

**Dr. Babasaheb Ambedkar Technological University**  
**(Established as a University of Technology in the State of Maharashtra)**  
**(Under Maharashtra Act No. XXIX of 2014)**  
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**Detailed Syllabus**  
**for**  
**Second Year B. Tech program in MINING ENGINEERING**

**With effective from**  
**Academic year July 2019-20**

**B.TECH. MINING ENGINEERING SCHEME & SYLLABUS**

**Semester- III**

Sr. No.	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
<b>Theory</b>						
01	BTMN301	Introduction to Mining Technology	4	0	-	4
02	BTMN302	Fluid Mechanics	3	0	-	3
03	BTMN303	Mine Electrical Engineering	4	0	-	4
04	BTMN304	Mechanical Engineering	4	0	-	4
05	BTMN305	Statistical and Numerical Methods	3	0	-	3
<b>Laboratory/Practical</b>						
06	BTMN306	Fluid Mechanics	-	-	2	1
			Sub-Total	18	0	02
			<b>Total</b>	<b>20</b>		<b>19</b>

**Semester- IV**

Sr. No.	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
<b>Theory</b>						
01	BTMN401	Mining Geology	3	0	-	3
02	BTMN402	Mine Surveying-I	4	0	-	4
03	BTMN403	Mining Machinery-I	4	0	-	4
04	BTMN404	Drilling & Blasting Engineering	4	0	-	4
05	BTMN405	Strength of Material	3	0	-	3
<b>Laboratories</b>						
06	BTMN406	Mining Geology	-	-	2	1
07	BTMN407	Mine Surveying-I	-	-	2	1
08	BTMN408	Mining Machinery-I	-	-	2	1
			Sub-Total	18	0	6
			<b>Total</b>	<b>24</b>		<b>21</b>

## Detailed Syllabus

### III Semester B. E. (Mining Engineering)

**Course Code:** BTMN301

**Title of the Course:** Introduction to Mining Technology

Contents
<b>Introduction to Mining:</b> Mining contribution to civilization, Main mineral resources of India and world, Occurrences, Distribution and Mining of minerals in India and its contribution to national growth, Mining and its consequences.
<b>Basic Terminology:</b> Mine, Mining, Mining Engineering, surface mining, underground mining, mineral, rock, ore, mineral deposit, seam, veins, lode, beds, hanging wall, footwall, shaft, cross cut, drift, adit, level, incline, winze, raise, panel, pillar, gallery, roadway, face, strike and dip, sump, bench, haul road, bench slope, overall pit slope, overburden, waste dump, stripping ratio.
<b>Exploration &amp; Development:</b> Phases of mining, Prospecting to reclamation, Brief introduction to various methods of prospecting and exploration.
<b>Mine Opening:</b> Development of mineral deposits; brief introduction to modes of primary access, choice of mode of entry - adit, shaft, decline, and combined model; their applicability and comparison.
<b>Shaft Sinking:</b> Location, size, shape, site selection, sinking shaft-preparatory arrangements, drilling and blasting, mucking, hosting, ventilation, pumping, lighting, supporting of sides, complete cycle of operations, special method of sinking to be used in difficult ground conditions, deepening and widening of shafts, modern technique of shaft sinking/boring.
<b>Exploitation Techniques:</b> Elementary idea of methods of mining (both surface and underground) for coal and non-coal deposits; cyclic and continuous methods of mining and their comparison. Unit operations in mining; elementary idea about production cycle, drilling, blasting, supporting, loading, hauling and processing as applicable to underground methods of mining. Brief description of Bord and Pillar (development), and Longwall (advancing and retreating) methods of coal mining. Brief description of elements of an opencast mine; ramp, haul roads, benches, production cycle, dumping of overburden and backfilling. Introduction to underground metalliferous stoping methods; brief descriptions of underhand and overhand stoping methods.
<b>Drifting:</b> Small and medium size tunnelling and drifting; drivage work in varying ground conditions using conventional methods – drilling, blasting, mucking, transportation, supports, services and cycle of operations. Mechanical methods of drivage of roadways and tunnels.

#### Text cum Reference Books:

1. Introduction to Mining Engineering by H.L. Hartman
2. Coal Mining Methods: S K Das
3. SME Mining Engineer's Handbook by Hustrulid

**Course Code:** BTMN302  
**Title of the Course:** Fluid Mechanics

Contents
Introduction and properties of fluids. Viscosity, laws, factors affecting and its measurements. Pressure and its measurements: absolute, gauge, atmospheric and vacuum pressure, manometers and mechanical gauges.
Hydrostatic force on surfaces: Total pressure and centre of pressure for plane, inclined and curve submerged surfaces, pressure on lock gates. Fluid kinematics: Types of fluid flows, rate of flow, continuity equation in three dimensions, velocity potential and stream function, free and forced vortex flows.
Equation of motion, Euler's and Bernoulli's equation and their practical applications. Venturimeter, Orificemeter and pitot tube. Momentum equation and moment of momentum. Flow through orifices: Introduction, classification of orifices, coefficient of contraction, velocity and discharges. Flow through notches: Introduction, classification of notches, rectangular, triangular, trapezoidal notches.
Fluid Measurements, Pitot Tube, Siphon, Venturimeter, Orifice Meter, Mouthpiece, Sudden Expansion in a Pipe, Weir Flow through Notches, Introduction, Classification of Notcher, Rectangular, Triangular, Trapezoidal Notch
Flow through pipes: loss of energy in friction, loss of pressure due to sudden expansion, contraction, bends, entry and exit. Darcy's and Chezy's equation. Hydraulic gradient and total energy line. Flow through pipes connected in series and parallel.
Mine pumps: Principle of working of reciprocating pumps and turbine pumps. Features of different types of pumps, reciprocating, centrifugal, turbine, mono pump, roto pump, three throw ram pumps, sludge pumps, borehole submersible pumps, air lift pumps, characteristics curves, simple calculations, maintenance of pumps.

**Text Books:**

1. Fluid Mechanics & Hydraulic Machines by Dr. R.K. Bansal
2. Fluid Mechanics & Machines by Mody & Seth
3. Fluid Mechanics by R.K. Rajput
4. Hydraulic Machines by R.K. Rajput
5. Fluid Mechanics & Fluid Power Engineering by Dr. D.S. Kumar

**Course Code: BTMN303**  
**Title of the Course: Mine Electrical Engineering**

<b>Contents</b>
<b>Mine Power Supply System:</b> Performance of short transmission lines, radial & ring-main distribution system, sub station arrangements for opencast & underground mines (OC&UG), voltage selection & power distribution in OC&UG mines. Mining cables, their construction, ratings, selection & application, fault detection & cable joint. Importance & significance of insulation resistance & its testing.
<b>Power Economics:</b> Understanding standard energy bills, importance of parameters therein & calculation of energy charges, types of power tariffs, importance of power factor & its improvement in mines.
<b>Electrical Drives and their Control:</b> Group & individual drive, selection of motors & starters for mining applications like haulage, ventilation fans, pumps, compressors, locomotives, winders. Introduction to power semiconductor devices, thyristor & its applications, basic principle of operation of thyristor controlled variable speed drive, electrical braking.
<b>Transformers, Switchgears &amp; Electrical Safety in Mine Applications:</b> Principle of working, construction & applications of mining type transformers & lighting transformer, ratings & their selection, thermal & overload relays, their applications. Circuit breakers, introduction of working principle, rating calculation & applications of OCB, ACB, & MCCB, gate end boxes, drill panel, field switch, & trans switch. Equipment earthing practice in mines, principle of flameproof enclosures, intrinsic safety, IE rules as applied to mines.
<b>Basic Electronics &amp; Instrumentation:</b> Transistor as amplifier in CE, CB & CC modes, bridge rectifiers & filters, working principle of feedback sinusoidal oscillators. Working principle of electronic voltmeter, digital frequency counter, CRO stroboscope, transducers & sensors used in measurement of strain, flow & displacement.
<b>Communication:</b> Different types of communication systems in mines, wired telephone system, fibre optics applications in mines, signalling systems in mines, data transmission systems.

**Text and Reference Book/s:**

1. Electrical equipments in mines by H. Cotton
2. A course in Electrical Power By Soni, Gupta and Bhatnagar
3. Electrical power by S L Uppal
4. Principles of Power Systems by V K Mehta
5. Principles of electrical engineering by V K Mehta & Rohit Mehta
6. Electric drives by N K Dey & P K Sen
7. Electric drives by Vedam Subramaniam
8. Electronic Principles by Malvino
9. Integrated Electronics by Millman & Halkias
10. Communication systems by B P Lathi
11. A course in Electrical Engineering By B L Thereja
12. Legislation in Indian Mines: A critical Appraisal by Prasad & Rakesh
13. Underground Mining Methods Handbook, SME, 1982
14. SME Mining Engineers Handbook, SME

## **PREREQUISITE**

Course on Basic Electrical Engineering, covered during First/Second Semester B.E.

### **OBJECTIVES OF THE COURSE is to impart knowledge on**

- Electrical power supply system in mines, its distribution, control & fault detection
- Power economics with emphasis on energy conservation
- Electric drives & their solid-state control
- Transformers, circuits breakers, relays & safety measures
- Principles of basic electronics, electronic measurements, communication systems in mines.

**Course Code: BTMN304**  
**Title of the Course: Mechanical Engineering**

<b>Contents</b>
Power Transmission: General Principles; Power transmission by belts [flat and V], ropes, chains and gears. Ratio of tension, centrifugal tension, slip and creep in belts [explanation of terms only]. Power transmitted by belts. [When C.F. tension is neglected] and chain drives; power transmitted by gears, type of gears.
Brakes and Dynamometers: Band brake, block brake, band and block brake, single and multiple disc clutches, transmission and absorption type dynamometers. Bearing and Couplings: Main types of bearings and couplings, anti friction bearings, Lubrication: Laws of friction for dry and lubricated surfaces, methods of lubrication of bearings.
Thermodynamics: Laws of thermodynamics, concept of entropy, methods of heating and expansion of gases, internal energy, external work done, total heat of gas, change of entropy during different methods, representation on PV and TQ diagram. Air Standard Cycles: Carnot, Otto, Diesel and Joule's cycles. Air Standard efficiencies, and mean effective pressure, representation of PV and TQ diagram.
Internal Combustion Engines: Classification based on types of fuel and working cycles, working of four stroke and two-strokes cycles. IC Engines; Their merits and demerits, study of parts of petrol and diesel Engine viz. fuel pump, injector and carburettor, Brief description of ignition system, cooling system, and lubrication system of IC Engines. Study of multi-cylinder engines. PV diagram, testing of IC engines, and thermal efficiencies, simple problems.
Air Compressors: Reciprocating and Rotary compressors single and multistage compressors, inter cooler, after cooler, receiver clearance volume and volumetric efficiency.
Refrigeration and air conditioning: Bale –Coleman refrigerators, vapour compression and absorption refrigerators, psychometric charts, introduction to comfort air-conditioning.

**Text Books:**

1. Theory of Machines : Phatakkar
2. Thermal Engineering : P. K. Nag
3. Thermal Engineering : Rajput
4. Heat Engine : V. M. Domkundwar
5. Theory of Machines : Khurmi & Gupta
6. I. C. Engines : Ganeshan
7. Refrigeration & Air-conditioning : Khurmi

**Reference Book/s:**

1. Design of machine elements : Bhandari
2. Thermal Engineering : Sengel
3. I. C. Engines : Webster

**Course Code:** BTMN305  
**Title of the Course:** Statistical & Numerical Methods

Contents
Solution of non-linear algebraic and transcendental equations; Newton- Raphson, iterative, false position and bisection methods; generalized Newton's method for multiple roots. Solution of linear simultaneous equations by Gauss elimination, Gauss-Jordan, Grout's triangularization, Jacobi and Gauss-Seidel methods.
Numerical solution of first order ordinary, differential equations by Picard's, Taylor's, Euler's, modified Euler's, Runge-Kutta and Milne's methods. Solution of simultaneous first order and second order ordinary differential equations by Runge-Kutta and Milne's methods. Solution of boundary value problems by finite difference methods.
Random variable, distribution function of continuous and discrete random variables, mathematical expectation, generating function; Moments, Skewness and Kurtosis.
Binomial, Poisson, normal Distribution, Correlation and regression, Correlation by rank, regression plane
The forward difference operator $\Delta$ , Factorial polynomial. Methods of expressing only polynomial in factorial polynomial Shift operator E, Missing terms. Newton's forward interpolation formula, Backward difference operator, Newton's backward interpolation formula.
Lagrange's interpolation formula for unequal intervals, Numerical differentiation, Numerical integration, Difference equation.

**Text and Reference Books:**

1. Engineering Mathematics by C N Tembhekar and P D Shobhane
2. Higher Engineering Mathematics by Dr. B. S. Grewal
3. Numerical methods for scientific and engineering computation by M K Jain, Iyengar and R K Jain
4. A Text book of Engineering Mathematics by N P Bali and Manish Goyal

**Course Code:** BTMN306  
**Title of the Course:** Fluid Mechanics Laboratory

Sr. No.	Name of the Practical's to be performed
1	Determination of metacentric height of floating body.
2	To find out type of flow using Reynold's Apparatus.
3	Determination of coefficient of discharge of an external mouth orifice.
4	To determination the coefficient of discharge through venturimeter.
5	To determine the coefficient of discharge through orifice meter.
6	To determine the coefficient of discharge for rectangular notch.
7	To determine the coefficient of discharge for triangular notch.
8	To verify Bernoulli's Theorem.
9	To determine coefficient of velocity (Cv), coefficient of contraction (Cc), coefficient of discharge (Cd) for a given orifice.
10	To determine impact of jet on vanes.

**Reference Books:**

1. Fluid Mechanics & Hydraulic Machines by Dr. R. K. Bansal
2. Fluid Mechanics & Fluid Power Engineering by Dr. D.S. Kumar



## Detailed Syllabus

### IV Semester B. E. (Mining Engineering)

**Course Code:** BTMN401  
**Title of the Course:** Mining Geology

Contents
Introduction to Geology, Science of Geology, its various branches and applications in mining engineering, internal structure of the earth, continental drift and plate tectonics, earth quakes and volcanism. <b>Minerology:</b> Definitions, Classification of various rock forming minerals, General Physical properties of minerals.
<b>Stratigraphy:-</b> Introduction, Definition, Principles of Stratigraphic Co- relation, Units of Stratigraphy, Physiographic divisions of India, Standard Geological Time Scale, Fossils - Elementary idea about their conditions, Modes of preservation and uses, Descriptions of important Indian formations- Archeans, Cuddapahs, Vindhyan, Gondwanas and Deccan traps.
<b>Structural Geology:-</b> Altitude of strata – Dip and Strike, Fold-Element of Folds, Classification of Fold, recognition of folds in the field, Fault – Terminology, Classification of faults, Effects of faults on outcrops, Geological maps, Unconformity and Joints, Influences of fold and fault in Mining operations, Problems of dip and strike, thickness and depth of strata.
<b>Petrology:- Igneous Rocks:-</b> Elementary knowledge of Magma and its crystallizations, Tabular classification of Igneous rocks, Textures and Structures of Igneous rocks, Description of common rock types. <b>Sedimentary &amp; Metamorphic Rocks:-</b> Textures and Structures of Sedimentary rocks, Classification of Sedimentary rocks, Description of common rock types. Agents of metamorphism, Textures and Structures of metamorphism rocks, Description of common rock types.
<b>Economic Geology:-</b> Fundamental Terms and their definitions, Brief Review of processes of mineral formation and their Genetic classification of mineral deposits: Magmatic ore deposits, Pegmatitic ore deposits, Contact metasomatic ore deposits, Hydrothermal ore deposits, Oxidation and Supergeine enrichment deposits, Metamorphic deposits, Control of ore depositions, Study of important metallic and non metallic deposits of India, Introduction to Geology to Indian Coal Fields.
<b>Hydrogeology:-</b> Hydrological cycle, Occurrence of ground water, Water table, Water table maps and their uses, Aquifer, Aquiclude, Aquifuge, Confined and Unconfined aquifers, Artesian Wells, Springs, Hydrological Properties of Rocks, Porosity and Permeability of rocks.

#### Text cum Reference Books:

1. A Text Book of Geology : P.K. Mukherjee
2. Principles of Engineering Geology : K.M. Bangar
3. Engineering Geology Manual : B.S. Satyanarayana Swami
4. Principles of Petrology : G.W. Tyrell
5. Geological Maps : G.W. Chiplunkar
6. Physical & Engineering Geology : S.K. Garg

**Course Code:** BTMN402  
**Title of the Course:** Mine Surveying-I

<b>Contents</b>
<p>Surveying: Definition, objective, classification and principles of surveying. Linear measurement: Instruments for measuring distances, ranging and chaining out survey lines, chain surveying- principle, field work, off-sets, booking and plotting, obstacles in chaining, problem solving.</p> <p>Angular measurement: Prismatic compass – principle and construction; bearing of lines; local attraction; magnetic declination.</p>
<p>Levelling: Definition of levelling terms; levelling instruments; different types of levelling; booking and reduction methods; differential, profile, cross- sectional and reciprocal levelling; temporary and permanent adjustments of levels, problem solving.</p>
<p>Theodolite: Essentials of the transit and modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing, traverse calculations, adjustment of the traverse; computation of co-ordinates; temporary and permanent adjustments.</p>
<p>Tacheometry: Principles and classification of tacheometry, stadia tacheometry; distance and elevation formulae; tacheometric surveying; self reduction tacheometers.</p> <p>Curve setting: Elements, laying of simple circular curves on surface and belowground. Transition curve and super elevation.</p>
<p>Plane table survey: Introduction, methods of plane table surveying, micro- optic alidade.</p> <p>Contours: Characteristics, methods of contouring and uses of contours.</p>
<p>EDM: Principle of measurement; types; corrections; selection of equipment; total station.</p> <p>Field Astronomy: Definition of various astronomical terms, methods for determination of true north of survey line.</p>

**Text Books:**

1. Surveying Volume I, II, III by Dr. B. C. Punmia
2. Surveying Volume I and II by Dr T. P. Kanetkar and S V Kulkarni

**Reference Book:**

1. Metalliferous Mine Surveying by Winniberg

**Course Code:** BTMN403  
**Title of the Course:** Mining Machinery-I

<b>Contents</b>
Pit-Top and Pit-Bottom Circuits: Simple pit-bottom circuits, pit-top circuits, tippers, screening and handling plants, railway sidings.
Wire Ropes: Wore ropes of different types and their construction and selection, space factor, fill factor, bending factor and factor of safety. Rope deterioration, estimation of size of rope, rope capping, recapping and rope splicing.
Rope Haulages: Types of rope haulages, selection, computations, and safety devices, Mine tubs, Mine cars, links, clips and rope capel. Application of rope haulages. Track laying and maintenance. Manriding system in underground mines, Types, construction and safety devices.
Locomotives: Different types. Diesel, electric trolley wire, construction and operation, application and maintenance. Locomotive haulage computations, safety devices. Track laying and maintenance.
Conveyors: Construction and operation of belt, chain and cable belt conveyors. Conveyor computations. High angle conveyors, shiftable conveyors. Aerial Ropeways: Types, construction, application and operation, safety devices.
Winding: Drum and friction winding with their variations and limitations, duty cycle, torque time diagrams and computations. Multilevel and deep winding. Drives for winding.
Head frames; types and fittings. Shaft fittings; signals, guides, Keps, tilting platform, cage receivers, protective roofing. Suspension gear, cages and skips. Safety devices on winders, emergency braking, over speed control, slow banking, depth indicators, automatic contrivances.

**Text Books:**

1. Mine Winding & Transport: Walker
2. Mine Transport by N. T. Karelin
3. Mine Hoisting: M. A. Ramlu, Oxford & IBH, 1996

**Reference Books:**

1. SME Mining Engineer's Handbook by Hustrulid
2. Underground Mining Methods Handbook by Hustrulid

**Course Code: BTMN404**  
**Title of the Course: Drilling & Blasting Engineering**

<b>Contents</b>
<b>Drilling:</b> Definition, need, classification, drillability and selection of drilling system, Percussive drilling - mechanics, required vertical thrust and RPM, Indexing, penetration rate etc. Rotary drilling - Mechanics, torque required and estimation of applied thrust, Rotary-percussive drilling - mechanics, torque required, applied axial thrust. Thermal drilling and other types of novel drilling methods with concepts.
<b>Performance of Drilling:</b> Factors affecting performance of drilling system, operating parameters etc. Bits: types of bits, construction and application, bit wear, Economics of drilling system.
<b>Explosives:</b> Definition, classification, composition, properties and various Tests on explosives Detonator: Need, classification, construction, Delay element, firing sequence, fuse, detonating cord, relay, nonel, shocktube, electronic detonators, Blasting accessories, exploders, circuit tester, etc.
<b>Blasting:</b> Mechanism of blasting- solid blasting, cut blasting and bench blasting, blasting pattern and design of blast round in underground coal mines, opencast, drifts, stopes, raise, winze, shaft, tunnel, etc. Secondary blasting methods.
Bulk transportation of explosive, storage and explosives (magazine), blasting in fiery seam, blasting under special conditions, deep hole blasting, environmental effects of blasting and their preventive measures.
Characteristics of good blast, blast performance, evaluation technique, controlled blasting techniques, cast blasting, blast simulation studies, misfire, dealing with misfire, blownout shot, blowthrough shot.

#### **Text and Reference Book/s:**

1. Principles and Practices of Modern Coal Mining by R D Singh, New Age Int. (P) Ltd., New Delhi
2. Surface Blast Design by C.J.Konya & E.J.Walter, Prentice Hall Publications
3. Explosives and Blasting Practices in Mines by Dr S K Das, Lovely Prakashan, Dhanbad
4. Principles of Rock Drilling by U.M.Rao Karanam and B.Misra, Oxford & IBH Co Pub. Ltd., New Delhi
5. Surface Mining by G B Mishra, Dhanbad Publishers
6. SME Mining Engineering Handbook by H.L.Hartman (Editor), Soc. For Mining, Metallurgy and Exploration Inc., Co.
7. Rock Breakage by Blasting by M.I. Petrosyan, Overseas Books Syndicate, Dhanbad

**Course Code:** BTMN405  
**Title of the Course:** Strength of Materials

<b>Contents</b>
<p><b>Mechanical Properties:</b> Concepts of stress and strain, stress-strain behaviour of ductile and brittle material in uniaxial state of stress, Elastic, plastic and strain hardened zones in stress-strain relation, elastic constants, relation between elastic constants, hardness, impact strength, brief description of common testing machines.</p> <p><b>Uniaxial State of Stress:</b> Uniaxial loading and deformation, simple cases of statistically indeterminate problems under axial loading, etc. Composite bars in tension and compression, temperature stresses in composite rods.</p>
<p><b>Biaxial State Stress:</b> State of stress in two dimensions, differential equation of equilibrium, transformation of stresses principal stresses, and principal planes, Maximum shear stress, Mohr's circles.</p> <p><b>Stresses Due to Torsion:</b> Torsion of circular sections assumptions and derivation of relation between torsional moment, shear stress and angle of twist, torsional stress in solid and circular sections. Torsion in thin walled hollow sections, helical springs.</p>
<p><b>Axial Force, Shear Force and Bending Moment Diagrams:</b> Concept of free body diagrams, types of load, determinations of axial force, shear force and bending moment at a section, axial force, SF and DM diagrams in beams and simple frames. Differential relation between shear force and bending moment. Relation between load and shear force.</p>
<p><b>Stresses in Beams (Bending and Shear):</b> Bending stresses in simple beams, assumptions and derivation of simple bending theory, relation between bending moment, bending stress and curvature. Homogeneous and composite beams.</p>
<p><b>Deflection of Beams:</b> Derivation of differential equation of moment curvature relation, differential equation relating deflection and moment shear and load deflection of simple beams by integration method.</p>
<p><b>Stability of Columns:</b> Concept of stability derivation of Euler formulae for bars, various conditions, limitations of Euler formula, tangent modulus theory, eccentrically loaded columns and secant formula.</p>

**Text and Reference Books:**

1. Mechanics of Solid (Vol-1 & 2) by Dr. H.J. Shaha And S.B. Junarkar
2. Strength of Material by J.P. Den Hartog
3. Strength of Material by Spriger
4. Strength of Material by Shaha And Kurve
5. Strength of Materials by S. Ramamrutham, Publishers Dhanpat Rai & Co., 2008
6. Strength of Materials by R K Rajput, Publishers S Chand & Company, New Delhi
7. Strength of Materials by Dr R K Bansal, Publishers Laxmi.

**Course Code: BTMN406**  
**Title of the Course: Mining Geology Laboratory**

Sr. No.	Name of the Practical's to be performed
1	Megascopic identification of rock forming minerals.
2	Megascopic identification of (ore forming) economic minerals.
3	Megascopic identification of Igneous rocks.
4	Megascopic identification of Sedimentary rocks.
5	Megascopic identification of Metamorphic rocks.
6	Study of geological models with folds, faults, unconformity and igneous intrusions.
7	Study of geological maps with folded, faulted and horizontal rock formations.
8	Study of geological map with tunnel and railway track with folded and faulted strata.
9	On the basis of given well data prepare the water table map of the area- Make the direction of ground water flow and ground water conditions.
10	Discuss the hydrological conditions of the area and mark suitable site for a well.
11	Identification of fossils.

**Reference Book/s:**

- |                                      |   |                          |
|--------------------------------------|---|--------------------------|
| 1. A Text Book of Geology            | : | P.K. Mukherjee           |
| 2. Principles of Engineering Geology | : | K.M. Bangar              |
| 3. Engineering Geology Manual        | : | B.S. Satyanarayana Swami |
| 4. Principles of Petrology           | : | G.W. Tyrell              |
| 5. Geological Maps                   | : | G.W. Chiplunkar          |
| 6. Physical & Engineering Geology    | : | S.K. Garg                |

**Course Code:** BTMN407  
**Title of the Course:** Mine Surveying- I Laboratory

Sr. No.	Name of the Practical's to be performed
1	A) To measure distance between station A and B by direct ranging. B) To measure distance between station A and B by indirect ranging.
2	A) To determine distance between station A and B when vision is free and obstructed. B) To determine distance between station P and R when vision and chaining both obstructed.
3	To observe the magnetic bearing of a close traverse by prismatic compass.
4	Building traversing by prismatic compass.
5	To determine elevation of given points by simple levelling.
6	A) Longitudinal and cross-sectional levelling. B) Contouring.
7	Plane table survey by radiation method.
8	Study of theodolite and to measure a horizontal angle by repetition method.
9	To find out multiplying constant ( $f/i$ ) and additive constant ( $f + d$ ) of the instrument.
10	To determine reduce level of a given object at higher elevation by measuring vertical angle.

**Reference Book/s:**

1. Surveying Volume I, II, III by Dr. B. C. Punmia
2. Surveying Volume I and II by Dr T. P. Kanetkar and S V Kulkarni

**Course Code:** BTMN408  
**Title of the Course:** Mining Machinery- I Laboratory

<b>Sr. No.</b>	<b>Name of the Practical's to be performed</b>
1	Study of pit-bottom layout.
2	Study of pit-top layout.
3	To study different types of safety devices used on rope haulages.
4	To study cage suspension gear arrangement.
5	Study of aerial ropeway system.
6	To study armoured face chain conveyor.
7	To study torque time diagram for friction winder.
8	To study torque time diagram for drum winder.
9	Study of electrical braking on winder.
10	To study ward Leonard system of speed control.

**Reference Book/s:**

1. Mine Transport by N. T. Karelin
2. Mine Hoisting by M. A. Ramlu, Oxford & IBH, 1996
3. Underground Mining Methods Handbook by Hustrulid