drains and influence of ground water flow systems on rock excavations  | 2  |
| V   | <b>Economic Geology:</b> Study of important metallic, nonmetallic and fuel minerals of India. Their geographical distribution, mode of occurrence, economic importance giving emphasis on occurrences in Rajasthan. Metallic minerals i.e. Lead, Zinc, Copper, Iron, Nickel, Gold, Aluminum, Manganese, Tungsten, Uranium; | 3  |
|     | Non-Metallic minerals i.e. Limestone, Talc, Rock-Phosphate, Gypsum, Kyanite, Marble, Granite, Sandstone, Garnet, Corundum, Diamond, Fluorite, Quartz, Feldspar, Calcite, Topaz, Kyanite, Olivine;  | 2  |
|     | Fuel minerals i.e. Coal, lignite and Petroleum. Definition, composition, properties, origin, theories of migration of petroleum, structural features of coal seams; Fuel mineral resources of Rajasthan  | 3  |
|     | TOTAL  | 40 |

|                        |   |              |
|------------------------|---|--------------|
| <b>TEXT BOOK</b>       |   |              |
| 1                      |   |              |
| <b>REFERENCE BOOKS</b> |   |              |
| SN                     | Name of Authors /Books /Publisher   | Year of Pub. |
| 1                      | Bolton T, Geological Maps, their solution and Interpretations, Cambrige Uni.Press |              |
| 2                      | S.Sinha Roy,Geology of Rajasthan,Geological Society of India, Bangalore           |              |
| 3                      | Krishnaswamy, Indias mineral resources, Oxford Pub                                |              |
| 4                      | Dobrin Geophysical exploration  |              |
| 5                      | Mckinstry, Mining geology, Prentice Hall  |              |

### 6MI6 MINE SAFETY ENGINEERING

B.Tech. Mining 6<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | <b>General:</b> Safety Philosophy, Development of industrial safety movement with special reference to mining, principles of Accident prevention, accident, injury, unsafe act, unsafe condition, reportable accidents, need for safety, | 3             |
|      | Regulation: American (OSHA) and Indian Regulation, Arousing and maintaining safety, interest, publicity and propaganda for safety, safety drives and campaigns,  | 3             |
|      | appraisal of safety programmes, development of safe behaviour, safety standards  | 2             |
| II   | <b>Accidents:</b> Theories & Principle of accidents, classification of accidents on different bases, Casualty, safety and productivity, cost of accident, computation of cost, utility of cost data,                                     | 3             |

Syllabus for B.Tech (Mining Engineering) Rajasthan Technical University Kota

|     |   |           |
|-----|---|-----------|
|     | accident compensation and insurance,  |           |
|     | Accident proneness, frequency and severity rates, accident records and statistics, accident and incident analysis, purpose and procedure of accident reporting & Investigation,   | 2         |
|     | Identification of the key facts, corrective actions, classification of facts, Accident reports, corrective actions  | 3         |
| III | <b>Safety organisation:</b> Safety Management Division of responsibility, Location of Safety function, size of safety department,   | 3         |
|     | safety committee – structure and functions, safety organisation, role of management, supervisor and workers,  | 3         |
|     | role of safety officer, qualification for safety specialist   | 2         |
| IV  | <b>Safety Engineering:</b> Lay out and safety, maintenance and safety, job safety analysis, Incidental safety devices and methods, audio visual aids. statutory of provisions related to safeguarding of Machinery and working condition, | 3         |
|     | Safety in Operation and Maintenance, safety instructions, Operational activities and hazards, starting and shut down procedures, safe operation of mining machines, work permit system,   | 3         |
|     | Safety in Storage and Emergency Planning Safety in storage, handling of chemicals and gases, storage layout, ventilation, emergency preparedness on site plan, off site plan, toxic hazard control  | 2         |
| V   | <b>Safety Education:</b> Vocational training as an aid of safety and productivity, techniques of training, lesson plan, training aids, training games, discussion methods, motivation of workers,   | 3         |
|     | Mine vocational training scheme, staff and institution facilities, training records and reports,  | 2         |
|     | appraisal of trainees, assessment and evaluation of training schemes  | 3         |
|     | <b>TOTAL</b>  | <b>40</b> |

|                        |   |              |
|------------------------|---|--------------|
| <b>TEXT BOOK</b>       |   |              |
| 1                      |   |              |
| <b>REFERENCE BOOKS</b> |   |              |
| SN                     | Name of Authors /Books /Publisher   | Year of Pub. |
| 1                      | Legislation in Indian Mine Vol. I and II by Rakesh Prasad, Pub.: Ashalata Publisher, Varanasi |              |
| 2                      | Safety in Mines by Prof. B. K. Khejriwal  |              |

### 6MI7 DIMENSIONAL STONE TECHNOLOGY

B.Tech. Mining 6<sup>th</sup> Semester  
0L+0T+3P

Max. Marks: 75  
Exam Hrs: 3

| SN | CONTENTS   | CONTACT HOURS |
|----|--|---------------|
| 1  | Marble & Granite deposits, types and potentials: Indian and Global scenario                          |               |
| 2  | Flowsheet of marble processing plant   |               |
| 3  | Determination of physico-mechanical properties of various marbles and granites                       |               |
| 4  | Wire saw, Chain saw & and Belt saw its operational observation at nearby mines                       |               |
| 5  | Various methods of splitting of rock and its application   |               |
| 6  | Gang saw and its operations for determination of rate of cutting for various dimensional stone       |               |
| 7  | Various types of cranes used in dimensional stone mining and processing & their applicability        |               |
| 8  | Various abrasives used in dimensional stone processing and their application                         |               |
| 9  | Jet flame technique for granite mining & observation in nearby industry                              |               |
| 10 | Blind cut and its comparison to other method   |               |
| 11 | Design a mechanised marble quarry in hilly terrain for 200m X 200m lease area                        |               |
| 12 | Design a mechanized granite quarry for flat terrain deposit in a 9 hectares lease area               |               |
| 13 | Design a mechanized flaggy lime stone (Kota stone) quarry for flat deposit of 150m X 150m lease area |               |
| 14 | Impact of various types of diamond beads in wire saw operation                                       |               |
| 15 | Impact of various types of diamond segment in gang saw operation                                     |               |

Syllabus for B.Tech (Mining Engineering) Rajasthan Technical University Kota

**6MI8 UNDERGROUND METALLIFEROUS MINING II****B.Tech. Mining 6<sup>th</sup> Semester**  
**0L+0T+3P****Max. Marks: 75**  
**Exam Hrs: 3**

| SN | CONTENTS   | CONTACT HOURS |
|----|--|---------------|
| 1  | Various terms, factors influencing selection of method of work and classification of underground methods |               |
| 2  | Designing sub-level stoping for a ore body width varying 10-15 mts                                       |               |
| 3  | Application of blast hole stoping and its comparison with sub-level open stoping                         |               |
| 4  | Cut and fill methods used in different Indian deposits   |               |
| 5  | Application of Vertical crater retreat method of mining in moderate strength of wall rocks               |               |
| 6  | Sub-level caving and block caving methods for deeper deposits  |               |
| 7  | Square-set stoping for excavation of manganese ore deposit   |               |
| 8  | Application of leaching technique in ore mining  |               |
| 9  | Stoping techniques used in excavation of gold deposit at deeper depth                                    |               |
| 10 | Designing an under ground metalliferous mine on given geological physico-mechanical properties of rock   |               |
| 11 | Design of Post pillar method   |               |
| 12 | Design of Shrinkage method   |               |
| 13 | Problem for mining for greater depth   |               |
| 14 | Design of block caving   |               |
| 15 | Design Sub level top slicing   |               |

**6MI9 MINE MACHINERY – II****B.Tech. Mining 6<sup>th</sup> Semester**  
**0L+0T+3P****Max. Marks: 75**  
**Exam Hrs: 3**

| SN | CONTENTS   | CONTACT HOURS |
|----|--|---------------|
| 1  | Process of changing of winding rope and its requirement as per regulation  |               |
| 2  | Designing direct rope haulage system in moderately dipping coal seam       |               |
| 3  | Endless rope haulage and its designing aspects                             |               |
| 4  | Application of Mono cable and Bi-cable rope way & its designing parameters |               |
| 5  | Diesel locomotives and comparative application                             |               |
| 6  | Battery locomotives and comparative application                            |               |
| 7  | Trolley wire locomotives and comparative application                       |               |
| 8  | Suspension gear arrangement of the shaft                                   |               |
| 9  | Different types of winding system and their comparative application        |               |
| 10 | Application of various types of detaching hooks                            |               |
| 11 | Various types of guides in winding   |               |
| 12 | Belt conveyors with their design parameters used in mines                  |               |
| 13 | Scraper chain conveyors with their design parameters used in mines         |               |
| 14 | Shaker conveyors with their design parameters used in mines                |               |
| 15 | Exhaust conditioner  |               |

**6MI10 SURVEY CAMP****B.Tech. Mining 6<sup>th</sup> Semester****Max. Marks: 75**  
**Exam Hrs: 3**

Note: There will be a Survey Camp of duration of 10 effective days at the start of VI Semester

Note: Students have to undergo a Practical Trainings of 60 days at the end of VI Semester for which assessment will be made at the beginning of next semester.

Syllabus for B.Tech (Mining Engineering) Rajasthan Technical University Kota

### 7MI1 MINE LEGISLATION

**B.Tech. Mining 7<sup>th</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | General Principles of Mining Laws, Development of mining legislation in India, Post independence trend of changes, National Mineral Policy. | 4             |
|      | Principal provisions of Mines and Minerals (Development and Regulation ) Act & Mineral Concession and Development Rules.                    | 4             |
| II   | Mines Act 1952 with upto date amendments  | 4             |
|      | Mines Rules 1955 with upto date amendments  | 4             |
| III  | Coal Mines Regulation 1957 with upto date amendments  | 4             |
|      | Metalliferous Mines Regulations 1961 with upto date amendments  | 4             |
| IV   | Principal provisions of pit head and bath rules, creche rules , mine vocational training rules,   | 4             |
|      | Explosive rules(related to mines); Electricity rules applicable to mines and oil fields   | 4             |
| V    | Principal provisions of industrial dispute act, workmen's compensation act, trade union act,  | 4             |
|      | payment of wages act and minimum wages act, Rescue rules; Legal requirements, Important technical circulars issued by DGMS                  | 4             |
|      | TOTAL   | 40            |

| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher  | Year of Pub. |
| 1               | P.Seshagiri Rao, Law of Mines & Minerals. Pub: Asia Law House, Hyderabad               |              |
| 2               | Rakesh & Prasad, Legislation in Indian Mines Vol. I & II. Pub: Mrs. Asha Lata Varanasi |              |
| 3               | Classified Mine Circulars Issued by DGMS (Compiled)                                    |              |
| 4               | Relevant Act, Rules and Regulations, Published by Govt. of India                       |              |

### 7MI2 MINE MANAGEMENT

**B.Tech. Mining 7<sup>th</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Management:</b> Definition of Management, Nature and Basics concepts of Management, Management and Administration, Functions of Manager in Information age, Principles of Scientific Management;   | 3             |
|      | Organization, Principles of organization. Departmentation. Levels of management and organizational chart. Management by objective, Management information systems, Forms of Business Organization: Private and public enterprises with special reference to mining of minerals. | 3             |
|      | Basic Principles of Trade unionism, Trade union activities w.r.t. mining in India, Major trade union bodies   | 2             |
| II   | <b>Personnel management:</b> Planning, organizing, directing, motivating, controlling, coordinating and communicating, staffing, manpower planning and recruitment.   | 3             |
|      | Performance appraisal, human resource development and planning, Directing, Decision making, Motivation – Meaning, Need for motivation,  | 2             |
|      | Theories of motivation, welfare measures, incentives and penalties Leadership – Meaning and   | 3             |

Syllabus for B.Tech (Mining Engineering) Rajasthan Technical University Kota

|     |   |    |
|-----|---|----|
|     | styles, Group and team working, Human resource management, human resource development, workers participation in management, human relationship  |    |
| III | <b>Production management:</b> , Production planning, scheduling and control short and long term, Queing theory, productivity concept and its measurement,   | 3  |
|     | Methods of improving productivity; Determination of norms and standards of operation by work study, Time and motion study; Improving working environment,. analysis of mine capacities,                           | 3  |
|     | PERT and CPM, net work diagrams, Industrial psychology, operational research  | 2  |
| IV  | <b>Material management:</b> meaning and objectives, Purchase and stores management, inventory, Systems of inventory control;  | 3  |
|     | Different techniques, ABC Analysis, Ordering of Inventory, Procurement Techniques, inventory analysis, value analysis, Purchase procedures in public sector;  | 3  |
|     | Preparation of tender documents; Tender completion formalities; Consideration of bids and finalization of purchase order  | 2  |
| V   | <b>Financial management:</b> Capital and capital management in public and private enterprises, methods of cost analysis and cost control, break even charts and analysis, standard costing and budgetary control, | 3  |
|     | Marketing function –Market and marketing environment, Consumer/buyer behavior,  | 2  |
|     | Marketing mix, Advertisement and sales promotion. Introduction to book keeping and financial statements   | 3  |
|     | TOTAL   | 40 |

|                        |   |              |
|------------------------|---|--------------|
| <b>TEXT BOOK</b>       |   |              |
| 1                      |   |              |
| <b>REFERENCE BOOKS</b> |   |              |
| SN                     | Name of Authors /Books /Publisher   | Year of Pub. |
| 1                      | Banga & Sharma: Engineering Economics and Industrial Organisation. Pub: Khana Publishers, New-Delhi |              |
| 2                      | V.L. Mote, Samuel Paul and G.S. Gupta. Managerial Economics, Concepts and Cases                     |              |
| 3                      | Memoria & Agarwal, Industrial Organisation, Pub: M/S jain Brothers, Delhi                           |              |
| 4                      | Khana, O.P., A text book of Work Study. Pub: M/S Dhanpatrai & Sons, Delhi                           |              |
| 5                      | Jain, S.P. Industrial & Labour laws. Pub: M/S M/S Dhanpatrai & Sons, Delhi                          |              |

### 7MI3 ADVANCED METHODS OF MINING

B.Tech. Mining 7<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | <b>Supports;</b> Powered supports, their Classification, principles of operation and design, constructional features and application,  | 3             |
|      | support of wide excavation, longwall faces and depillaring,  | 3             |
|      | Hydraulic fluids, Shotcreting, Roof stitching  | 2             |
| II   | <b>Special surface Mining Situations :</b> Mining over old underground workings; Placer mining; hydraulicking, dredging, dump leaching, deep sea mining. highwall mining. Steep angle conveyor, high angle conveyor, | 3             |
|      | Mining by surface miner, In pit crushing and cross pit conveying techniques. Application of skip transportation in open cast mines. Cross pit conveying,   | 2             |
|      | High wall mining, Twin bench blasting, Blast design for casting, coyote blasting, chamber blasting, Application and use of GPS and Geomedia software   | 3             |
| III  | <b>Mining of coal under difficult Situations:</b> Contiguous seams, seams prone to outburst and bumps; Mining of seams prone to fire and spontaneous combustion,   | 3             |

Syllabus for B.Tech (Mining Engineering) Rajasthan Technical University Kota



|    |   |    |
|----|---|----|
|    | Mining of seams in the vicinity and under of water bodies and structures. Recent developments in underground coal mining technology,  | 3  |
|    | Remote controlled operations and use of robots in coal mining   | 2  |
| IV | <b>Hydraulic Mining:</b> The concept; Layout of workings on district and level systems; Winning of panels; Pillar methods (square pillars, rectangular pillars and long pillars); and sublevel stoping; | 4  |
|    | <b>In-situ Gasification:</b> The concept and chemistry; Methods- using underground excavations, and using vertical or directionally drilled boreholes from surface                                      | 4  |
| V  | <b>Special Metal Mining Situations:</b> Stoping of superimposed veins and parallel ore bodies; Combined methods; Extraction of underground pillar, Recent developments in underground metal mining,     | 3  |
|    | Special method of mining for deep deposit and difficult mining conditions, Scope of applications for mining of deep seated low grade mineral deposits,  | 2  |
|    | Solution mining, ore mining by leaching, Bacterial leaching, under water/Sea-bed mining, nuclear device mining systems, different methods for winning manganese nodules from the ocean floor            | 3  |
|    | TOTAL   | 40 |

|                        |  |              |
|------------------------|--|--------------|
| <b>TEXT BOOK</b>       |  |              |
| 1                      |  |              |
| <b>REFERENCE BOOKS</b> |  |              |
| SN                     | Name of Authors /Books /Publisher  | Year of Pub. |
| 1                      | R.D. Singh, Principles & Practices of Modern Coal Mining Pub:-New Age International Pvt.Ltd. New Delhi |              |
| 2                      | T.N. Singh, Underground winning of coal. Pub: Oxford & IBH, New-Delhi                                  |              |
| 3                      | Singh & Dhar, Thick Seam Mining, Pub: : Oxford & IBH, New-Delhi  |              |
| 4                      | Samir Kumar Das, Modern coal mining. Geeta book store, Dhanbad   |              |
| 5                      | Prof. J. G. Singh; "Underground Coal Mining Method" Braj-Kalp Publisher, Varansi                       |              |
| 6                      | William A. Hustrulid, Rechar Bullock; "Underground Mining Methods" SME Publication                     |              |

### 7MI4 MINERAL PROCESSING

B.Tech. Mining 7<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | Scope, object and limitations of Mineral Dressing; Role of microscopic study   | 4             |
|      | <b>Comminution and Liberation:</b> Theory and practice of crushing & grinding; Conventional units used-their fields of application and limitation                                      | 4             |
| II   | <b>Sizing and Classification:</b> Laws of setting of solids in fluid; Laboratory methods of sizing and interpretation of sizing data;  | 4             |
|      | Industrial sizing by screens; Types of classifiers; Classification as means of sizing by screens   | 4             |
| III  | <b>Gravity concentration Methods-</b> Jigging, Flowing film concentration like spirals and shaking table, Heavy Media separation; Theory, applications and limitations of each method; | 4             |
|      | Introductory Froth Flotation, physico-chemical, principles underlying flotation-reagents, flotation machines; Flotation of sulphides, oxides and non-metals                            | 4             |
| IV   | <b>Electrical Methods of Concentration:</b> Electrostatic and magnetic methods, their principles of operation, fields of application and limitations                                   | 3             |
|      | <b>Dewatering and drying:</b> Thickening, filtration and drying  | 3             |
|      | <b>Coal washing:</b> coal washability, crushing, sizing and cleaning of coal   | 2             |
| V    | <b>Sampling:</b> Importance and methods used in ore-dressing   | 4             |

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|  |  |           |
|--|--|-----------|
|  | <b>Simplified Flow Sheets:</b> Beneficiation of coal and simple ores of copper, lead, zinc, Iron and manganese with reference to Indian deposits | <b>4</b>  |
|  | <b>TOTAL</b>   | <b>40</b> |

|                        |  |                     |
|------------------------|--|---------------------|
| <b>TEXT BOOK</b>       |  |                     |
| <b>1</b>               |  |                     |
| <b>REFERENCE BOOKS</b> |  |                     |
| <b>SN</b>              | <b>Name of Authors /Books /Publisher</b>   | <b>Year of Pub.</b> |
| <b>1</b>               | M.A. Gaudin, Mineral Dressing  |                     |
| <b>2</b>               | H.G. Vijendra, Handbook on Mineral Dressing. Pub: Vikas Publishing house New-Delhi |                     |
| <b>3</b>               | S.K.Jain, Mineral Dressing   |                     |
| <b>4</b>               | Rao, Mineral Dressing  |                     |

### 7MI5 ENVIRONMENTAL MANAGEMENT IN SURFACE MINES

**B.Tech. Mining 7<sup>th</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| <b>UNIT</b> | <b>CONTENTS</b>   | <b>CONTACT HOURS</b> |
|-------------|---|----------------------|
| <b>I</b>    | <b>Man and Mine Environment:</b> Changes of social environment caused by mining; Socio-economic factors;  | <b>4</b>             |
|             | Occupational health hazards due to mine dust, poor lighting and ventilation, noise and vibration, trace elements, radioactive emission, Impact of surface subsidence. | <b>4</b>             |
| <b>II</b>   | <b>Air and Water pollution:</b> Sources, ill effects, measurement and monitoring, standards; Preventive and mitigating measures                                       | <b>4</b>             |
|             | <b>Dust in mines:</b> Dangers, formation, prevention and suppression; Dust sampling apparatus, their construction and applications                                    | <b>4</b>             |
| <b>III</b>  | <b>Noise and Vibration:</b> Sources, ill effect, measurement and monitoring, standards; Preventive and mitigating measures  | <b>4</b>             |
|             | <b>Acid Mine Drainage:</b> Sources, mechanism of formation and ill effects; Preventive and mitigating measures  | <b>4</b>             |
| <b>IV</b>   | <b>Land Reclamation:</b> Re-vegetation and restoration methodologies; Plant species selection; Case studies of coal and metalliferous mine dumps/spoils               | <b>4</b>             |
|             | <b>Environmental Management:</b> Factors to be considered, EIA, EMP preparation, Mine Closure Planning  | <b>4</b>             |
| <b>V</b>    | <b>Environmental laws and acts;</b> Main provisions of Environmental Protection Act 1986, EIA notification 2006 and Circulars issued by MoEF,                         | <b>4</b>             |
|             | Forest Conservation Act 1980 and Forest Conservation Rules 1981 related with the Mining   | <b>4</b>             |
|             | <b>TOTAL</b>  | <b>40</b>            |

|                        |  |                     |
|------------------------|--|---------------------|
| <b>TEXT BOOK</b>       |  |                     |
| <b>1</b>               |  |                     |
| <b>REFERENCE BOOKS</b> |  |                     |
| <b>SN</b>              | <b>Name of Authors /Books /Publisher</b>   | <b>Year of Pub.</b> |
| <b>1</b>               | Dr. B.B. Dhar, Environmental Management of Mining Operations. Pub  |                     |
| <b>2</b>               | Proceeding of the National & International Seminars/Symposium organized in concern with mine environment |                     |

Syllabus for B.Tech (Mining Engineering) Rajasthan Technical University Kota

|   |  |      |
|---|--|------|
| 3 | Rekha Ghosh, D. S. Chatterjee; "Environmental Geology" Capital Publishing Co. New Delhi                          |      |
| 4 | David Stone; "Minefill 2001" Proceedings of the International Symposium on Mining with Backfill" SME Publication | 2001 |

### 7MI6.1 Elective (Rock Engineering)

B.Tech. Mining 7<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | Slope design: Basics mechanics of rock and spoil slope failures; Parameters for stability analysis;                                 | 4             |
|      | Design of slopes; Reinforcement of rock slopes and monitoring of slopes   | 4             |
| II   | Design of mine excavations like drifts, shafts and stopes; Pillar design; Theories of roof failures of small and large excavations; | 4             |
|      | Cavability of ore and stratified deposit  | 4             |
| III  | Drillability of rocks; Mechanics of rotary and percussive drilling; Design of drills; Drill bits for optimum penetration;           | 4             |
|      | Parameters affecting rate of penetration; Effect of flushing medium on drill performance  | 4             |
| IV   | Rock reinforcement; Estimation of support requirements of underground excavation.   | 4             |
|      | Mining subsidence, bumps and rock burst, istressing to control rock bursts  | 4             |
| V    | Mechanics of rock breakage in blasting;   | 4             |
|      | Influence of rock properties; Controlling damage  | 4             |
|      | TOTAL   | 40            |

| TEXT BOOK       |   |              |
|-----------------|---|--------------|
| 1               |   |              |
| REFERENCE BOOKS |   |              |
| SN              | Name of Authors /Books /Publisher   | Year of Pub. |
| 1               | Dr.Sushil Bhandari, Engineering Rock Blasting Operations. Pub: A.A.Balkema Publisher Old post Road, Brook field, VTO5036, USA |              |
| 2               | Obert & Duall, Rock Mechanics and design of structures in rock. Pub: John Willey & Sons                                       |              |
| 3               | Railey & Dalley, Experimental stress analysis. Pub: McGraw Hill Book Company  |              |
| 4               |   |              |
| 5               |   |              |
| 6               |   |              |
| 7               |   |              |

### 7MI6.2 Elective (Advances in Mine Ventilation)

B.Tech. Mining 7<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | Advanced treatment of Air flow in Mines; Thermodynamics considerations  | 4             |
|      | Instrumentation and monitoring in mine ventilation and air conditioning | 4             |
| II   | Planning and design of mine ventilation systems                         | 4             |
|      | network theory and analysis by digital computer, heat flow from rocks   | 4             |
| III  | Mine heat load calculation  | 3             |

Syllabus for B.Tech (Mining Engineering) Rajasthan Technical University Kota

|    |  |    |
|----|--|----|
|    | Design of refrigeration and air conditioning systems in mines  | 3  |
|    | Degasification of coal mines                                   | 2  |
| IV | Leakage, re-circulation and reversal of air flow               | 3  |
|    | Methane drainage- control and case studies                     | 3  |
|    | Network analysis- controlled flow models by CPM                | 2  |
| V  | Natural splitting problems by Hardy-Cross and other techniques | 4  |
|    | Environmental monitoring and automatic control systems         | 4  |
|    | TOTAL  | 40 |

|                        |  |              |
|------------------------|--|--------------|
| <b>TEXT BOOK</b>       |  |              |
| 1                      |  |              |
| <b>REFERENCE BOOKS</b> |  |              |
| SN                     | Name of Authors /Books /Publisher  | Year of Pub. |
| 1                      | G.B. Mishra, Mine Environmental Engineering. Pub: Dhanbad Publisher, Dhanbad   |              |
| 2                      | L.C. Kaku, Numerical Problems on Mine Ventilation. Pub: Punam Publisher        |              |
| 3                      | Mutmansky & Weng, Mine ventilation & Air conditioning. Pub: John Willey & Sons |              |

### 7MI6.3 Elective (Remote Sensing and GIS)

B.Tech. Mining 7<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Remote Sensing Process:</b> Introduction to Remote Sensing, data acquisition and processing, sensor systems, applications  | 3             |
|      | Radiation (EMR) and its characteristics, Radiation principles, Planck's Law   | 3             |
|      | Electromagnetic, Stefan's Law, properties of solar radiant energy, atmospheric windows  | 2             |
| II   | <b>Physical Basis of Remote Sensing:</b> Interaction in the atmosphere, nature of atmospheric interaction, atmospheric effects of visible, near infrared thermal and microwave wavelengths, spectral characteristics of individual leaf                       | 3             |
|      | Interaction at ground surface, interaction with soils and rocks, effects of soil moisture, organic matter, particles, size and texture, interaction with vegetation,  | 2             |
|      | vegetation canopies, effect of leaf pigments, cell structure, radiation geometry  | 3             |
| III  | <b>Platform and Sensors:</b> Multi concept in remote sensing, general requirements of a platform, balloon aircraft, satellite platforms sun-synchronous orbits, sensors for visible near infra-red wavelengths, profilers, images, scanners, radiometers      | 3             |
|      | optical mechanical and push button scanners, spectral, spatial, radiometric and temporal resolution, IFOV, FOV, geometric characteristics of scanners, V/H ratio,   | 3             |
|      | comparison of satellite/ aerial platforms and sensors and remote sensing data products, land sat and TM, SPOT, IRS, ERS etc   | 2             |
| IV   | <b>Visual &amp; Digital Image Processing:</b> Remote Sensing Data Products, Elements of visual Image Interpretations, Generation of Thematic Maps,  | 4             |
|      | Digital Image Processing System, Image Enhancement, Image Transformation, Image Classification  | 4             |
| V    | <b>Geographical Information System:</b> Difference between image processing system geographical system (GIS), utility of GIS, various GIS packages and their salient features, essential components of a GIS, scanners and digitisers, raster and vector data | 3             |
|      | storage, hierarchical data, network systems, relational database, data management, conventional database management systems, spatial database management  | 2             |
|      | data manipulation and analysis, reclassification and aggregation, geometric and spatial operation on data   | 3             |

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|  |  |    |
|--|--|----|
|  | management and statistical modeling, Applications and Modern Trends of GIS in various natural resources and engineering applications |    |
|  | TOTAL  | 40 |

| TEXT BOOK       |   |              |
|-----------------|---|--------------|
| 1               |   |              |
| REFERENCE BOOKS |   |              |
| SN              | Name of Authors /Books /Publisher   | Year of Pub. |
| 1               | Remote Sensing and GIS: B.Bhatta  |              |
| 2               | Remote Sensing and Image Interpretation : T.M. Lillensand and R.W. Keifer                     |              |
| 3               | Principles of Remote Sensing : P.J. Curren  |              |
| 4               | Principles of Geographical Information systems for land Resources Assessment : P.A. Baurrough |              |
| 5               | Manual of Remote Sensing, Vol.2 : American Society of Photogrammetry and Remote Sensing       |              |
| 6               | Geographical Information systems Management Perspective : Stan Aromoff                        |              |

#### 7MI7 Special Methods of Mining

B.Tech. Mining 7<sup>th</sup> Semester  
0L+0T+2P

Max. Marks: 50  
Exam Hrs: 3

Declared by concerned faculty as per theory course contents

#### 7MI8 Mineral Processing

B.Tech. Mining 7<sup>th</sup> Semester  
0L+0T+2P

Max. Marks: 50  
Exam Hrs: 3

| SN | CONTENTS   | CONTACT HOURS |
|----|--|---------------|
| 1  | Jaw crushers and their comparison                        |               |
| 2  | Roll crushers and their comparison                       |               |
| 3  | Gyratory crushers and their comparison                   |               |
| 4  | The ball mill and its application                        |               |
| 5  | Various types of classifiers                             |               |
| 6  | Determination of various sized product with sieve shaker |               |
| 7  | Concept and apparatus of froth flotation                 |               |
| 8  | Process of thickening & filtration                       |               |
| 9  | Wilfrey table  |               |
| 10 | Filter press   |               |
| 11 | Laboratory jig   |               |
| 12 | Flowsheet of lead-zinc ore (Zawar)                       |               |
| 13 | Flowsheet of copper ore (Khetri)                         |               |
| 14 | Flowsheet of Gold, Iron ore, Manganese ore               |               |
| 15 | Flowsheet of coal washing                                |               |

### 7MI9 Environmental Management in Surface Mines

**B.Tech. Mining 7<sup>th</sup> Semester**  
0L+0T+2P

**Max. Marks: 50**  
**Exam Hrs: 3**

| SN | CONTENTS   | CONTACT HOURS |
|----|--|---------------|
| 1  | Occupational health hazards and their remedial measures  |               |
| 2  | Standards for water, air, noise, dust etc. and their impact when found in excess                         |               |
| 3  | Measurement of dust contents with the help of dust sampler   |               |
| 4  | Measurement of dust by instruments used in mines   |               |
| 5  | Sound level meter and measurement of noise level produced by various mining machineries                  |               |
| 6  | Measurement of vibration with the help of Blastmate series III seismograph                               |               |
| 7  | Reclamation of dumps for mechanized opencast mines   |               |
| 8  | Preparation of EMP of mines, collection of various fields data and their evaluation                      |               |
| 9  | Measurement of vibrations produced in mines by seismograph   |               |
| 10 | Measurement of pH value of water samples collected from mine discharge and analyzing its adverse effects |               |
| 11 | Gravimetric dust sampler   |               |
| 12 | Preparation of EIA   |               |
| 13 | Sound level measurement  |               |
| 14 | Problem for Acid mine drainage   |               |
| 15 | Case study of reclamation and valley filling   |               |

### 7MI10 MINE COMPUTING LAB – II

**B.Tech. Mining 7<sup>th</sup> Semester**  
0L+0T+2P

**Max. Marks: 50**  
**Exam Hrs: 3**

| SN | CONTENTS  | CONTACT HOURS |
|----|---|---------------|
| 1  | Programs related with strain and stress analysis of rocks   |               |
| 2  | Slope stability analysis and simulation   |               |
| 3  | Pillar design problem for underground mines   |               |
| 4  | Design of mine opening  |               |
| 5  | Subsidence prediction of underground coal mines   |               |
| 6  | Detailed planning by Datamine/ Surpac software of massive deposit   |               |
| 7  | Detailed planning by Datamine/ Surpac software of vein type deposit   |               |
| 8  | Computer analysis of data collected during survey camp  |               |
| 9  | Design a optimum blast for lime stone quarry  |               |
| 10 | Design of a pumping system for a u/g mine   |               |
| 11 | Design of support system in U/G mining  |               |
| 12 | Design of stope with various field condition  |               |
| 13 | To prepare a program for designing a drift for metalliferous mining   |               |
| 14 | Optimization of Shovel-Dumper operation   |               |
| 15 | Design of mine ventilation system<br>(a) Calculation of air quantity<br>(b) Equivalent resistance of mines.<br>(c) Calculation of relative humidity etc |               |

### 8M11 MINE ECONOMICS & FINANCIAL MANAGEMENT

**B.Tech. Mining 8<sup>th</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Introduction:</b> Economic importance of the mining industry; mining economy; risky nature of the mining industry; the state and the mining industry; Marketing and export of minerals; National mineral policy            | 4             |
|      | <b>Loss of mineral in Mining:</b> Classification and incorporation of losses, coefficient of recovery of mineral extraction; Dilution and recovery  | 4             |
| II   | <b>Mine examination and Valuation:</b> Examination and report on mines/mineral properties; valuation of mines/mineral properties; present value and its computation; ore value and profitability of mining; recoverable value | 4             |
|      | <b>Cost of Mining:</b> Capital and operating cost, factor affecting operating cost, method of estimating future costs; computation of cost of development and stoping operation   | 4             |
| III  | <b>Financial Management:</b> Finance function and objectives of a firm. Generally accepted accounting principles (GAAP); Scope of financial management  | 4             |
|      | <b>Financial Statements:</b> Nature and limitations of financial statements. Interpretation of financial statements. Uni-variate and multivariate ratio analysis. Limitation of ratio analysis                                | 4             |
| IV   | <b>Cost analysis:</b> Various cost concept; Cost-Volume-Profit analysis; Break-even analysis; Cost indifference point. Decision making with the cost data. Cost and budgetary control   | 4             |
|      | <b>Financial Analysis:</b> Revenue and mining costs; Taxes and royalties; Net Present Value (NPV); Internal Rate of Return (IRR); Effect of inflation on NPV of a project; Sensitivity analysis                               | 4             |
| V    | Capital-its importance, various forms, formation and processes of formation; Raising capital.   | 4             |
|      | Mine accountancy and book keeping   | 4             |
|      | International investment and trade in mineral materials and products  | 4             |
|      | TOTAL   | 40            |

| TEXT BOOK       |  |              |
|-----------------|--|--------------|
| 1               |  |              |
| REFERENCE BOOKS |  |              |
| SN              | Name of Authors /Books /Publisher                                      | Year of Pub. |
| 1               | Park , A text book of Mine Valuation                                   |              |
| 2               | W.A. Hustrulid, Underground Mining Methods Handbook                    |              |
| 3               | Rendu, An Introduction to Geostatistical Methods of Mineral Evaluation |              |
| 4               | R.T. Deshmukh, Mine Economics  |              |

### 8M12 MINE PLANNING AND DESIGN

**B.Tech. Mining 8<sup>th</sup> Semester**  
3L+0T

**Max. Marks: 100**  
**Exam Hrs: 3**

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | <b>Feasibility study:</b> Its function and preparation of feasibility report for metallic and non-metallic minerals | 4             |
|      | Minerals inventory and ore reserves   | 4             |
| II   | Different types of underground mining methods as per the organizational and technical parameters                    | 4             |
|      | Determination of size of mine, life of mine and production rates  | 4             |

Syllabus for B.Tech (Mining Engineering) Rajasthan Technical University Kota

|     |  |    |
|-----|--|----|
| III | Design for mining the mineral deposits by open-pit mining, under ground mining and the combination of both   | 4  |
|     | The ultimate open pit profile based on physical and economical parameters; Optimum pit design  | 4  |
| IV  | Division of underground mine into parts, levels and panels; Determination of level interval; Size of long wall faces.<br>Stope design-the basic concepts | 4  |
|     | Different planning stages- micro and macro planning, Project scheduling  | 4  |
| V   | Computer applications; Information systems; Information technology, Design for mining mineral deposits by underground mining                             | 4  |
|     | Production planning: Selection of machines; Haul road design; Optimum load haul system; Optimum blast design   | 4  |
|     | TOTAL  | 40 |

|                        |   |                     |
|------------------------|---|---------------------|
| <b>TEXT BOOK</b>       |   |                     |
| 1                      |   |                     |
| <b>REFERENCE BOOKS</b> |   |                     |
| <b>SN</b>              | <b>Name of Authors /Books /Publisher</b>  | <b>Year of Pub.</b> |
| 1                      | W.Hustrulid & Kuchta, Open Pit Mine Planning and Design Vol & I. Pub: A.A. Balkema  |                     |
| 2                      | W.A. Hustrulid, Underground Mining Methods Handbook   |                     |
| 3                      | Cummins and Gievens; SME Handbook.Pub: Society of Mining Engineers of the American Institute of Mining , Metallurgical, and Petroleum Engineers, Inc New York |                     |
| 4                      | Bhattacharya, A., Principles of Mine Planning, Allied Publishers  |                     |

### 8MI3 ROCK FRAGMENTATION

B.Tech. Mining 8<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | Present status of drilling and blasting practices in India and abroad: Methods of drilling  | 4             |
|      | Different types of machines; Hydraulic drills; Long hole drilling; Novel methods of drilling; Choice of drills  | 4             |
| II   | Variables in drilling; Machines of drilling; Drillability of rocks  | 4             |
|      | Study of bit life, cost of drilling, hole diameter, pull down weight, joints etc. in relation to BHD and rock characteristic; Trouble shooting; Diagnosis of problems in drilling | 4             |
| III  | Emerging trends in explosives, initiating system and blasting techniques; Mechanics of blasting   | 4             |
|      | Blast round design & influence of controllable and non controllable parameters on blasting  | 4             |
| IV   | Fragmentation assessment and monitoring, Instrumentation and software application for design of blast round, monitoring and assessment of rock fragmentation                      | 4             |
|      | Deep hole blasting, Hot hole blasting, Stemming plug  | 4             |
| V    | Blasting damages – Micro and macro level damages due to blasting; Ground vibrations, flyrock and air over pressure  | 4             |
|      | Wall control, Blast casting; Demolition blasting, Nuclear blasting; Destress blasting; Safety during blasting   | 4             |
|      | TOTAL   | 40            |

|                        |  |  |
|------------------------|--|--|
| <b>TEXT BOOK</b>       |  |  |
| 1                      |  |  |
| <b>REFERENCE BOOKS</b> |  |  |

Syllabus for B.Tech (Mining Engineering) Rajasthan Technical University Kota



| SN | Name of Authors /Books /Publisher   | Year of Pub. |
|----|---|--------------|
| 1  | Dr.Sushil Bhandari, Engineering Rock Blasting Operations. Pub: A.A.Balkema Publisher Old post Road, Brook field, VTO5036, USA |              |
| 2  | C.P. Chugh, High Technology in Drilling and Exploration, Pub: Oxford & IBH, New Delhi   |              |

#### 8MI4.1 ELECTIVE (EXPERIMENTAL STRESS ANALYSIS)

B.Tech. Mining 8<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS  | CONTACT HOURS |
|------|---|---------------|
| I    | Importance of experimental methods, similitude laws and design of experiments, some simple measuring instruments                    | 8             |
| II   | Bagg's deformeter. Strain gauges-principles and applications  | 8             |
| III  | Mechanical, optical and electrical strain gauges; semi-conductor strain gauges; strain recording instruments                        | 8             |
| IV   | Photo-elasticity-two dimensional stress analysis, principles and applications, Moirs techniques, three dimensional stress analysis  | 8             |
| V    | Non-destructive testing, Brittle coatings. Some application of experimental stress analysis and research, design and field problems | 8             |
|      | TOTAL   | 40            |

| TEXT BOOK       |   |              |
|-----------------|---|--------------|
| 1               |   |              |
| REFERENCE BOOKS |   |              |
| SN              | Name of Authors /Books /Publisher   | Year of Pub. |
| 1               | Obert & Duall, Rock Mechanics and design of structures in rock. Pub: John Willey & Sons   |              |
| 2               | Railey & Dalley, Experimental stress analysis. Pub: McGraw Hill Book Company  |              |
| 3               | Vutukuri & lama, Handbook of Mechanical properties of rock Vol.I&II. Pub: Transtech, Germany  |              |
| 4               | Syd.S.Peng, Coal Mine Ground Control. Pub: John Willey & Sons   |              |
| 5               | J.C. Jaeger & NGW Cook, Fundamentals of Rock Mechanics. Pub: Chapman & hall, London   |              |
| 6               | Charles Jaeger, Rock Mechanics & Engineering. Pub: Cambridge University Press, Cambridge London   |              |
| 7               | Manual on Rock Mechanics, Prepared by Central Soil & Materials Research Station, New Delhi, Add: Central Board of Irrigation and power Malcha Marg, Chanakyapuri, New-Delhi- 110021 |              |

#### 8MI4.2 ELECTIVE (NUMERICAL METHODS)

B.Tech. Mining 8<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | Introduction to Elastic Rock Models: Fundamentals; Elastic, homogenous isotropic, non linear elastic and elasto-plastic models | 8             |
| II   | Finite Element Method- the concept, formation of mesh elements and finite difference patterns solution;                        | 8             |
| III  | Discretization and element configuration; Element stiffness, assemblage and solution   | 8             |
| IV   | Boundary element method: The concept, discretization, different methods of solution for isotropic                              | 8             |

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|   |  |    |
|---|--|----|
|   | and infinite media                     |    |
| V | Practical application of above methods | 8  |
|   | TOTAL                                  | 40 |

|                        |  |              |
|------------------------|--|--------------|
| <b>TEXT BOOK</b>       |  |              |
| 1                      |  |              |
| <b>REFERENCE BOOKS</b> |  |              |
| SN                     | Name of Authors /Books /Publisher  | Year of Pub. |
| 1                      | An Introduction to FEM by J. N. Reddy  |              |
| 2                      | The FEM: Its basics and fundamentals by O. C. Zienkewicz and R. L. Taylor            |              |
| 3                      | An Introduction to the mathematical theory of Finite Elements and J. Tinsley Oden    |              |
| 4                      | Programming for boundary element method: an introduction to Engineers by Gernot Beer |              |
| 5                      | An Introduction to boundary element methods by Prem K. Kythe                         |              |

### 8MI4.3 Elective (Maintenance Management)

B.Tech. Mining 8<sup>th</sup> Semester  
3L+0T

Max. Marks: 100  
Exam Hrs: 3

| UNIT | CONTENTS   | CONTACT HOURS |
|------|--|---------------|
| I    | <b>Introduction:</b> General objectives, Functions; Organization and administration of maintenance systems; Requirements, Concepts and structure of suitable organizations for maintenance systems   | 4             |
|      | <b>Failure Analysis:</b> Analysis for source identification, classification and selectivity of failure; Statistical and reliability concepts and models for failure analysis   | 4             |
| II   | Classification of maintenance systems; Basis and models for various maintenance systems  | 4             |
|      | Cost management for maintenance: cost estimates- recording, summarizing and distributing cost data, maintenance budget   | 4             |
| III  | Decision models for maintenance planning; Operation and control, optimum level of maintenance; replacement aspects of breakdown and preventive types, group and individual types, obsolete facility, deteriorating and completely failing facilities | 4             |
|      | replacement vs. reconditioning, economics of overhaul, addition replacement model-additive damage case, zero memory case, partially observed situation, planning horizon procedure   | 4             |
| IV   | Spare planning and control: static spares, insurance spares with and without salvage value, low moving spares; man power planning-crew size, allocation etc. stand by machines   | 4             |
|      | economical and operational aspects; scheduling planning of activities, monitoring and updating, resource allocation, Assigning priorities  | 4             |
| V    | Other relevant topics: work measurement for maintenance, maintenance control indices, maintenance service contract, preventive maintenance management-guidelines, procedure, general management of lubrication system,                               | 4             |
|      | organizing preventive maintenance program using vibration signature analysis-some basic ideas, management of records for maintenance, computerization of maintenance activities, major plant shut-down procedures                                    | 4             |
|      | TOTAL  | 40            |

|                        |  |              |
|------------------------|--|--------------|
| <b>TEXT BOOK</b>       |  |              |
| 1                      |  |              |
| <b>REFERENCE BOOKS</b> |  |              |
| SN                     | Name of Authors /Books /Publisher                                      | Year of Pub. |
| 1                      | Higging L.T. Morrow L.C. Maintenance Engineering Handbook, McGraw Hill | 1977         |
| 2                      | Newbrought B.T., Effective maintenance management, McGraw Hill         | 1967         |

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### 8MI5 Mine Planning and Design

B.Tech. Mining 8<sup>th</sup> Semester  
0L+0T+2P

Max. Marks: 100  
Exam Hrs: 3

| SN | CONTENTS  | CONTACT HOURS |
|----|---|---------------|
| 1  | Estimation of ore reserve based on bore hole data of lime stone deposit |               |
| 2  | Estimation of ore reserve based on bore hole data of Iron ore deposit   |               |
| 3  | Estimation of ore reserve based on bore hole data of Bauxite deposit    |               |
| 4  | Estimation of ore reserve based on bore hole data of Lead zinc deposit  |               |
| 5  | Design of drive in a lead zinc mine                                     |               |
| 6  | Design of Raise/ winge in a lead zinc mine                              |               |
| 7  | Design of shaft in a lead zinc mine                                     |               |
| 8  | Design of box cut in an o/c mine  |               |
| 9  | Design of haul road   |               |
| 10 | Problem related to ultimate slope in o/c mine                           |               |
| 11 | Problem for shovel dumper combination                                   |               |
| 12 | Design of length of long wall face                                      |               |
| 13 | Problem related to scheduling   |               |
| 14 | Optimum blast design for o/c mine                                       |               |
| 15 | Optimum blast design for u/g mine                                       |               |

Each practical is computer based.

### 8MI6 Rock Fragmentation

B.Tech. Mining 8<sup>th</sup> Semester  
0L+0T+2P

Max. Marks: 75  
Exam Hrs: 3

Declared by concerned faculty as per theory course contents