

**15MAT31 ENGINEERING MATHEMATICS-III**

<b>Sub Code: 15MAT31</b>	<b>IA Marks :20</b>
<b>Hrs/week: 04</b>	<b>Exam Hours : 03</b>
<b>Total Hrs: 50</b>	<b>Exam Marks : 80</b>

TO BE TAKEN FOR MATHEMATICS BOARD

## 15MN32 MINING ELECTRICAL ENGINEERING

**Objectives:** Learn the Importance of Electrical and Electrical Usage in Mining Industry and their Applications for Various Mining Machineries used.

<b>Sub Code: 15MN32</b>	<b>IA Marks :20</b>
<b>Hrs/week: 04</b>	<b>Exam Hours : 03</b>
<b>Total Hrs: 50</b>	<b>Exam Marks : 80</b>
<b>Credit = 04</b>	

### MODULE-1: Introduction

**Introduction:** Scope and importance of electrical engineering in Mining, Qualification, roles and responsibilities of electrical inspectors, Indian Electricity rules applicable to Mining.

**Introduction to Electrical Drives and its Application in Mining:** Electrical Drives, Advantages, parts, Choice of Electrical Drives, status of AC and DC Drives, precautions in coal mines, methods of neutral grounding, types of electric drives for control of winders, shearers and conveyors, electric drives for mine hoists. **10 Hours**

### MODULE-2: DC Machines

**DC Machines:** Types and characteristics of DC Motors, voltage and torque equation of dc motors, regulation, speed control of shunt motors – Armature, Flux and Voltage control, problems on shunt motors. Electric braking of shunt motors – Dynamic, plugging and regenerative, Characteristics of dc shunt generator. **10 Hours**

### MODULE-3: AC Machines

**AC Machines:** Types and working principle of 3 phase Induction motors, working principle of synchronous motor, problems on synchronous motors, speed control of induction motors, plugging of an induction motor, working principle of an alternator. **10 Hours**

### MODULE-4: Protective Devices & Power Distribution in Mines

**Protective Devices:** Fuses - Types, Air break switches, Air circuit breakers, Oil Circuit breakers, principle of underground signaling in mines, types of motor enclosures in mines

**Power Distribution in Mines:** Single line diagram of power distribution on surface and in underground mines, Cables – Various types for surface and underground mines, Flameproof apparatus, Intrinsically safe apparatus, Standard voltage levels for mining as per IER 1956. **10 Hours**

## **MODULE-5: Mine Illumination**

**Mine Illumination:** Definition, laws of illumination, types of lighting sources, comparison of conventional and solid state lighting, general lighting in underground and surface mines, standards of mine lighting, LED lighting – working, types used in underground and surface mines. **10 Hours**

### **TEXT BOOK:**

1. “**Fundamentals of Electrical Drives.**” G.K. Dubey, Narosa Publishing House, 1995 (Module-1)
2. “ **Electrical Technology,**” B.L. Theraja, A.K. Theraja, Volume II AC and DC Machines, S.Chand & Company, 1999 (Module-2&3)
3. “ **Electrical Power,**” J.B. Gupta, S.K. Kataria & Sons, 1992 (Module-4&5)

### **REFERENCE BOOKS:**

1. “ **Universal Mining School Reports**”, Cardiff, Mining publishing London, 1<sup>st</sup> Ed., 1997
2. “ **The Indian Electricity Rules 1956**”, Chapter X (Module-1)
3. “ **A Study of Indian Electricity rules, 1956,**” L.C. Kaku, Lovely Prakashan, 2007
4. “ **Electric Drives**”, N.K. De, P.K. Sen, Prentice Hall of India, 2001
5. “ **The Lighting of underground Mines**”, Donald A Trotter, Transtech Publications, 1982
6. “**Electric Motors: Applications & Controls**” by M.V.Deshpande.

## 15MN33 Mining Geology-I

**Objective:** Learn about Importance of Mining Geology, Types of Rocks, Structures, Geological Disturbances in Rocks and their Effects on rock Structures.

<b>Sub Code : 15MN33</b>	<b>IA Marks : 20</b>
<b>Hrs/week : 04</b>	<b>Exam Hours : 03</b>
<b>Total Hrs : 50</b>	<b>Exam Marks : 80</b>
<b>Credit = 04</b>	

### MODULE-1: Physical Geology

Geology and its role in Mining, Earth as a planet- internal structure and composition of the earth. Geological work of Wind, Rivers, Lakes, Glaciers, Seas, Oceans and ground water, influences of these process on Mining Engineering Sectors. Earthquakes and seismic hazards and their relation with volcanoes. Engineering protection against earthquakes. **10 Hours.**

### MODULE-2: Mineralogy & Petrology

**Mineralogy :** Definitions, Physical properties of minerals, chemical composition, occurrence and uses of Quartz and its varieties, Felspar, Carbonates Mica, Garnet, Olivine, Pyroxenes and Amphiboles.

**Petrology:** Broad classification of rocks into Igneous, Sedimentary and Metamorphic rocks with examples. Structures, classification of Igneous rocks, classification of sedimentary rocks depending upon the grain size, Metamorphic agents and kinds. **10 Hours**

### MODULE-3: Texture, Structure and Mineralogy of Rocks

**Igneous Rocks:** Granite, Diorite, Gabbro, Dunite, Pegmatite, Porphyries, Dolerite, Basalt, Rhyolite & Obsidian

**Sedimentary Rocks:** Conglomerate, Breccia, Sandstone, Limestone & Shale.

**Metamorphic Rocks:** Gneiss, Schist, Quartzite Marble & Slate. **10 Hours**

### MODULE-4: Geological Time Scale & Indian Stratigraphy

**Geological Time Scale:** Correlation, Catastropism, Geological Clock, Law of order of superposition, Uniformitarianism, fossil and their uses.

**Indian Stratigraphy:** Physio-geographic divisions of India with special reference to Dharwar, Cuddapah, vindhyans, gondwanas and tertiary system with their economic importances. **10 Hours.**

### MODULE-5: Structural Geology

**Structural Geology:** Primary & Secondary Structure, Dip& strike, True Dip& Apparent Dip, Compass clinometers.

Structural features of rocks, interpretation of topographic maps. Classification of folds, faults, joints and unconformities, their recognition in the field and importance in mining operations. **10 Hours**

### **TEXT BOOKS:**

1. **“Engineering and General Geology,”** Parbin Singh. Katson publisher, Ludhiana, 1<sup>st</sup> Ed. 2002.
2. **“A Text Book of Geology,”** P.K.Mukerjee. The World Press Pvt. Ltd., Calcutta.2000 (MODULE-I-V)

### **REFERENCE BOOKS:**

1. **“Principles of Petrology”** G.W.Tyrill, B.I. Publications Pvt. Ltd., New Delhi.1999.
2. **“Geology of India,”** Wadia, D.N., Tata Mc. Graw Hill Publilshing co. Ltd., 2000
3. **“Structural Geology,”** Marland & Billings, Prentice Hall of India Pvt. Ltd., New Delhi.2000.
4. **“Geology of the Himalayas”**, E.T Attikinson, Cosmo Publications, New Delhi, India, 1980.
5. **“Principles of Engineering Geology”** by K.M Bangar, Standard Publishers, Delhi, 1995.
6. **“Physical & Engineering Geology”** by S.K.Garg.

## 15ME34 Mechanics of Materials

<b>Subject Code: 15ME34</b>	<b>IA Marks: 20</b>
<b>Hrs/week : 04</b>	<b>Exam Hours:03</b>
<b>Total Hrs : 50</b>	<b>Exam Marks:80</b>
<b>Credit = 04</b>	

### MODULE-1:

**Stress and Strain:** Definition of Stress, Strain and Stress-strain relations, Mechanical behaviour of materials, Linear elasticity, Young's modulus of elasticity and Poisson's ratio, Stress-Strain curves in tension for Mild steel, Cast iron and non-ferrous metals.

Bars of uniform cross section, varying cross section and discontinuous/stepped cross section, Extension / Shortening under point (axial) load, body force (self weight), temperature change, Compound bars, Composite Sections, Numerical examples. **10 Hours**

### MODULE-2:

**Compound Stress:** Uniaxial, Biaxial, General 2D stress state, Definition of Plane stress and Plane strain states, Stresses on inclined sections, Principal stresses, Principal planes, Principal axes, Maximum shear stress, Mohr's circle, Numerical examples.

Expression for Volumetric strain, Elastic constants, Numerical examples

**Cylinders:** Determination of deformations, strains and stresses in thin cylinders subjected to internal pressure, Numerical examples. **10 Hours**

### MODULE-3:

**Bending Moment and Shear Force diagrams:** Types of beams, loads and reactions, Definition of shear force and bending moment, sign conventions, Relationship between shear force, bending moment and rate of loading, Shear force and bending moment diagrams for different beams, Numerical examples involving beams subjected to concentrated loads, uniformly distributed load (UDL), uniformly varying load (UVL) and couple.

**10 Hours**

### MODULE-4:

**Stresses in Beams:** Euler-Bernoulli beam theory, Relationship between bending moment, bending stress, and radius of curvature. Transverse Shear stresses, shear stress across rectangular, circular, symmetrical I- and T-sections only, Numerical examples.

**Deflection of Beams :** Governing differential equation and its solution, Double integration method for cantilever and simply supported beams for point load, UDL, UVL and Couple, Macaulay's method, Numerical examples. **10 Hours**

### MODULE-5:

**Torsion of shafts with circular cross section:** Derivation of governing equation, Torsional rigidity, Torsional strength, Power transmitted by solid and hollow shafts, Numerical examples

**Elastic stability of Columns:** Euler's theory for axially loaded elastic long columns, Derivation of Euler's load for various end conditions, limitations of Euler's theory, Rankine's formula, Numerical examples. **10 Hours**

**TEXT BOOKS:**

1. Mechanics of Materials, in SI Units, Ferdinand Beer and Russell Johnston, 5th Ed., TATA McGraw Hill-2003.
2. Mechanics of Materials, R. C. Hibbeler, Prentice Hall. Pearson Edu., 2005
3. Mechanics of Materials, James M. Gere, Thomson, Fifth Edition, 2004.

**REFERENCE BOOKS:**

1. Mechanics of Materials ,K.V. Rao, G.C.Raju, First edition 2007
2. Mechanics of Materials by J.B.K Das.
3. Strength of Materials, Bhavikatti, Vikas publications.2nd Edition, 1998.
4. Strength of Materials, S.S.Rattan, Tata McGraw Hill 2009
5. Engineering Mechanics of Solids, Egor.P.Popov,Pearson Edu.India.2nd Edition 2007.
6. Strength of Materials by Vazirani V.N & Ratwani, Vol-II, Kanna Publishers, 1996.

## 15MN35 ELEMENTS OF MINING ENGINEERING

**Objectives:** Learn the Basics of Mining, Importance of Underground and Surface Mining, Method of Opening a Deposit with various Means of Entry, Special and various Conditions to be overcome in Shaft Sinking and their Accessories.

<b>Sub Code</b> : 15MN35	<b>IA Marks</b> : 20
<b>Hrs/week</b> : 03	<b>Exam Hours</b> : 03
<b>Total Hrs</b> : 50	<b>Exam Marks</b> : 80
<b>Credit = 04</b>	

### **MODULE-I: Introduction to mining engineering and Opening up of deposits**

**Introduction to mining engineering:** Significance to mining industry in national economy and infrastructure building, basic mining terminologies, geo-technical investigations, classification of mining methods, selection criteria for underground or opencast mining methods.

**Opening up of deposits:** Types, size and location of entries into underground coal and other minerals.

**10 Hours**

### **MODULE-2: Shaft sinking operation, Special and mechanized methods of shaft sinking**

**Shaft sinking operation:** Preliminary geo-technical investigations for a shaft sinking, surface arrangements for sinking shafts and equipment. unit-operations of drilling, blasting, mucking; Temporary and permanent lining. Construction of insets and shaft stations.

**Special and mechanized methods of shaft sinking:** Methods of sinking shaft in water-logged, pressurized strata in loose and running soils. Mechanized sinking, shaft borers, drop raise method. Need for widening and deepening of operating shafts. Different methods for widening and deepening shafts- cycles of operation, equipment and manpower needed.

**10 Hours**

### **MODULE-3: Development of workings**

**Development of workings:** Drivage of cross cuts, drifts, inclines and raises by conventional and mechanized methods. Arrangements for ventilation, supports, lighting, transportation and drainage; Drilling patterns for underground coal mines and hard rock mines.

**10 Hours**

### **MODULE-4: Mine supports**

**Mine supports:** Types of support: timber, prop, chock/cog, cross bar, concrete, steel and hydraulic supports. Yielding and rigid supports. Fore poling, roof stitching, roof bolting, applicability, advantages and limitations of various supports.

**10 Hours**

### **MODULE-5: Tunneling methods**

**Conventional method:** drilling and blasting method, types of drill patterns, blasting and transportation of muck.

**Mechanized method:** construction and working principle of tunnel boring machine, applicability, advantages and limitations of tunnel boring machine.

**Shield tunneling method:** construction and working principle, applicability, advantages and limitations.

**10 Hours**



**TEXT BOOKS:**

1. **“Elements of Mining Technology,** vol. I, “D.J.Deshmukh, Vidyasewa, Prakashan, Nagpur.7th Ed.1996.
2. **“Introductory Mining Engineering”** by Hartman H.L., John Wiley Sons. 1st Ed. 2004.
3. **Tunnel Engineering Book**

**REFERENCE BOOKS:**

1. **“Underground mining methods handbook,”** W.A.Hustrulid, Published by S.M.E. of the American institute of mining metallurgical and petroleum Engineers inc., New York, 1982.
2. **“Universal mining school volumes”** Cardiff Gt.Britain, 1931.
3. **Winning and working** by B.Ghosh.
4. **Advances in Drilling & Blasting** by V.R.Sastry.
5. **Drilling & Blasting** by Carlos Lopez Jimeno.
6. **Workshop on New Development in Mining Machinery.**

## 15MN36 COMPUTER AIDED MACHINE DRAWING\*

\* **NOTE: To be checked with the Mechanical syllabus**

Sub Code : 15MN36	IA Marks : 20
Hrs/week : 04	Exam Hours : 03
Total Hrs. : 50	Exam Marks : 80
Credit = 04	

### MODULE-1:

**Introduction:** Review of graphic interface of the software. Review of basic sketching commands and navigational commands. Starting a new drawing sheet. Sheet sizes. Naming a drawing. Drawing units, grid and snap.

**Section of Solids:** Section of Pyramids, Prisms resting only on their bases (No Problems on axis inclinations, spheres and hollow solids), True shape of sections.

**Orthographic views:** Conversion of pictorial views into orthographic projections of simple machine parts with section. (Bureau of Indian Standards convention to be followed for the drawings) Hidden line conventions. Precedence of lines.

**10 Hours**

### MODULE-2:

**Thread forms:** Thread terminology, sectional views of threads. ISO Metric (Internal & External) BSW (Internal & External) square and Acme. Sellers thread, American Standard thread. Etc.

**Fasteners:** Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simple assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw.

**10 Hours**

### MODULE-3:

**Keys & Joints:** Parallel, Taper, Feather key, Gibhead key, Woodruff key

**Riveted Joints:** single and double riveted lap joint, butt joint (Chain and Zigzag. using snap head rivet) cotter joints, knuckle joint (pin joint) for two rods.

**10 Hours**

### MODULE-4:

**Couplings:** Protected type flange coupling, pin type flexible coupling, and universal coupling, Oldham's coupling, Muff coupling. Etc.

**10 Hours**

### MODULE-5:

#### Assembly Drawings

Drawing formats, title block, revision block, tolerance block, release block, BOM (Bill of Materials) drawing details, and drawing notes.

1. Screw jack (Bottle type)
2. Tailstock of lathe
3. I.C. Engine connecting rod
4. Machine vice
5. Plummer block (Pedestal Bearing)

**10 Hours**

**Text books:**

1. **“A Primer on Computer Aided Machine Drawing-2007”**, Published by VTU, Belgaum.
2. **“Machine Drawing”** by Sri N.D.Bhat & V.M.Panchal.

**Reference Book:**

1. **“A Text Book of Computer Aided Machine Drawing”**, S. Trymbaka Murthy, CBS Publishers, New Delhi, 2007.
2. **“Machine Drawing with Auto CAD”** Goutam Pohit & Goutham Ghosh, 1<sup>st</sup> Indian print Pearson Education, 2005.
3. **“Auto CAD 2006, for engineers and designers”** Sham Tickoo. Dream tech 2005.
4. **“Machine Drawing”**, by R.K.Swamy.
5. **“A Text Book of Computer Aided Machine Drawing”**, by K.R.GopalKrishna.
6. **“Machine Drawing”**, by K.L.Narayana.

## 15MNL37 MINING GEOLOGY LABORATORY – I

**Objective:** Learn about Importance of Mining Geology, Types of Rocks, Structures, Geological Disturbances in Rocks and their Effects on rock Structures in Laboratory.

<b>Sub Code : 15MNL37</b>	<b>IA Marks: 20</b>
<b>Labs/Instructions</b> <b>Hrs/week: 03 (02 Hrs Lab + 01 Hr Tutorial)</b>	<b>Exam Hours:03</b>
<b>Total Number of Lecture Hrs : 48</b>	<b>Exam Marks:80</b>
<b>Credits = 02</b>	

### Part - A ( Any one question 35 Marks)

#### I. Experimental study of Minerals

Physical properties, chemical composition, mode of occurrence, Distribution, identification and uses with reference to mining importance.

**Experiment No.01:** Quartz, Felspar and Mica Group of Minerals.

**Experiment No. 02:** Calcite, Magnesite, Ferromagnesium Minerals

#### II. Experimental study of Rocks

Physical Properties, Mineral composition, Texture, Petrogenesis, Engineering properties, distribution and uses.

**Experiment No. 03:** Igneous Rocks.

**Experiment No. 04:** Sedimentary Rocks.

**Experiment No. 05:** Metamorphic Rocks.

### Part – B ( Any one question 35 Marks)

#### III.Structures Based study of Rocks

Zenolithic, Vesicular, Amygdaloidal, pegmatitic, Stratification, Graded bedding, Current bedding Ripple Marks, Cataclastic, Maculose, Slaty, Schistose, Gneissose, Granulose & Hornfelsic Structures.

**Experiment No. 06:** Igneous, Sedimentary & Metamorphic Rocks.

#### IV. Experimental study of Geological Maps.

Drawing sections along the profile areas, Interpretations, descriptions on structural features, Order of super position and geological history and concluding the various forms of land mass.

**Experiment No. 07:** Topographic Maps, Geological Maps, Structural geological maps – Dipping strata.

**Experiment No. 08:** Structural Geological Maps – Folded strata.

**Experiment No. 09:** Structural Geological Maps –Faulted strata & Unconformities.

**Experiment No. 10:** Tracing of Out Crop Maps.

### Part – C : Viva voce 10 Marks

### **15MNL38 MINING ELECTRICAL ENGINEERING LABORATORY**

**Objective:** Learn to calculate Resistance / Inductance / power / Efficiency / Power Factor.

To study the speed / Torque characteristics of AC and DC machines and to calculate losses and find their Efficiency,

To calculate losses in a transformer and to plot the efficiency curves

<b>Sub Code : 15MNL38</b>	<b>IA Marks: 20</b>
<b>Labs/Instructions</b> <b>Hrs/week: 03 (02 Hrs Lab + 01 Hr Tutorial)</b>	<b>Exam Hours:03</b>
<b>Total Number of Lecture Hrs : 48</b>	<b>Exam Marks:80</b>
<b>Credits = 02</b>	

#### **Part - A ( Any one question 35 Marks)**

1. Measurement of
  - a) Resistance by voltmeter and Ammeter method.
  - b) Inductance and Power factor of choke by ammeter voltmeter, wattmeter method.
2. Open circuit characteristics of a D.C. Generator.
3. Load test on shunt generator.
4. Load test on compound generator.
5. Speed control of shunt motor

#### **Part - B ( Any one question 35 Marks)**

6. Load test on shunt motor
7. O.C. and S.C. test on a single-phase transformer and predetermination of efficiency and regulation.
8. Load test on a single phase Induction motor.
9. Load test on 3-phase Induction motor.
10. Calibration of energy meter

#### **Part – C : Viva voce 10 Marks**