

## BE-301 ENGINEERING MATHEMATICS – I

### Unit I

**Numerical analysis:** Errors & Approximations, Solution of Algebraic & Trancedental Equations (RegulaFalsi ,Newton-Raphson, Secant Method), Solution of simultaneous linear equations by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

**Definite Integrals :** Definite Integrals as a limit of a sum, its application in Summation of Series.

### Unit II

**Calculus :**Expansion of functions by Maclaurin's and Taylor's theorem. Partial differentiation, Euler's theorem and its application in approximation and errors, Maxima and Minima of function of two variables, Curvature : Radius of curvature.

### Unit III

**Differential Equations :** Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method,Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).Linear Differential Equations with Constant Coefficients, Cauchy's Homogeneous differential Equation, Simultaneous differential Equations, Method of Variation of Parameters

### Unit IV

**Matrices :**Rank, Nullity, Solution of Simultaneous equation by elementary transformation, Consistency of System of Simultaneous Linear Equation, Eigen Values and Eigen Vectors, Cayley-Hamilton Theorem and its Application to find the inverse.

### Unit V

**Graph Theory :** Graphs, Subgraphs, Degree and Distance, Tree, cycles and Network, Algebra of Logic, Boolean Algebra, Principle of Duality, Basic Theorems, Boolean Expressions and Functions. Elementary Concept of Fuzzy Logic.

### References and Text Books:

- 1)Higher Engineering Mathematics by B.S. Grewal, Khanna Publication.
- 2)Engineering Mathematics volume I & III by D.K. Jain
- 3)Engineering Mathematics volume I by D.C.Agrawal

## **MI-302 Drilling and Shot Firing**

### **UNIT-I**

#### **Exploration Drilling**

Boring for exploration; Various types of exploratory drills and their applicability – Auger, Cable-tool, Odex, Core Drills; Core recovery: single and double tube core barrels, wire line core barrel; Storage of cores; Interpretation of borehole data.

### **UNIT-II**

#### **Explosives and Initiating Systems**

Types of explosives, their composition and properties, classification; Selection of explosives; Manufacture, transport, storage and handling of explosives; Testing of explosives; Types of initiating systems – Electrical Detonators, Detonating Fuse, Detonating Relays, NONEL, Electronic Detonators, Blasting accessories, exploders.

### **UNIT-III**

#### **Drilling & Blasting in Surface Mines**

Drilling: Blasthole drills – types, classification, applicability and limitations; Mechanics of drilling, performance parameters, drilling cost, compressed air requirement for hole cleaning; Selection of drilling systems, drilling errors, organization of drilling.

### **UNIT-IV**

**Blasting:** Mechanics of rock fragmentation; Livingstone theory of crater formation; Factors affecting blasting, Blast design - estimation of burden and spacing, estimation of charge requirement; Initiation patterns; Secondary blasting – pop and plaster shooting; Problems associated with blasting, Ground vibration and air over pressure, Blast instrumentation

### **UNIT-V**

#### **Drilling & Blasting in Underground Mines**

Coal mines: Drilling systems and their applicability, blasting-off-solid, different blasting cuts, ring hole blasting, calculation of specific charge, specific drilling and detonator factor, initiation patterns.

Metal mines: Drilling systems and their applicability, blast design for horizontal drivages, different blasting cuts, longhole blasting, vertical crater retreat blasting.

#### **References and Text Books:**

1. R. P. Pal, A. A. Balkema, **Rock blasting effect and operation**, 1st Ed, 2005.
2. D. J. Deshmukh, **Elements of mining technology**, Vol. 1, Central Techno Publications, Nagpur, 7th Ed, 2001
3. B. H. Gary, **Blasting operations**, Mc-graw Hill, 1st ed, 1981.
4. R. P. Pal, **Blasting in ground excavations and mines**, Oxford and IBH, 1st Ed, 1993.
5. C. P. Chugh, **Drilling technology handbook**, Oxford and IBH, 1st Ed, 1977.
6. R. D. Singh, **Principles and practices of modern coal mining**, New age international, 1st Ed, 1997.
7. S. K. Das, **Explosive and blasting practices in mines**, Lovely prakashan, 1st Ed, 1993.
8. P. K. Rajameny, A Joshi, and S. Bhandari, **Blast design and Practice**, Himanshu Publications, Udaypur, 2006.

**MI-303 Mine-Technology –I**

**UNIT-1**

Mining – definition and economic importance; Mine – definition, different types and classification; Mine life cycle.

**UNIT-II**

Mineral deposit – different types and their classification; Mineral resources of India; Modes of entry to a mine – shaft, incline, decline, adit and box-cut.

**UNIT-III**

Overview of surface mining: Types of surface mines, unit operations, basic bench geometry, applicability & limitations and advantages & disadvantages.

**UNIT-IV**

Overview of underground mining: Different coal mining methods and their applicability & limitations; Different metal mining methods and their applicability & limitations.

**UNIT-V**

Basic concepts of transportation, ventilation, illumination and support in underground mines.

**References and Text Books:**

1. D. J. Deshmukh, Elements of mining technology, Vol. 3, Vidyasewa, 3rd ed, 1989.
2. N. T. Karlein, Mine transport, Orient Longman, 1st ed, 1967.
3. C. F. Statham, **Coal mining practice**, Caxton Eastern, 1st Ed, 1960.
4. R. D. Singh, **Principles and practices of modern coal mining**, New age international, 1st ed, 1997.
5. S. K. Das, **Modern coal mining technology**, Lovely prakashan, 2nd Ed, 1994.
6. M. P. Alexandrov, **Material handling equipment**, MIR, 1st ed, 1981.

**List of Practicals:**

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

**MI-304 Geology –I**

**UNIT-I**

**Mineralogy**

Minerals: Physical and chemical properties; Crystal, crystal classes and systems; Classification of minerals and properties of common silicate minerals (Quartz, Feldspar, Pyroxene, Amphibole, Garnet, Olivine, Mica), sulphides (Pyrite, Chalcopyrite, Galena, Sphalerite) and oxides (Haematite, Magnetite, Chromite, Pyrolusite, Psilomelane).

**UNIT-II**

**Petrology Igneous rocks:** Magma and lava, extrusive and intrusive forms, textures; Classification and description of some common igneous rocks (Granite, Dolerite, gabbro, Basalt, Rhyolite, Pegmatite).

**UNIT-III**

**Sedimentary rocks:** Sedimentation processes; Classification and description of some common sedimentary rocks (Conglomerate, Sandstone, Shale, Limestone).

**UNIT-IV**

**Metamorphic rocks:** Processes of metamorphism, textures and structures of metamorphic rocks; Classification and description of some common metamorphic rocks (Slate, Phyllite, Schist, Gneiss, Quartzite, Marble).

**UNIT-V**

**Paleontology and Stratigraphy**

Concepts of palaeontology; Fossils, their mode of preservation and significance as indices of age and climate; Concept of index fossils. Principles of stratigraphy; Broad stratigraphic subdivisions and associated rock types of important ore provinces, coal belts and oil fields of India.

**References and Text Books:**

1. P. K. Mukherjee, **A Text Book of Geology**, The World Press Pvt. Ltd., 9th Edition, 1982.
2. H. H. Read, **Rutley's Elements of Mineralogy**, CBS Publishers and Distributors, 26th Edition, 1984
3. P. B. Marland, **Structural Geology**, Prentice Hall of India Pvt. Ltd., 3rd Edition, 1990.
4. D. E. Salisbury & W. E. Ford, **A Text Book of Mineralogy**, Wiley Eastern Limited, 4th Edition, 1992.
5. G. W. Tyrrel, **The Principles of Petrology**, B. I. Publications Pvt. Ltd., 1989.
6. G. B. Mahapatra, **Text Book of Physical Geology**, CBS Publishers and Distributors, 1st Edition, 1990.
7. R. Kumar, **Fundamentals of Historical Geology and Stratigraphy of India**, Wiley Eastern Limited, 1992.

**List of Practicals:**

**Mineralogy**

**Study of physical properties of:**

(A) **Rock forming minerals:** Talc, Gypsum, Calcite, Fluorite, Feldspar (Orthoclase, Microcline, , Shale, Carbonaceous Shale, Coal, Limestone.

(B) **Ore minerals:** Haematite, Magnetite. Chalcopyrite, Malachite, Azurite, Chromite, Bauxite, Pyrolusite, Psilomelane, Sphalerite, Galena

**Petrology**

**Study of common rocks with reference to their structures, mineral composition and uses.**

(A) **Igneous Rocks:** Granite, Syenite, Gabbro, Basalt, Dolerite, Lamprophyre, Aplite, Pegmatite.

(B) **Metamorphic Rocks:** Slate, Schists, Gneisses, Quartzite, Marble, Amphibolite, Charnockite.

(C) **Sedimentary Rocks:** Conglomerate, Sandstone, Shale, Carbonaceous Shale, Coal, Limestone.

**MI-305 Mine Surveying**

**UNIT-1**

**Surveying:** Definition, objective, classification and principles of surveying.

**UNIT-II**

**Linear Measurement:** Instruments for measuring distances; Ranging and taping survey lines; Chain surveying – principle, field work, off-sets, booking and plotting, obstacles in taping.

**UNIT-III**

**Angular Measurement:** Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments; Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments.

**UNIT-IV**

**Levelling:** Definition & terminology; Levelling instruments types - tilting, auto set and digital levels; Levelling staves; Different types of levelling - differential, profile, cross-sectional and reciprocal levelling; Booking and reduction methods; Underground levelling; Temporary and permanent adjustments of levels.

**UNIT-V**

**Total Station:** Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station.

**Contours: Concepts;** Characteristics of contour; Contour Interval; Methods of contouring and uses of contours.

**Plane Table Surveying:** Methods; Detail surveying and contouring using plane table and micro-optic alidade. Computation of areas and volumes.

**References and Text Books:**

1. W. Schofield and M. Breach, **Engineering Surveying**, Sixth edition, 2007, ELSEVIER, B & H.
2. B. C. Punmia, **Surveying, Vol - I, II, III**, Laxmi Publication, New Delhi, 12th Edition, 1990.
3. V. Maslov, **Geodetic Surveying**, Mir Publication, Moscow, Revised edition, 1980.
4. Fedorov, **Elementary Plane and Mine Surveying**, Mir Publication, Moscow, Revised Edition, 1986.
5. V. Natarajan, **Advanced Surveying**, B. I. Publication, Bombay, First edition, 1976.
6. T. P. Kanetkar, **Surveying and Levelling**, Pune Vidyarthi Griha Prakashan, Reprints, 1995.
7. S. K. Roy, **Fundamentals of Surveying**, Printice Hall of India Pvt., New Delhi, Third Printing, 2004.

**List of Experiments:**

**1. Prismatic Compass Surveying:**

(a) Bearing of the lines (b) Traversing;

**2. Levelling:**

(a) Precise Levelling (b) Profile Levelling;

**3. Plane Table Surveying:**

(a) Intersection Method (b) Radiation Method; Theodolite Traversing;

**4. Theodolite:**

(a) Horizontal angle measurement (b) Vertical angle measurement; Signs and Conventions used by the GSI, MMR and CMR;

**5. Triangulation Survey:**

(a) By 1" Theodolite (b) By Electronic Theodolite;

**6. Triangulation Survey**

(a) By EDM (b) By Total Station;

**7. Distance Measurement:**

(a) By EDM (b) By Total Station;

**8. Coordinate Measurement:**

(a) By Total Station (b) By GPS;

**9. Traversing and Recording Position of points by GPS; Special Mine Surveys – Surveys for connecting National Grid, Survey of installations of Mine Structures**