

**School of Engineering & I.T.**

**MATS University**

**Raipur**



**Syllabus Scheme**  
For  
**Bachelor of Technology**  
**Mining Engineering**

## **SCHOOL OF ENGINEERING & IT, MATS UNIVERSITY**

### **MINING DEPARTMENT**

#### **Programme Outcome:**

Mining engineering programmes are designed to prepare graduates to attain the following program outcomes:

1. An ability to apply knowledge of mathematics ,science and engineering to solve practical complex problems.
  2. An ability to identify, critically analyze, formulate and solve engineering problems using principles of mathematics, sciences, and engineering sciences.
  3. An ability to select appropriate engineering tools and techniques and use them with skill and proficiency.
  4. An ability to use the modern tools , resources and IT tools for complex engineering problems.
  5. An ability to design a system and process to meet desired needs of society within realistic limitations such as health, safety, security and environmental considerations.
  6. An ability to create and conduct experiments, interpret data, design of experiments and provide well informed conclusions.
  7. An ability to understand the impact of engineering solutions within purview of laws, in a contemporary, global, economical, environmental, and social context for sustainable development of society.
  8. An Ability to develop ability to work individually and in a team as a member or a leader to develop professional ethics and leadership qualities.
  9. An ability to function professionally with ethical response ability as an individual as well as in multidisciplinary teams with positive attitude for engineering practice.
  10. An ability to communicate effectively on complex engineering activities and effective documentation.
  11. An ability to appreciate the importance of goal setting and to recognize the need for life-long learning for technological change.
  12. An ability to become a good mining engineer to give good and safe working condition to the workers and employees.
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		Mining Machinery - II Lab										Y	
		Blasting Engineering Lab		Y	Y	Y		Y			Y		Y
		Mineral Dressing Lab		Y	Y	Y		Y			Y		Y
		<b>Professional Elective – I</b>											
		Coal & Non-Coal Mineral Processing											
		Small Scale & Dimensional Stone Mining											
		Surface Mining-II		Y	Y	Y	Y	Y	Y		Y	Y	Y
		Mine power Systems											
		Electrical Machinery in Mines											
<b>Y E A R 4</b>	<b>S E M 7</b>	Mine Economics		Y	Y	Y	Y	Y			Y	Y	Y
		Rock Mechanics		Y	Y		Y	Y			Y	Y	Y
		Mine Environment-II				Y		Y	Y		Y		Y
		Computer Applications in Mining		Y	Y	Y				Y	Y		Y
		Professional Elective – II											
		Mine Environment-II Laboratory		Y	Y	Y		Y					Y
		Rock Mechanics Laboratory		Y	Y	Y							Y
		Vocational & Industrial Training Evaluation & Presentation		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
		Computer Application in Mining Laboratory		Y	Y	Y		Y			Y	Y	Y
		<b>Professional Elective – II</b>											
		Mine Planning & Development		Y	Y	Y	Y	Y		Y			Y
		Advance Surface Mining		Y	Y	Y	Y	Y		Y		Y	Y
		Mine Health and Safety		Y	Y	Y	Y						Y
		Advanced Mining Geology		Y	Y	Y	Y						Y
		Advance Mine Machinery		Y	Y	Y	Y	Y					Y
	<b>S E M 8</b>	Pollution Control Engg.		Y	Y	Y	Y					Y	Y
		Mining Machinery III										Y	
		Strata Control										Y	
		Disaster Management		Y	Y	Y			Y	Y		Y	
		<b>Elective III</b>											
		Pollution Control Engg. Lab										Y	
		Strata Control Lab		Y	Y	Y		Y			Y	Y	
		Major Project (200M arks)		Y	Y	Y					Y	Y	
		<b>Elective III</b>											
		Safety Engineering			Y	Y		Y	Y			Y	
		GIS & Remote		Y	Y	Y	Y			Y		Y	

	Sensing in Mining												
	Ecology and sustainable development												<b>Y</b>
	Surface Mining II			<b>Y</b>	<b>Y</b>	<b>Y</b>					<b>Y</b>	<b>Y</b>	<b>Y</b>

# SEMESTER-I

## MATS UNIVERSITY, RAIPUR (C.G.) SCHOOL OF ENGINEERING & I.T.

Semester : 1st B.Tech

Branch : All Streams of Engineering

Subject : Engineering Mathematics-I

Total Theory Periods : 60

Total Tutorial Periods : 00

Total Credits : 04

Code : BT 100

### **OBJECTIVES:**

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT-1 MATRICES: Rank & inverse of matrices by elementary transformation. GaussJordan method of finding the inverse of a matrix. Normal form of a matrix. Consistency and inconsistency of linear system of equations. Eigen values and eigen vectors of a matrix. Cayley- Hamilton theorem.

UNIT-2 Differential Calculus: Successive Differentiation, Leibnitz's theorem; expansion of functions in Taylor's and Maclaurin series; tracing of simple curves.

UNIT-3 Integral calculus: Reduction formula, application of integration to rectifications, Quadrature, volume of revolution, centre of gravity and moment of inertia.

UNIT-4 Partial Differentiation: Partial derivatives, Euler's theorem on homogeneous functions, maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers, Jacobians, differentiation under integral sign.

UNIT-5 Ordinary Differential Equations and Applications: Exact differential equations, reducible to exact form; first order differential equations (non linear); application to simple electrical circuits and heat flow. Theory of equations: Roots of polynomial equations, relations between roots and coefficients, transformation of equations, removal of terms, solution of cubic and biquadratic equations -Cardin's and Ferrari's method.

### **Name of text Books:**

1. Higher Engineering Mathematics by B.S.Grewal (42th edition)-Khanna Publisher.
2. Advanced Engineering Mathematics by Erwin Kreyszig (8th edition)-John Wiley & Sons.

### **Name of Reference Books:**

1. Differential Calculus by Gorakh Prasad-Pothisala Private Limited.
2. Advanced Engineering Mathematics by R.K.Jain and S.R.K. Iyengar-Narosa Publishing House.
3. Applied Mathematics by P.N.Wartikar & J.N.Wartikar Vol-II -Pune Vidyarthi Griha Prakasan, Pune.
4. Integral Calculus by Gorakh Prasad-Pothisala Private Limited.

### **OUTCOMES:**

- This course equips students to have basic knowledge and understanding in one fields of materials, integral and differential calculus.



**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : 1st B.Tech

Branch : All Streams of Engineering

Subject : Basic Electrical Engineering

Total Theory Periods : 60

Total Tutorial Periods : 00

Total Credits : 04

Code : BT 101

**OBJECTIVES:**

- To explain the basic theorems used in Electrical circuits and the different components and function of electrical machines.
- To explain the fundamentals of semiconductor and applications.
- To impart knowledge of communication

**UNIT-I: D.C. NETWORKS** Basic electrical components, ohm's law, resistance in series, resistance in parallel, short and open circuit equivalent resistance. Kirchhoff's law, node voltage and mesh current methods, delta-star and delta/star conversion, classification of network elements, superposition theorem, Thevenin's and Norton's theorem.

**UNIT-II : A.C. NETWORKS** Single phase AC circuits:- Solution of R.L.C. series circuit, the J operator complex representation of impedance, phasor diagram, power in complex notation, solution of parallel and series parallel circuits. Three phase AC circuits:- Delta and star connection, line and phase quantities, solution of Three phase circuits, balanced supply voltage and balanced load, phasor diagram.

**UNIT-III: ELECTRO MAGNETISM** Magnetic circuits:- B-H Curve, Solution of magnetic circuit, Hysteresis and eddy current losses, difference / welect / magnetic circuit. Transformers:- Construction, EMF equation, rating, phasor diagram on no load and full load Equivalent circuit, regulation, losses efficiency all day efficiency calculation.

**UNIT-IV : DC MACHINES**

Construction, EMF and Torque equation, classification and application and characteristics of DC motors. House wiring & safety:- Single phase and three phase system—phase, neutral and earth, basic house wiring, different types of wiring—staircase, florescent lamp and ceiling fan, basic safety measures at home and industry.

**UNIT-V : ELECTRICAL MEASURING INSTRUMENTS** Classification Indicating, recording and integrating types of instruments, controlling torque, Damping torque, DCPMMC instruments, shunts and multipliers, moving iron ammeter, working principle of single phase energy meter.

**OUTCOMES:**

- ability to identify the electrical components explain the characteristics of electrical machines

**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : 1st B.Tech

Branch : All Streams of Engineering

Subject : Technical English

Total Theory Periods : 45

Total Tutorial Periods : 00

Total Credits : 03

Code : BT 102

**OBJECTIVES:**

- To enable learners of Engineering and Technology develop their basic communication skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading and writing leading to effective and efficient communication.

**OUTCOMES:**

Learners should be able to

- speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- read different genres of texts adopting various reading strategies.
- listen/view and comprehend different spoken discourses/excerpts in different accents

UNIT-I Technical vocabulary-meaning in context, sequencing words,articles, prepositions,intensive reading and predicting content-reading and interpretation- process description.

UNIT-II Phrases/structures indicating use/purpose- non verbal communication- listening- correlating verbal and non verbal communication-speaking in group discussion- formal letter writing- writing analytical paragraphs.

UNIT III Cause and effect expressions- different grammatical forms of the same word- speaking stress and intonation- writing using connectives- report writing- types ,structures, data collection,content form recommendation.

UNIT –IV Numerical adjectives- oral instructions- descriptive writings, letter of application-content, format (c.v./biodata)-imperative forms –checklists, yes/no question forms- e mail communication.

UNIT-V Speaking – discussion of problems and solutions- creative and critical thinking, writing a proposal.

**Books and references :**

1. P.k. dutta, g. Rajeevan and c.l.n.prakash, 'a course in communication skills,. Cambridge university press, india2007

2. Krishna mohan and meera banerjee, 'developing communication skills' Macmillan india limited

3. Edger thrope, showick thrope, 'objective english' second edition,pearson education,2007

**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : 1st B.Tech

Branch : All Streams of Engineering

Subject : Engineering Graphics

Total Theory Periods : 45

Total Tutorial Periods : 20

Total Credits : 04

Code : BT 103

**OBJECTIVES:**

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

**OUTCOMES:**

On Completion of the course the student will be able to

- perform free hand sketching of basic geometrical constructions and multiple views of objects.
- do orthographic projection of lines and plane surfaces.
- draw projections and solids and development of surfaces. □ prepare isometric and perspective sections of simple solids.
- demonstrate computer aided drafting.

UNIT – I a)Importance of Engineering Drawing, Scales: Representative Fraction, Type of Scale, Plain and Diagonal Scale.

b) Engineering Curves: Conic section, Ellipse, parabola, hyperbola, Cycloidal Curves: Cycloid, Epicycloids, Hypocycloid, Involute..

UNIT – II a) Projection: Introduction, Principle of Projection, method of projection, planes of projection, four quadrants, first and third angle projection, reference line symbols for methods of projection, Orthographic projection.

b) Projection of Points: Introduction point situated in first, second, third & fourth quadrant. Projection of lines: Introduction, line parallel to one or both the planes, line contained by one or both the planes, line perpendicular to one of the planes, line inclined to one plane and parallel to other. Line inclined to both the planes. [Simple problems only]

UNIT – III a)Projections of planes: Introduction, types of planes, projection of planes, projection of planes perpendicular to both the reference planes, perpendicular to one plane and parallel to the other plane, perpendicular to one plane and inclined to the other plane.

b) Projections of Solids: Introduction, types of solids, projections of solids in simple position, projections of solids with axes inclined to one of the reference planes and parallel to the other, projections of solids with axes inclined to both H.P. and the V.P., section planes, types of sections, true shape of section, section of solids.

UNIT – IV a)Development of Surfaces: Introduction, methods of development, development of lateral surfaces of right solids, cube, prisms, cylinders, pyramids & cone.

b)Isometric Projection: Introduction, Isometric axes, lines & planes, Isometric scale, Isometric projection and Isometric view of simple objects.

UNIT – V Computer Aided Drawing: Introduction to CAD, benefits and limitation of CAD, CAD Software's, AutoCAD introduction, Basic Commands of AutoCAD, Concept of Layers, Dimensioning and text, Creation of two dimensional drawing.

**TEXT BOOKS:**

- (i) Bhatt, N.D., "Elementary Engineering Drawing", Charotar Book Stall, Anand
- (ii) George Omura, " Mastering AutoCAD" B.P.B. Publication, New Delhi

**REFERENCE BOOKS:**

- (i) Engineering Graphics – Laxminarayanan & V. and Vaish Wanar, R.S. Jain Brothers, New Delhi
- (ii) Engineering Graphics – Chandra, AM & Chandra Satish 1998.
- (iii) Engineering Graphics – K.L. Narayan and P. Kannaih, Tata McGraw Hill
- (iv) A Text book of Engineering Drawing (Plane & Solid Geometry) – N.D. Bhatt & V.M. Panchal, Charotar Publishing House
- (v) The Fundamental of Engineering drawing and Graphics Technology – French and Vireck, McGraw Hill.

**MATS UNIVERSITY, RAIPUR (C.G.)**  
**SCHOOL OF ENGINEERING & I.T.**

Semester : 1st B.Tech  
Branch : All Streams of Engineering  
Subject : Engineering Physics  
Total Theory Periods : 45  
Total Tutorial Periods : 00  
Total Credits : 03  
Code : BT 104

**OBJECTIVES:**

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

**OUTCOMES:**

- The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

**UNIT -1 :THEORY OF RELATIVITY** Frame of reference, Galilean principle of relativity, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, time dilation, Relativistic addition of velocities, Variation of mass with velocity, Mass energy equivalence, energy-momentum relationship.

**UNIT-2: ACOUSTICS AND WAVE OPTICS** (i) Acoustics: Ultrasonic waves: Production and engineering applications, basis requirements for an acoustically good hall, determination of wavelength, reverberation time, Sabine's formula.

(ii) Wave Optics: Interference by division of amplitude: Newton's rings experiment, interference by division of wavefront: Fresnel's biprism experiment, Diffraction at single slit, diffraction grating, Resolving Power of grating.

**UNIT-3: X-RAY AND CONDUCTIVITY** (i) X-ray: Origin of continuous and characteristic X-ray, Duane-Hunt limit for minimum wavelength, Moseley's law, Bragg's law for X-ray diffraction. (ii) Super Conductivity: Superconductors, Meissner effect, Type-I and Type-II, Superconductors, BCS theory, application of superconductors.

**UNIT-4: QUANTUM PHYSICS** Inadequacy of classical mechanics-Qualitative study of black body radiation and photoelectric effect, Compton effect, DeBroglie's hypothesis, Davison – Germer experiment, Uncertainty principle and its applications, Wave function and wave packet, phase and group velocities, Probabilities and normalization, Schrödinger equation: Time dependent and time independent, Application of Schrödinger equation: particle in a box

**UNIT -5: LASER** Introduction, temporal and spatial coherence, principle of Laser, stimulated and spontaneous emission, Einstein's Coefficients, He-Ne Laser, Ruby Laser, Application of Lasers.

**TEXT BOOKS:** 1. Gaur and Gupta "Engineering Physics" 2. Beiser, "Modern Physics", McGraw-Hill Inc., New Delhi. 3. Avadhanulu and Kshirsagar "Engineering Physics".

**REFERENCE BOOKS:**

- Jenkins and White: "Optics", McGraw-Hill Book Company.
- Singh R.B. : "Physics of Oscillations and Waves"

- Ghatak A.K.: “Optics”
- Mani and Mehta: “Modern Physics”, Affiliated East-West Press Pvt. Ltd, 1998.
- Sanjeev Puri: Modern Physics, narosa Pub. Co. 2004.
- Azroff: Solid State Physics, Tata McGraw-Hill, 2004.
- Theraja: B.L., Basic Electronics, S.Chand, 2002.
- Puri: Digital Electronics, Tata McGraw-Hill, 2002.
- Millman, J and Halkias: integrated Electronics, Tata McGraw-Hill, 2004.
- Tyagrajan and Ghatak: Lasers, Macmillan, 2001. •

**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : 1st B.Tech

Branch : All Streams of Engineering

Lab : Basic Electrical Engineering Lab

Total Practical Periods : 30

Total Credits : 01

Code : BT 105

List of Experiments (To perform minimum 10 experiments)

1. To verify Thevenin's theorem and Norton's theorem.
2. To verify Superposition theorem.
3. To verify Kirchhoff's Current Law and Kirchhoff's Voltage Law.
4. To verify Maximum Power Transfer theorem
5. To determine V– I characteristics of Incandescent lamp.
6. To study B-H curve.
7. To measure current, power, voltage and power factor of series RLC circuit.
8. To measure current, power, voltage of parallel RLC circuit.
9. To measure current, power, voltage of series parallel RLC circuit.
10. To measure R and L of choke coil.
11. To study construction of transformer.
12. To perform ratio test and polarity test of single phase transformer.
13. To calculate efficiency of single phase transformer by direct loading.
14. To study construction of D.C. machine.
15. To study charging and discharging of a capacitor.
16. To study the Wattmeter and Energy meter.

**OUTCOMES:**

- ability to fabricate carpentry components and pipe connections including plumbing works.
- ability to use welding equipments to join the structures.
- ability to fabricate electrical circuits.

**LIST OF EQUIPMENTS**



**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : 1st B.Tech

Branch : All Streams of Engineering

Lab : Engineering Physics Lab

Total Practical Periods : 30

Total Credits : 01

Code : BT 106

**OBJECTIVES:**

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

**OUTCOMES:**

- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

**LIST OF EXPERIMENTS (Any ten experiments can be performed)**

1. To determine the surface tension by Capillary/Jager's method.
2. To determine the wave length of light by Newton's rings method.
3. To determine the wave length of light by Fresnel's Biprism.
4. To determine the focal length of combination of two thin lenses by nodal slide assembly and its verification.
5. To determine specific resistance of a wire by Carry Foster's Bridge.
6. To determine the Hall coefficient of semiconductor.
7. To determine e/m by Thomson's method.
8. Study of Photo – Cell and determination of Planck's constant.
9. Determination of wavelength of a spectral line using diffraction grating.
10. Determination of divergence of LASER beam.
11. Determination of grating element of a diffraction grating using LASER beam.
12. To determine the coefficients of viscosity of a liquid by capillary flow/Stoke's method.
13. To determine the frequency of A.C. mains using sonometer.
14. To determine the moment of inertia of flywheel.
- 15 To determine the forbidden energy gap of semiconductor diode.
16. To determine the mechanical equivalent of heat (J) by Calender & Barne's method.
17. To determine the numerical aperture (NA) of the given fiber cables.
18. To study the characteristics of LDR.

**LIST OF EQUIPMENTS**

**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : 1st B.Tech  
Branch : All Streams of Engineering  
Lab : Engineering Graphics Lab  
Total Practical Periods : 30  
Total Credits : 01  
Code : BT 107

**LIST OF EXPERIMENTS**

**Component-1**

Sheet-1: Projection of Solids (4 problems) + Section and Development of solid surfaces (4 problems)

Sheet -2: Orthographic projection without section (4 problems).

Sheet -3: Orthographic projection with section (4 problems). Sheet- 4: Isometric Projections (6 problems).

**Component -2**

One A-3 size sketch book consisting of:-

- 1) 6 problems each from Projection of Curves, Lines, Planes and Solids.
- 2) 6 problems from Section and Development of Solids.
- 3) 4 problems each from the Orthographic Projections (with Section), Reading of orthographic projections and Isometric projections.

**Component - 3**

- 1.. An introduction of cad software and its utilities in the engineering software.
2. Study of the basic initial setting and viewing of drafting software interface.
3. Study of various tool bar options and exercises to familiarize all the drawing tools.
4. Use of various modify commands of drafting software.
5. Dimensioning in 2d and 3d entities.
6. Draw different types of 3d modeling entities using viewing commands, to view them (isometric projection).
7. Sectioning of solid primitives and rendering in 3d.
8. intersection of solid primitives.

**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : 1st B.Tech

Branch : All Streams of Engineering

Lab : Communication & Soft Skills

Total Practical Periods : 30 Total Credits : 01

Code : BT 108

**List of Tasks**

1. Listening comprehension – Achieving ability to comprehend material delivered at relatively fast speed; comprehending spoken material in Standard Indian English, British English, and American English; intelligent listening in situations such as interview in which one is a candidate.
2. Vocabulary building, Creativity, using Advertisements, Case Studies etc.
3. Personality Development: Decision-Making, Problem Solving, Goal Setting, Time Management & Positive Thinking
4. Cross-Cultural Communication: Role-Play/ Non-Verbal Communication.
5. Meetings- making meeting effective, chairing a meeting, decision making, seeking opinions , interrupting and handling interruptions, clarifications, closure- Agenda, Minute writing.
6. Group Discussion – dynamics of group discussion, Lateral thinking, Brainstorming and Negotiation skills
7. Resume writing – CV – structural differences, structure and presentation, planning, defining the career objective
8. Interview Skills – formal & informal interviews, concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing
9. Writing Skills - Business Communication, Essays for competitive examinations.
10. Technical Report Writing/ Project Proposals – Types of formats and styles, subject matter – organization, clarity, coherence and style, planning, data-collection, tools, analysis.- Feasibility, Progress and Project Reports.

**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : 1st B.Tech

Branch : All Streams of Engineering

Lab : Workshop practice -I

Total Practical Periods : 45 (15 Instructional Periods)

Total Credits : 02

Code : BT 109

### **INSTRUCTIONAL SYLLABUS**

#### **Carpentry :**

Timber, definition, engineering applications, seasoning and preservation, plywood and ply boards.

#### **Foundry :**

Moulding sands, constituents and characteristics. Pattern, definition, materials, types, core prints. Role of gate, runner, riser, core and chaplets. Causes and remedies of some common casting defects like blow holes, cavities, inclusions.

#### **Welding:**

Definitions of welding, brazing and soldering processes, and their applications, Oxyacetylene gas welding process, equipment and techniques, type of flames and their applications. Manual met a arc Welding technique and equipment, AC and DC welding, electrodes, constituents and functions of electrode coating. Welding positions. Type of weld joint. Common welding defects such as cracks, undercutting slag inclusion, porosity.

### **LIST OF EXPERIMENTS**

1. T-Lap joint and Bridle joint (Carpentry shop)
2. Mould of any pattern (foundry shop)
3. Casting of any simple pattern (foundry shop)
4. (a) Gas welding practice by students on mild steel flat  
(b) Lap joint by Gas welding
5. (a) MMA Welding practice by students  
(b) Square butt joint by MMA Welding
6. (a) Lap joint by MMA Welding  
(b) Demonstration of brazing

### **LIST OF EQUIPMENTS**

## **SEMESTER-II**

**MATS UNIVERSITY, RAIPUR (C.G.)**

**SCHOOL OF ENGINEERING & I.T.**

Semester : II B.Tech

Branch : All Streams of Engineering

Subject : Engineering Mathematics-II

Total Theory Periods : 60

Total Tutorial Periods : 00

Total Credits : 04

Code : BT 200

### **OBJECTIVES:**

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

### **OUTCOMES:**

- The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

**UNIT-1: MULTIPLE INTEGRALS** Double and triple integrals, change of order of integration; Beta and Gamma functions; application to area and volume.

**UNIT-2: VECTOR CALCULUS** Scalar and vector fields, Line and surface integrals, gradient, divergence and curl, line integrals, Green's theorem, divergence theorem and Stock's theorem(without proofs)and their simple applications

**UNIT-3: DIFFERENTIAL EQUATION OF HIGHER ORDER** Linear differential equations of higher order with constant coefficients, method of variation of parameters, Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients.

**UNIT-4 : LAPLACE TRANSFORMS** Transforms of elementary functions, transforms of derivatives and derivatives of transforms, inverse transforms, transforms of periodic function, shifting a theorem, solutions of ODE's using Laplace transforms.

**UNIT-5 : COMPLEX NUMBERS** De Moivre's theorem, roots of complex numbers, separation into real and imaginary parts of circular, hyperbolic, logarithmic and exponential function, summation of trigonometric series by C+iS method. .

### **TEXT BOOKS:**

1. Higher Engineering Mathematics by B.S.Grewal (40th edition)-Khanna Publisher.
2. Advanced Engineering Mathematics by Erwin Kreyszig (8th edition)-John Wiley & Sons.

**REFERENCE BOOKS:**

1. Differential Calculus by Gorakh Prasad-Pothisala Private Limited.
2. Advanced Engineering Mathematics by R.K.Jain and S.R.K. Iyengar-Narosa Publishing House.
3. Applied Mathematics by P.N.Wartikar & J.N.Wartikar Vol-II –Pune Vidyarthi Griha Prakasan, Pune.
4. Integral Calculus by Gorakh Prasad-Pothisala Private Limited.

**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : II B.Tech

Branch : All Streams of Engineering

Subject : Fundamental of Mechanical Engineering

Total Theory Periods : 45

Total Tutorial Periods : 20

Total Credits : 04

Code : BT 201

**OBJECTIVES:**

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

**OUTCOMES:**

- ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
- ability to analyse the forces in any structures.
- ability to solve rigid body subjected to dynamic forces.

**UNIT – I :**

**RESULTANT AND EQUILIBRIUM ANALYSIS:**

Basic concepts and laws of mechanics, system of forces, free body diagram, Resultant and equilibrium of concurrent, parallel and non-concurrent co-planar force system.  
General numerical applications.

**UNIT – II :**

(a) ANALYSIS OF PLANE TRUSSES Perfect truss, basic assumptions for perfect truss, analysis of axial forces in the members by method of joint and method of sections. General numerical applications.

(b) FRICTION Static, dynamic and limiting friction, Law of limiting friction, Angle of friction, Angle of Repose, Cone of Friction, Wedge friction. General numerical applications

**UNIT –III :**

PROPERTIES OF SURFACES Centre of Gravity, Second moment of area, determination of second moment of area by integration, polar moment of inertia, radius of gyration of area, Parallel axis theorem, Moment of inertia of composite areas, and determination of Product of inertia by integration.

**UNIT –IV :**

KINETICS OF PARTICLES (a) D'Alembert's principle applied to bodies having rectilinear motion.

(b) Principle of work and Energy: General numerical applications (c) Principle of Impulse and momentum: General numerical applications

**UNIT – V :**

LAWS OF THERMODYNAMICS (a) Thermodynamic System, properties, process, cycle, thermodynamic equilibrium, Quasi-static Process, Zeroth Law of thermodynamics, Work and Heat transfer, flow work, general numerical application.

(b) First Law of thermodynamics, internal energy, proof of internal energy as a point function, general numerical application of first law to non-flow process and steady flow process.

**Text Books:**

1. Engineering Mechanics (Statics and Dynamics) ; A. K. Tayal ,Umesh Pub., Delhi .
2. Engineering Mechanics : S. Timoshenko and D.H. Young,TMH
3. Engineering Thermodynamics: P.K.Nag, TMH
4. Engineering Thermodynamics: C.P.Arora, TMH

**Reference Books:**

1. Engineering Mechanics (Statics and Dynamics): R.C.Hibbeler, Pearson
2. Engineering Mechanics:Meriam and Kreige ,John Wiley and sons
3. Thermodynamics: Cengel and Boles, TMH
4. Essentials of Engg Mechanics: S.Rajasekharan& G.Shankara Subramaniam, Vikas Publications
5. Engineering Mechanics: Basudeb Bhatyacharya , Oxford



**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : II B.Tech

Branch : All Streams of Engineering

Subject : Basic Electronics Engineering

Total Theory Periods : 45

Total Tutorial Periods : 20

Total Credits : 04

Code : BT 202

**OBJECTIVES:**

- To explain the principles of digital electronics
- To impart knowledge of communication.

**OUTCOMES:**

- ability to identify electronics components and use of them to design circuits.

**UNIT-I:**

**SEMICONDUCTOR & JUNCTION DIODE CHARACTERISTICS**

Review of semi conductor Physics – n and p – type semiconductors, Mass Action Law, Opencircuited p-n junction, The p-n junction as a rectifier( forward bias and reverse bias ),The current components, drift and diffusion in p-n diode, law of junction, diode equation, Energy band diagram of p-n diode, Volt- ampere characteristics of p-n diode, temperature dependence of V-I characteristics, transition and diffusion capacitances, p-n junction in the breakdown region, ideal diode, terminal characteristics of junction diode, load –line analysis of diode circuits ,breakdown mechanisms in semiconductor diodes, Zener diode characteristics, characteristics of tunnel diode, varactor diode.

**UNIT-II :**

(a) RECTIFIERS Half wave rectifier, ripple factor, full wave rectifier, Bridge rectifiers and Harmonic components in a rectifier circuit (b) FILTERS Inductor filter, Capacitor filter, L-section filter,  $\pi$ -Section filter and comparison of various filter circuits in terms of ripple factors © REGULATORS Regulators line regulation and load regulation, Block diagram of power supply, working of switched mode power Supply (SMPS)

**UNIT-III:**

BJT Introduction, NPN & PNP transistors, transistor action, biasing, current components, current amplification factor, relationship between  $\alpha$  &  $\beta$ , ebers-moll model, transistor circuit configuration, CB,CE,CC, comparison of characteristics of transistors in different configuration, transistor as an amplifier, .

**UNIT – IV :**

TRANSISTOR BIASING Transistor Load line. Transistor Biasing and Thermal stabilization: The operating point, Bias stability, Stability factor, Emitter Bias, Collector – to – base bias, Voltage divider bias with emitter bias, Emitter bypass capacitor. Bias Compensation.

**UNIT V :**

FET & MOSFET Field Effect Transistor (FET): Introduction, Construction, Operation, V-I Characteristics, Transfer Characteristics, Drain Characteristics, Small-Signal Model. Metal Oxide

Semiconductor Field Effect Transistor (MOSFET): Introduction, Construction, Operation and characteristics, Depletion MOSFET, Enhancement MOSFET

Breakdown devices Introduction, unijunction transistor (UJT), programmable UJT (PUT), silicon controlled rectifier (SCR),

**TEXT BOOKS:**

1. Electronic Devices and Circuits-J Millman and C.C. Halkias, Tata McGraw Hill, 1998
2. Electronic Devices and Circuits –A.P. Godse & U.A. Bakshi.
3. Electronic Devices and Circuits –R.S.Sedha.

**REFERENCES:**

1. Electronic Devices and Circuits-Prof GS N Raju, I K International Publishing House Ltd 2006.
2. Electronic Devices and Circuits-T F Bogart Jr., J.S.Beasley and G.Rico, Pearson Education, 6th edition, 2004
3. Principles of electronic circuits- S G Burns and P R Bond, Galgotia publications, 2nd Edn 1998

**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : II B.Tech  
Branch : All Streams of Engineering  
Subject : Environmental Sciences  
Total Theory Periods : 45  
Total Tutorial Periods : 00  
Total Credits : 03  
Code : BT 203

**UNIT-I:**

**CONCEPTS OF ENVIRONMENTAL SCIENCES AND NATURAL RESOURCES**

Environment, Levels of organizations in environment, Structure and functions in an ecosystem; Biosphere, its Origin and distribution on land, in water and in air, Broad nature of chemical composition of plants and animals. Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternative).

**UNIT-II:**

**BIODIVERSITY AND ITS CONSERVATION**

Biodiversity at global, national and local levels; India as a mega-diversity nation; Threats to biodiversity (biotic, abiotic stresses), and strategies for conservation.

**UNIT-III:**

**ENVIRONMENTAL POLLUTION**

Types of pollution- Air, water (including urban, rural, marine), soil, noise, thermal, nuclear; Pollution prevention; Management of pollution- Rural/Urban/Industrial waste management [with case study of any one type, e.g., power (thermal/nuclear), fertilizer, tannin, leather, chemical, sugar], Solid/Liquid waste management, disaster management.

**UNIT-IV:**

**ENVIRONMENTAL BIOTECHNOLOGY AND ENVIRONMENTAL MONITORING**

Biotechnology for environmental protection- Biological indicators, bio-sensors; Remedial measures- Bio-remediation, phyto-remediation, bio-pesticides, bio-fertilizers; Bio-reactors- Design and application. Monitoring- Identification of environmental problem, tools for monitoring (remote sensing, GIS); Sampling strategies- Air, water, soil sampling techniques.

**SOCIAL ISSUES AND ENVIRONMENT**

Problems relating to urban environment- Population pressure, water scarcity, industrialization; remedial measures; Climate change- Reasons, effects (global warming, ozone layer depletion, acid

rain) with one case study; Legal issues- Environmental legislation (Acts and issues involved), Environmental ethics

**TEXTBOOKS :**

1. Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2nd Edition, Pearson Education, 2004.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

**REFERENCE BOOKS :**

1. A. K. Chatterji, "Introduction to Environmental Biotechnology", Prentice Hall of India, New Delhi, 2006.
2. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
3. Nebel B. J., "Environmental Science", Prentice Hall of India, New Delhi, 1987.

**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : II B.Tech

Branch : All Streams of Engineering

Subject : Engineering Chemistry

Total Theory Periods : 45

Total Tutorial Periods : 00

Total Credits : 03

Code : BT 204

**OBJECTIVES:**

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- Principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
- Preparation, properties and applications of engineering materials. □ Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels

**OUTCOMES:**

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

**UNIT-I:**

**ELECTROCHEMISTRY AND BATTERY TECHNOLOGY** **ELECTROCHEMISTRY:** Introduction, Derivation of Nernst equation for electrode potential. Reference electrodes: Introduction, construction, working and applications of calomel and Ag / AgCl electrodes. Measurement of electrode potential using calomel electrode. Ion selective electrode: Introduction; Construction and working of glass electrode, determination of pH using glass electrode. Concentration cells: Electrolyte concentration cells, numerical problems.

**BATTERY TECHNOLOGY:** Introduction, classification - primary, secondary and reserve batteries. Characteristics - cell potential, current, capacity, electricity storage density, energy efficiency, cycle 10 hours life and shelf life. Construction, working and applications of Zinc Air, Nickel- metal hydride batteries. Lithium batteries: Introduction, construction, working and applications of Li-MnO<sub>2</sub> and Li-ion batteries.

**FUEL CELLS:** Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H<sub>2</sub>SO<sub>4</sub> electrolyte.

**UNIT-II:**

**CORROSION AND METAL FINISHING** **CORROSION:** Introduction, electrochemical theory of corrosion, galvanic series. Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of medium – pH, conductivity, and temperature. Types of corrosion- Differential metal, differential aeration (Pitting and water line) and stress. Corrosion control: Inorganic coatings Anodizing of Al and phosphating; Metal coatings-Galvanization and Tinning. Cathodic protection (sacrificial anodic and impressed current methods).

**METAL FINISHING:** Introduction, Technological importance. Electroplating: Introduction, principles governing-Polarization, decomposition potential and overvoltage. Factors influencing the nature of electro deposit-current density, concentration of metal ion & electrolyte; pH, temperature & throwing power of plating bath; additives- brighteners, levellers, structure modifiers & wetting agents. Electroplating of Nickel (Watt's Bath) and Chromium(decorative and hard). Electro less plating: Introduction, distinction between electroplating and electro less plating, electro less plating of copper & manufacture of double sided Printed Circuit Board with copper.

#### UNIT-III:

**FUELS AND SOLAR ENERGY FUELS:** Introduction, classification, calorific value- gross and net calorific values, determination of calorific value of fuel using bomb calorimeter, numerical problems. Cracking: Introduction, fluidized catalytic cracking, synthesis of petrol by Fischer-Tropsch process, reformation of petrol, octane and cetane numbers. Gasoline and diesel knocking and their mechanism, anti knocking agents, power alcohol & biodiesel.

**SOLAR ENERGY:** Introduction, utilization and conversion, photovoltaic cells- construction and working. Design of PV cells: modules, panels & arrays. Advantages & disadvantages of PV cells. Production of solar grade silicon: Union carbide process, purification of silicon (zone refining), doping of silicon-diffusion technique (n&p types).

#### UNIT-IV:

**POLYMERS:** Introduction, types of polymerization: addition and condensation, mechanism of polymerization- free radical mechanism taking vinyl chloride as an example. Molecular weight of polymers: number average and weight average, numerical problems. Glass transition temperature (T<sub>g</sub>): Factors influencing T<sub>g</sub>-Flexibility, inter molecular forces, molecular mass, branching & cross linking and stereo regularity. Significance of T<sub>g</sub>. Structure property relationship: crystallinity, tensile strength, elasticity & chemical resistivity. Synthesis, properties and applications of PMMA (plexi glass), Polyurethane and polycarbonate. Elastomers: Introduction, synthesis, properties and applications of Silicone rubber. Adhesives: Introduction, synthesis, properties and applications of epoxy resin. Polymer Composites: Introduction, synthesis, properties and applications of Kevlar. Conducting polymers: Introduction, mechanism of conduction in Poly aniline and applications of conducting poly aniline.

#### UNIT-V:

**WATER TECHNOLOGY AND NANOMATERIALS** Water Technology: Introduction, boiler troubles with disadvantages & prevention methods-scale and sludge formation, priming and foaming, boiler corrosion(due to dissolved O<sub>2</sub>, CO<sub>2</sub> and MgCl<sub>2</sub>). Determination of DO, BOD and COD, numerical problems on COD. Sewage treatment: Primary, secondary (activated sludge method) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis & electro dialysis (ion selective).

**NANO MATERIALS:** Introduction, properties (size dependent). Synthesis-bottom up approach (sol-gel, precipitation, gas condensation & chemical vapour condensation processes). Nano scale materials- carbon nano tubes, nano wires, fullerenes, dendrimers, nano rods, & nano composites.

#### **Textbooks :**

1. B.S.Jai Prakash, R.Venugopal, Sivakumaraiah & Pushpa Iyengar., "Chemistry for Engineering Students", Subhash Publications, Bangalore.

2. R.V.Gadag & A.Nityananda Shetty., “Engineering Chemistry”, I K International Publishing House Private Ltd. New Delhi.

3. P.C.Jain & Monica Jain., “Engineering Chemistry”, Dhanpat Rai Publications, New Delhi.

**Reference Books:**

1. O.G.Palanna, “Engineering Chemistry”, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint.

2. G.A.Ozin & A.C. Arsenault, “Nanochemistry A Chemical Approach to Nanomaterials”, RSC publishing, 2005.

3. “Wiley Engineering Chemistry”, Wiley India Pvt. Ltd. New Delhi. Second Edition.

4. V.R.Gowariker, N.V.Viswanathan & J.Sreedhar., “Polymer Science”, Wiley-Eastern Ltd.

5. M.G.Fontana., “Corrosion Engineering”, Tata McGraw Hill Publishing Pvt. Ltd. New Delhi.

**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : II B.Tech

Branch : All Streams of Engineering

Subject : Constitution of India, Professional Ethics and Human Rights

Total Theory Periods : 15

Total Tutorial Periods : 00

Total Credits : 01

Code : BT 205

**UNIT-I:**

**CONSTITUTION OF INDIA** Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution, Preamble to the Indian Constitution Fundamental Rights & its limitations.

**UNIT-II:**

**FUNDAMENTAL DUTIES AND UNION EXECUTIVES** Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties. Union Executives – President, Prime Minister Parliament Supreme Court of India

**UNIT-III: STATE LEGISLATURE AND ELECTORAL PROCESS** State Executives – Governor Chief Minister, State Legislature High Court of State, Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th & 91st Amendments.

**UNIT-IV: HUMAN RIGHTS** Special Provision for SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions. Human Rights – Meaning and Definitions, Legislation Specific Themes in Human Rights- Working of National Human Rights Commission in India , Powers and functions of Municipalities, Panchyats and Co - Operative Societies..

**UNIT-V: PROFESSIONAL ETHICS** Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.

**Textbooks :**

1. Durga Das Basu: "Introduction to the Constitution on India", (Students Edn.) Prentice –Hall EEE, 19th / 20th Edn., 2001 2. Charles E. Haries, Michael S Pritchard and Michael J. Robins "Engineering Ethics" Thompson Asia, 2003-08-05.

**Reference Books:**

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
2. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice –Hall of India Pvt. Ltd. New Delhi, 2004
3. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI Learning Pvt. Ltd., New Delhi, 2011.



**MATS UNIVERSITY, RAIPUR (C.G.)  
SCHOOL OF ENGINEERING & I.T.**

Semester : II B.Tech

Branch : All Streams of Engineering

Lab : Fundamental of Mechanical Engineering Lab

Total Practical Periods : 30

Total Credits : 01

Code : BT 206

Note: MINIMUM TEN NUMBERS OF EXPERIMENTS IS TO BE PERFORMED

**LIST OF EXPERIMENTS**

1. To verify law of triangle of forces.
2. To verify the Lami's theorem.
3. To verify the law of polygon of forces.
4. To verify the law of lever. 5. To determine the support reactions of a simply supported beam subjected to point loads.
6. To draw the variation of bending moment at a given section in a simply supported beam under a moving point load.
7. To find the coefficient of friction between surfaces of wooden plane and following blocks: i) Aluminum ii) Tin iii) Glass iv) Asbestos v) Teak ply vi) Sand paper vii) card board .
8. To determine the coefficient of friction between (i) Belt and pulley (ii) Rope and pulley.
9. To study simple jib crane and to determine the internal forces in members of jib crane.
10. To determine the stiffness of helical compression spring.
11. To study lifting machine.
12. To study the lifting machine "second order pulley system" and to draw the following characteristic diagram: ( i ) Load-effort diagram ( ii ) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.
- 13 To study the lifting machine "Wheel and Differential axle" and to draw the following characteristic diagram: (i). Load-effort diagram (ii) Load- ideal effort diagram (iii). Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.
14. To study the lifting machine "Worm and worm wheel" and to draw the following characteristic diagram: (i). Load-effort diagram (ii). Load- ideal effort diagram (iii). Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.
15. To study the lifting machine "Simple screw jack" and to draw the following characteristic diagrams of the machine: ( i ) Load-effort diagram (ii). Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.
16. To study the lifting machine "Modified screw jack" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.
17. To study the lifting machine "Geared Jib crane" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

18. To study the lifting machine “Single Purchase Winch crab” and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

19. To study the lifting machine “Double Purchase Winch crab” and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine. LIST OF EQUIPMENTS

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. III Sem.**

**Subject:-MATHEMATICS--III**

Total Lecture Periods/Week : 3

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code: - BT360**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objectives:**

1. To make the students understand that Fourier series analysis is a powerful method where the formulas are integrals and to have knowledge of expanding periodic functions that explore variety of applications of Fourier series.
2. To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differential equations.
3. To have a thorough knowledge of PDE which arise in mathematical descriptions of situations in engineering.
4. To provide a sound background of complex analysis to perform a thorough investigation of major theorems of complex analysis and to apply these ideas to a wide range of problems that include the evaluation of both complex line integrals and real integrals.
5. To study about a quantity that may take any of a given range of values that can't be predicted exactly but can be described in terms of their probability

**UNIT - I Fourier Series**

Euler's Formula, Functions having points of discontinuity, Change of interval, Even & Odd Functions, half range series, Harmonic analysis.

**UNIT - II Special Function**

Series solution of differential equations, the method of Frobenius, Bessel's differential equations, Bessel's function of first & second kind, Recurrence relation, orthogonality Legendre's differential equation, Legendre's polynomial, Rodriguez's formula, generating function, recurrence relation, Orthogonality.

**UNIT - III Partial Differential Equation**

Formation, Solution by direct integration method, Linear equation of first order, Homogeneous Linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables. Laplace, heat & wave equations.

**UNIT - IV Complex Variable**

Derivative, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Flow problems, Complex integration, Cauchy theorem, Cauchy integral formula, Taylor & Laurent series, Singularity, Residue, Evaluation of real definite integrals.

**UNIT - V Statistics**

Random variables, Discrete & continuous probability distributions, Expectation, Mean & Standard Deviation, Moments & moment generating function, Distributions- Binomial, Poisson and Normal distributions.

**TEXT BOOKS: -**

1. Higher Engg. Mathematics by Dr. B.S. Grewal – Khanna Publishers.
2. Advanced Engg. Mathematics by Erwin Kreyszig – John Wiley & Sons.

**REFERENCE BOOKS: -**

1. Advanced Engg. Mathematics by R.K. Jain and S.R.K. Iyengar – Narosa Publishing House.
2. Applied Mathematics by P.N. Wartikar & J.N. Wartikar. Vol- II – Pune Vidyarthi Griha Prakashan, Pune
3. Applied Mathematics for Engineers & Physicists by Louis A. Pipes - TMH.

4. Higher Engineering Mathematics by B.V.Ramana , Tata McGraw Hill

**Course Outcome:**After studying the contents of the syllabus in detail the students will be able to

1. define Fourier series including half range series, Harmonic analysis and variety of its applications.
2. define (mathematically) Unit step, Unit impulse, Laplace transforms, its properties, Inverse and applications to solve ordinary differential equations.
3. form and solve by direct integration method Linear equation of first order including Homogeneous and Non-homogeneous Linear equations and also method of separation of variables.
4. solve difficult problems using theorems of complex analysis and apply Residue theorem to evaluate real integrals.
5. understand discrete and continuous probability distribution and be able to find mean and standard deviation and use the Uniform distribution.

**School of Engineering & I.T.**

**MATS University**

**Raipur**



**Syllabus Scheme**  
**(III<sup>rd</sup> Semester)**  
**For**  
**Bachelor of Technology**  
**Mining Engineering**

**Subject Code for School of Engineering & I.T. Deptt.**

**III<sup>rd</sup> Semester (Mining)**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject Name</b>
1.	BT360	Mathematics – III
2.	BT361	Computer Programming
3.	BT362	Mechanics of Solids & Fluid Mechanics
4.	BT363	Mining Geology-I
5.	BT364	Mine Surveying-I
6.	BT365	Introduction to Mining Engineering
7.	BT366	Computer Programming Laboratory
8.	BT367	Mechanics of Solids & Fluid Mechanics Lab
9.	BT368	Mining Geology-I Lab
10.	BT369	Mine Surveying-I Lab



# MATS UNIVERSITY

ARANG, RAIPUR(C.G.)



## Scheme of Teaching & Examination

### III - Semester

S.N.	code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BT360	Mathematics – III	4	0	-	70	30	3
2.	BT361	Computer Programming	3	0	-	70	30	3
3.	BT362	Mechanics of Solids & Fluid Mechanics	3	0	-	70	30	4
4.	BT363	Mining Geology-I	4	0	-	70	30	4
5.	BT364	Mine Surveying-I	4	0	-	70	30	4
6.	BT365	Introduction to Mining Engineering	4	0	-	70	30	4
7.	BT366	Computer Programming Laboratory	-	-	2	30	20	1
8.	BT367	Mechanics of Solids & Fluid Mechanics Lab	-	-	2	30	20	1
9.	BT368	Mining Geology-I Lab	-	-	2	30	20	1
10.	BT369	Mine Surveying-I Lab	-	-	2	30	20	1
<b>Total</b>			<b>22</b>	<b>0</b>	<b>8</b>	<b>540</b>	<b>260</b>	<b>26</b>

L – Lecture, T – Tutorial, ESE – End Semester Examination,

P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. III Sem.**

**Subject:-MATHEMATICS--III**

Total Lecture Periods/Week : 3

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code: - BT360**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objectives:**

1. To make the students understand that Fourier series analysis is a powerful method where the formulas are integrals and to have knowledge of expanding periodic functions that explore variety of applications of Fourier series.
2. To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differential equations.
3. To have a thorough knowledge of PDE which arise in mathematical descriptions of situations in engineering.
4. To provide a sound background of complex analysis to perform a thorough investigation of major theorems of complex analysis and to apply these ideas to a wide range of problems that include the evaluation of both complex line integrals and real integrals.
5. To study about a quantity that may take any of a given range of values that can't be predicted exactly but can be described in terms of their probability.

**UNIT - I Fourier Series**

Euler's Formula, Functions having points of discontinuity, Change of interval, Even & Odd Functions, half range series, Harmonic analysis.

**UNIT - II Special Function**

Series solution of differential equations, the method of Frobenius, Bessel's differential equations, Bessel's function of first & second kind, Recurrence relation, orthogonality Legendre's differential equation, Legendre's polynomial, Rodriguez's formula, generating function, recurrence relation, Orthogonality.

**UNIT - III Partial Differential Equation**

Formation, Solution by direct integration method, Linear equation of first order, Homogeneous Linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables. Laplace, heat & wave equations.

**UNIT - IV Complex Variable**

Derivative, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Flow problems, Complex integration, Cauchy theorem, Cauchy integral formula, Taylor & Laurent series, Singularity, Residue, Evaluation of real definite integrals.

**UNIT - V Statistics**

Random variables, Discrete & continuous probability distributions, Expectation, Mean & Standard Deviation, Moments & moment generating function, Distributions- Binomial, Poisson and Normal distributions.



### References books

- Higher Engg. Mathematics by Dr. B.S. Grewal– Khanna Publishers.
- Advanced Engg. Mathematics by Erwin Kreyszig – John Wiley & Sons.
- Advanced Engg. Mathematics by R.K. Jain and S.R.K. Iyengar – Narosa Publishing House.
- Applied Mathematics by P.N.Wartikar& J.N. Wartikar. Vol- II– Pune Vidyarthi Griha Prakashan,Pune
- Applied Mathematics for Engineers & Physicists by Louis A. Pipes- TMH.
- Higher Engineering Mathematics by B.V.Ramana , Tata McGraw Hill

### Course Outcome:

After studying the contents of the syllabus in detail the students will be able to

1. define Fourier series including half range series, Harmonic analysis and variety of its applications.
2. define (mathematically) Unit step, Unit impulse, Laplace transforms, its properties, Inverse and applications to solve ordinary differential equations.
3. form and solve by direct integration method Linear equation of first order including Homogeneous and Non-homogeneous Linear equations and also method of separation of variables.
4. solve difficult problems using theorems of complex analysis and apply Residue theorem to evaluate real integrals.
5. understand discrete and continuous probability distribution and be able to find mean and standard deviation and use the Uniform distribution

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech.III Sem.**

**Subject:- MOS & FM**

Total Lecture Periods/Week : **4**

Total marks in end semester Exam:**100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code: - BT362**

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **02**

**Course Objectives:**

1. Discuss the stress and strain relationship, Mohr's Circle, principal stress and principal strain, tension and compression in composite bars.
2. Derive the bending stresses in beams and plates.
3. Determine the slope and deflection of beams by deflection methods, area moment and conjugate beam methods.
4. Study the physical properties of the fluid, compressibility & incompressibility of fluid, Newtonian and Non-Newtonian fluids.
5. Study the fluid in static and kinematics

**UNIT-I Concept of Stress and Strain**

Stress and strain at a point; Axial and shear stresses' Ultimate an working stresses; Relation between stress and strain' Poisson's Ratio; Two dimensional state of strain 'Principle stresses and Principle planes' Mohr's Circle' Two state of strain' Principle strains and principle axis of strain; Determination of Principle strain from strain measurements; Calculation of Principle stresses from; Principle strains; Composite bars in tension and Compression; Thermal stresses in composite bars.

**UNIT-II Bending Stresses in Beams and plates**

Pure bending' Bending Stresses' Section Modulus of rolled and built up sections Composite beams' Distribution of normal and shear stresses across the section of a simple beam with vertical section of symmetry; Theory of plates.

**UNIT-III Deflection of beams**

Slope and deflection of beams by deflection methods; Area moment and conjugate beam Methods' propped cantilever and fixed beams.

**UNIT-IV Introduction to Fluid Mechanics & Fluid Statics**

Physical properties of fluids; Compressible and Incompressible fluids; Newtonian and Non-Newtonian fluids. Pressure, density and height relationships; manometer pressure on curved and plane surfaces; Centre of Pressure; Buoyancy; Stability of Immersed and Floating bodies; Fluids in relative equilibrium.

**UNIT-V Fluid Kinematics**

Classification of flow: Uniform and Non-Uniform; Steady and Non- Steady; Laminar and Turbulent; One, Two, Three dimensional flows; Stream lines; Streak lines; Path lines; Stream Tubes; Elementary Explanation of stream function and velocity potential; Basic idea of flow nets.

**TEXT BOOKS: -**

1. Strength of Materials – R.K. Rajput (S. Chand & Co.)
2. Mechanics of Materials – B.C. Punmia (Laxmi Publication)
3. A text book of fluid mechanics by R. K. Bansal (Luxmi publication)
4. A text book of fluid mechanics and Hydraulic mechanics in SI Units by R. K. Rajput(S. Chand and company)

**Course Outcome:**

1. The students are expected to enhance the technical knowledge on relation between stress & strain, Mohr's circle, principal stress & principal strain.
2. The students are expected to possess ability to identify, formulate, and solve engineering problems in bending stresses in beams and plates, deflection of beams and knowledge in fluid statics & fluid dynamics.
3. The students are expected to possess ability to use the techniques, skills and modern engineering tools necessary for mechanics of solid & fluid mechanics.
4. Work effectively as an individual and as a member of multidisciplinary team.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech.III Sem.**

**Subject: Computer Programming**

Total Lecture Periods/Week : 3

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: Mining Engineering**

**Code: BT 361**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

**Course Objectives:**

1. Discuss the history and development of C compiler, data types, functions, operators, debugging.
2. Explain if-else statements, conditional operator, loop control, arrays and pointer.
3. Explain declaring and defining functions, library function, recursion.
4. Discuss the reading and writing strings & declaring and using structures.
5. Discuss the reading and writing the text files through C programs.

**Unit-1**

Introduction to C language: History and development, C compilers, Data types, Identifiers, Constant, Operators, console I/O statements, compilation, flowcharts debugging and testing of programs.

**Unit-2**

Control Statements: if-else, for loop, do-while loop, while loop, nested if-else, Arrays: Syntax and definition, one, Two dimensional and multi dimensional arrays, reading and writing an array. Pointers and arrays, array of pointers.

**Unit-3**

Functions: Declaring and defining functions, storage classes, Function calling, call by value, call by reference, using library functions in programs.

**Unit-4**

Strings: reading and writing strings, passing a string into a function, using library functions to manipulate strings. Structures: Declaring and using structures. Array of structures, passing structures into function. Unions.

**Unit-5**

File Handling: reading and writing text files through C programs. . Working with Binary files, fread and fwrite. Command line arguments. Bitwise operators in C.

**Text Books:**

1. Let us C – Yashwant Kanetkar BPB Publication
2. Programming in ANSI C – E. Balaguruswamy Tata Mc-Graw Hill

**Course Outcome:**

1. The students are expected to enhance the technical knowledge on C language
2. The students are expected to possess ability to identify, formulate, and solve engineering problems in data types, functions, operator, arrays, pointer, functions, debugging, structures.
3. The students are expected to possess ability to use the techniques, skills and modern engineering tools necessary for C Programming
4. Work effectively as an individual and as a member of multidisciplinary team

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. III Sem.**

**Subject:- Mine Surveying I**

Total Lecture Periods/Week : **4**

Total marks in end semester Exam:**100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code: - BT 364**

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **02**

**Course Objectives:**

1. Discuss the chain survey for linear measurements
2. Explain the compass survey
3. Discuss the plane table surveying and Miner's Dial
4. Brief discussion on types of leveling instruments, temporary and temporary adjustment of leveling instruments, trigonometric leveling, reciprocal leveling.

**UNIT I: Chain Survey**

Linear Measurements; Types of chains; Tapes; Errors in chaining and corrections in linear measurements; Direct and indirect Ranging; Principles of chain surveying offsets; Limiting length of offsets; Booking field notes; Obstacles in chaining; Instruments for setting out right angles.

**UNIT II: Compass Survey**

Theory of Magnetism; Dip of Magnetic needle; Prismatic Compass; Surveyor's Compass; Bearings; Designation of Bearings; Calculation of Included Angles; Local Attraction; Magnetic Declination. errors in compass survey

**UNIT III: Leveling**

Definitions of important terms used in leveling; Development in leveling Instruments; Types and Constructional details; Temporary and Permanent Adjustments; Methods of leveling; Straight edge leveling; Fly leveling; Check leveling; Reciprocal leveling; Longitudinal Sections; Cross- Sectioning; Trigonometric leveling; Methods of booking and reduction of levels

**UNIT IV: Theodolite Surveying**

Types of Theodolites; Description of various parts of a vernier Theodolite; Requirements of Mining type Theodolites; Measurements of height and distances of accessible and inaccessible points; Traversing with Theodolite on surface and underground; Checks on Closed and Open traverses. Balancing of traverses; Temporary & Permanent adjustments of Theodolites; Sources of errors and their prevention.

**UNIT V : PLANE TABLE SURVEYING**

Principles of Plane Tabling; instrument used in plane tabling; Working operations; Methods of Plane Table Surveying; Two and Three point problems ; advantages and disadvantages; errors in plane tabling

**References:**

1. Metalliferous Mine Surveying : Frederick Winniberg
2. Surveying and levelling :Kanetkar and Deshpande
3. Surveying Vol. I by B.C. Punmia& Ashok Jain
4. Suverying Vol. II by B.C.Punmia& Ashok Jain
5. Surveying Vol. I by S.K.Duggal
6. Surveying Vol II by S.K.Duggal
7. Mine Surveying Vol I by Ghatak
8. Mine Surveying Vol II by Ghatak

**Course Outcome:**

1. The students are expected to enhance the technical knowledge on linear measurements by chain surveying & tape surveying, compass surveying and plane table surveying.
2. The students are expected to possess ability to identify, formulate, and solve engineering problems in leveling.
3. The students are expected to posses ability to use the techniques, skills and modern engineering tools necessary for mine surveying.
4. Work effectively as an individual and as a member of multidisciplinary team.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. III Sem.**

**Subject:- Mining Geology I**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code :- BT 363**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

**Course Objectives:**

1. Discuss the size, shape, mass & density of earth, age of earth, internal structure of earth, earthquake and volcanism.
2. Explain physical properties of the mineral.
3. Brief discussion of igneous rock, sedimentary rock and metamorphic rock.
4. Discuss the folds, faults, joints, geological maps.

**UNIT I: The Earth in Space and Time**

Solar System; Size, Shape, Mass and Density of Earth; A Brief idea of the origin and the age of the Earth; Interior of the Earth- seismic data, Density and Pressure within the Earth; The internal structure and composition of Earth; Elementary knowledge of Diastrophism, earthquakes and volcanism, Volcanic and earthquake belts, and their relationship with plate tectonics.

**UNIT II: Mineralogy**

Physical Properties of Minerals; Classification of various Rock forming Minerals; Introduction and preliminary study of principle Rock forming Mineral groups - Garnet, Pyroxene, Amphibole, Mica, Feldspar and Felspethoid, Megascopic properties of Economically important non Silicate minerals.

**UNIT III: Igneous and Metamorphic Petrology**

Elementary knowledge of Magma and its Crystallization; Classification of Igneous Rocks; Textures and Structures of Igneous Rocks; Petrographic Description of Common Igneous Rocks; Agents and Types of Metamorphism; Depth zones, Facies and Grades of Metamorphism and Petrographic Description of Common Metamorphic Rocks

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**UNIT IV: Sedimentary Petrology**

Textures and Structures of Sedimentary Rocks; Sedimentary Processes- Weathering, Transportation and Deposition; Classification and Petrographic Description of Common Sedimentary Rocks.

**UNIT V: Structural Geology**

Concept of Deformation; Primary and Secondary Planer and Linear structure of Rocks; Topography and its representations; Altitude of strata- Dip and strike; Outcrop patterns; Width of Outcrop and thickness of beds; Structural Contours; Geological Maps; Study of Unconformity; Folds, Joints, Faults and their influence in Mining Operations.

**References:**

1. Engineering And General Geology : Parbin Singh
2. Physical And Engineering Geology : S.K. Garg
3. Rutley's Elements of Mineralogy : H.H.Read
4. Principles Of Petrology : G.W.Tyrell
5. Structural Geology : M.P.Billings
6. Geological Maps : G.W.Chiplonkar
7. A Text Book of Geology : P.K. Mukherjee
8. Applied Geology : S. Bange

**Course Outcome:**

1. The students are expected to enhance the technical knowledge on shape, size, mass & density of earth, age of earth, structure of the earth.
2. The students are expected to possess ability to identify, formulate, and solve engineering problems in properties of minerals, structural geology, types of rocks and geological maps
3. The students are expected to possess ability to use the techniques, skills and modern engineering tools necessary for Engineering Geology.
4. Work effectively as an individual and as a member of multidisciplinary team



**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. III Sem.**

**Subject: - Introduction to Mining**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT 365**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objectives:**

1. Discuss the various drilling machines are used .for exploratory drilling.
2. Explain the drives of inclines, drifts and adits for the opening of the underground mines.
3. Explain the drilling, blasting, loading, transportation, ventilation, lightening and drainage operation used in shaft sinking in the underground mines.
4. Discuss the various methods of shaft sinking.
5. Explain the advantages and disadvantages of surface mining and underground mining.
6. Discuss the various types of machinery used in the underground mining and surface mining.

**UNIT I: Exploratory Drilling**

Drilling machines used for exploratory drilling viz. Rotary & Percussive, their attachments; Core Barrels; Conditions of applicability of drilling methods; Borehole Survey, Directional drilling, Underground methods of exploratory drilling.

**UNIT II: Drivage of Inclines/Drifts/Adits**

Types of Openings; Choice of Openings; Location of Openings; Drilling, blasting, loading and transportation of muck during drivage of inclines/adits/drifts, Ventilation, lighting and drainage, Extension of center line; Organization and cycle of operations; Mechanized methods of drivages of inclines/adits/drifts.

**UNIT III: Shaft Sinking**

Drilling, blasting, loading and transportation of muck, Ventilation, lighting and drainage, Extension of center line; Shaft lining and its design; Special methods of shaft sinking; Shaft boring; Deepening and widening of shafts. Upward drivage, Organization and cycle of operations.

**UNIT IV: Introduction to Underground Mining**

Definition of important terms, Mine development, Activities involved in development of a mine, Stages in the life of a mine, Introduction to unit operations in underground mining. Choice of method of mining, Introduction to various Underground Mining methods Introduction to various types of machineries used in Underground mining.

**UNIT V: Introduction to surface Mining**

Definition of important terms, Advantages and disadvantages of surface mining, mineral deposits amenable to surface mining, Various surface mining methods, Introduction to unit operations in surface mining. Introduction to various types of machineries used in surface mining.

**References:**

1. Surface Mining : G.B. Misra
2. Mining Engineer's Handbook Vol. 1&2, 2nd Edition : Edited by Harold Hartman
3. U.M.S. Notes :
4. Elements of Mining Technology Vol. 1&3 : D.J.Deshmukh
5. Mining of Mineral Deposits : Shevyakov
6. Modern Coal Mining : Samir Das
7. Coal Mining : R.D.Singh
8. Mining : Boki
9. Introduction to mining:

**Course Outcome:**

1. The students are expected to enhance the technical knowledge on exploratory drilling, drivage of inclines, adits and shaft sinking
2. The students are expected to possess ability to identify, formulate and solve engineering problems in drilling and shaft sinking.
3. The students are expected to possess ability to use the techniques, skills, and modern engineering tools necessary for mine development practice.
4. Work effectively as an individual and as a member of a multidisciplinary team.

## **Department of Mining Engineering**

### **List of Experiment**

**Subject:       Computer Programming Lab.**  
**Code:         BT-366**  
**Maximum Marks 50**

- (1) Write a program to add 2 numbers?
- (2) Write a program to print digit in reverse order?
- (3) Write a program to find if a number is even or odd?
- (4) Write a program to find greatest number using if statement?
- (5) Write a program to find greatest number using nested if else?
- (6) Write a program to find if number is perfect number or not?
- (7) Write a program to find prime number?
- (8) Write a program for Lucas series?
- (9) Write a program for Fabonary series?
- (10) Write a program to print Armstrong number?

## **Department of Mining Engineering**

### **List of Experiment**

**Subject: Mining Geology I lab.**  
**Code: BT-368**  
**Maximum Marks 50**

Megascopic Description of Rock Forming Minerals.

Megascopic Description of important Igneous, Sedimentary, Metamorphic Rocks.

Basic Concept of Contours, Attitude of Beds, Width of Outcrop, True and Apparent Dips.

Study of Geological Maps and Preparation of Cross Sections.

## **Department of Mining Engineering**

### **List of Experiment**

**Subject: Mining Surveying I lab.**  
**Code: BT-369**  
**Maximum Marks 50**

#### **List of Practical's to be performed (minimum 10)**

1. Ranging and chaining of line of 50 Meter.
2. Determination of width of an obstacle which can be seen across but can't be chained.
3. Determination of area of a field by Cross staff survey.
4. Study of various types of chained.
5. Determination of included angle with the help of a Prismatic Compass.
6. Plotting a closed traverse and elimination of errors.
7. Determination of width of an inaccessible obstacle by intersection.
8. Determination of location of instrument station by two point problem.
9. Determination of location of instrument station by three point problem.
10. Study of Dumpy level.
11. Determination of difference in elevation and gradient between two stations using dumpy level.
12. Study of Vernier Theodolite.
13. Angle measurement by repetition method.
14. Angle measurement by reiteration method.

## **Department of Mining Engineering**

### **List of Experiment**

**Subject:       MOS & FM Lab.**  
**Code:         BT-367**  
**Maximum Marks 50**

1. Determination of compressive strength of cement cube.
2. Determination of tensile strength of cement cube.
3. Determination of fineness of cement by sieving method.
4. Determination of fineness of cement by Blain Apparatus.
5. To determine Uni-axial tensile test of mild steel.
6. To determine Izod Charpy Value of given mild steel.
7. To determine the Rockwell Hardness of given material.
8. To determine Compressive strength of wood: (a.) Along the fiber and (b.) Across the fiber.
9. To study the cupping test machine and determination of Erichser value of mild steel sheet.
10. To determine the meta-centric height of a ship model.
11. To calibrate an orifice-meter.
12. To determine the head loss in various pipe fittings.
13. To determine the coefficient of discharge of a mouthpiece.
14. To study the variation of friction factor for pipe flow.
15. To verify the bernoulli's theorem.

**School of Engineering & I.T.**

**MATS University**

**Raipur**



**Syllabus Scheme**

**(IV<sup>th</sup> Semester)**

**For**

**Bachelor of Technology**

**Mining Engineering**

## Subject Code for School of Engineering & I.T. Deptt.

### IV<sup>th</sup> Semester (Mining)

S.No.	Subject Code	Subject Name
1.	BT460	Mine Environment-I
2.	BT461	Underground Coal Mining
3.	BT462	Engineering Materials
4.	BT463	Mining Geology – II
5.	BT464	Mine Surveying-II
6.	BT465x	Open Elective – I
7.	BT466	Mining Geology – II Lab
8.	BT467	Mine Surveying-II Lab
9.	BT468	Underground Coal Mining Lab
10.	BT469	Mine Environment-I Lab





# MATS UNIVERSITY

ARANG, RAIPUR (C.G.)



## Scheme of Teaching & Examination

### IV - Semester

S.N.	code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BT460	Mine Environment-I	3	0	-	70	30	3
2.	BT461	Underground Coal Mining	4	0	-	70	30	4
3.	BT462	Engineering Materials	4	0	-	70	30	4
4.	BT463	Mining Geology – II	4	0	-	70	30	4
5.	BT464	Mine Surveying-II	4	0	-	70	30	4
6.	BT465x	Open Elective – I	3	0	-	70	30	3
7.	BT466	Mining Geology – II Lab	-	-	2	30	20	1
8.	BT467	Mine Surveying-II Lab	-	-	2	30	20	1
9.	BT468	Underground Coal Mining Lab	-	-	2	30	20	1
10.	BT469	Mine Environment-I Lab	-	-	2	30	20	1
<b>Total</b>			<b>22</b>	<b>0</b>	<b>8</b>	<b>540</b>	<b>260</b>	<b>26</b>

L – Lecture, T – Tutorial, ESE – End Semester Examination,  
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

### OPEN ELECTIVE-I

Subject Code	Subject Name
BT4651	Engineering Risk–Benefit Analysis
BT4652	Disaster Management
BT4653	Global Strategy and Technology
BT4654	Project Management
BT4655	Software Engineering

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech.IV<sup>th</sup> Sem.**

**Subject: - Mine Environment- I**

Total Lecture Periods/Week : **3**

Total marks in end semester Exam: **100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code : - BT 460**

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **02**

**Course Objectives:**

1. Explain the origin, occurrence, effects, and detection of various mine gases.
2. Discuss the air conditioning of surface mines and underground mines.

**UNIT I: MINE ATMOSPHERE**

Pollution of Mine Atmosphere, Mine Gases, Their Origin, Occurrence, Effects and Detection, Methane Drainage. Monitoring System for Mine environment, Analysis of Mine air.

**UNIT II: Mine Heat & Humidity**

Heat & humidity in mine, atmosphere and its effects, Cooling power of mine air, Assessment of comfort conditions, Air conditioning of Mines, Surface, Underground and divided installations, Spot coolers.

**UNIT III: Mine Dust**

Classification, physiological effect, measurement of dust concentration, dynamics of small particles, sampling of air borne dust, prevention and suppression of dust.

**UNIT IV: Mine Illumination**

Types of portable lamps, maintenance and examination, Lamp room design and organization, Percentage and accumulation tests, Lighting from mains, Photometry and illumination surveys, standard of illumination for Underground and open cast workings.

**UNIT V: Safety & Health**

Occupational Safety and Health Acts, Safety procedures, Type of Accidents, Chemical and Heat Burns, Prevention of Accidents involving Hazardous substances, Human error and Hazard Analysis. Hazard Control Measures in integrated steel industry, Petroleum Refinery,

**TEXT BOOKS**

1. V.S.Vutukuri and R.D.Lama, Environmental Engineering in Mines, Trans Tech Publishers.
2. M.J.McPherson, Subsurface Ventilation and Environmental Engineering, Chapman & Hall Publication, London.
3. G.B.Mishra, Mine Ventilation and Environment, Oxford University Press.

## **REFERENCE BOOKS**

1. H.L.Hartman, Mine Ventilation and Air Conditioning, Wiley Publication, 1999.
2. D.J.Deshmukh, Elements of Mining Technology Vol II, VidyasewaPrakashan, Nagpur.
3. A.Skochinsky and Komorov V., Mine Ventilation, MIR Pub., Moscow
4. B.B.Dhar and A.K.Ghose, Mining Challenges for 21st Century, Ashish Publications New Delhi.
5. D. Penman, J.S. Penman, The principles and practice of Mine Ventilation, Charles Griffin
6. H. Rabia, Mine Environmental Engineering, Entrac Software Pub.

## **Course Outcomes:**

1. The students are expected to enhance the technical knowledge on origin, occurrence, effects, and detection of various mine gases, air conditioning of surface and underground mining.
2. Work effectively as an individual and as a member of a multidisciplinary team.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. IV<sup>th</sup> Sem.**

**Subject: - Mine Surveying II**

Total Lecture Periods/Week : **4**

Total marks in end semester Exam: **100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code : - BT 464**

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **02**

**Course Objective**

- To choose proper method of surveying for any surveying assignment.
- To set out simple curve on surface and in underground.
- To determine the distance and elevation of any point on the surface & in underground.
- To find out magnitude of error in various surveying.

**UNIT I: Tacheometry**

Principles of Stadia Methods; Determination of constants; Theory of anallactic lens; Distance and elevation formulae Subtense and Tangential Methods; Reduction of stadia Notes; Beaman stadia bar; Auto-reduction Tacheometer.

**UNIT II: Setting Out**

Setting out simple curves on surface and in underground; Elementary knowledge of compound and transition curves; joint boundary survey; Equalization of boundaries; Maintenance of direction and gradient of roadways i.e. marking and checking of center line and grade line, transfer of point from roof to floor and floor to roof.

**UNIT III: Plans & Sections**

General 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; Planimeter and its uses; Enlargement & reduction of plans. Mines Regulations concerning above topics.

**UNIT IV: Triangulation & Correlation Survey**

Principles forming network of triangles; Selection of sites of triangulation stations; Base and Check base lines; Measurement and adjustment of angles by simple methods; Calculation of Co-ordinates. Methods of correlation of surface and underground surveys through adits, inclines, and shafts; Use of magnetic needle and Gyro theodolites; Different methods of Stope surveying and open pit surveying;

**UNIT V: Astronomical Survey, Photographic Surveying & Modern Surveying Techniques**

Definitions of important terms; Determination of azimuth by astronomical observations.

General Principles; Phototheodolite; Stereo photographic Surveying; Aerial Surveying -Field of application; Vertical and oblique photographs; Aerial photography; Preparation of photographic maps by simple methods; EDM equipment; Geodimeter, Tellurometer, Total Station, Distomat, Softwares.

## **Text Books**

1. Mine surveying by S. Ghatak
1. Surveying & Levelling by B. C. Punamia
2. Surveying & Levelling by Kanetkar & Kulkarni

## **Course outcomes:**

- Apply knowledge of surveying for understanding, formulating and solving surveying problems.
- Identify, analyze and solve surveying problems.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. IV<sup>th</sup> Sem.**

**Subject: - Engineering Materials**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code :- BT 462**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objectives:**

1. Discuss the classification of engineering materials, structure of metals and alloys, and Fe-C phase diagram
2. Explain the treatment of iron & steel, hardening, annealing, normalizing, and tempering.
3. Explain the various types of ropes and its construction and application.
4. Explain the classification of cement, RCC, application of fly ash mining.
5. Discuss the engineering behavior of materials.

**UNIT I: General**

Introduction, Classification of engineering materials, Structure of Metals and Alloys, Iron-carbon phase diagram.

**UNIT II: Heat Treatment Of Iron & Steel**

Different Types Of Steels, Their Properties and Uses, Different Types of Heat Treatment Techniques viz. Hardening, Annealing, Normalizing & Tempering and Their Uses in Mining Industry.

**UNIT III: Wire Rope**

Types and Construction, Wire Rope Lays, Non- Stranded Ropes, Selection of Wire Ropes, Ropes Used For Different Purpose, Mass & Strength Of Wire Ropes, Wire ropes used in Mines, Application of wire ropes in Mines, Testing of wire ropes, Factor of safety, Examination of Wire ropes, Care of wire ropes. Ropes splicing.

**UNIT IV: Construction Materials**

Cements – Classification & Properties, Quick Setting Cement, R.C.C., Shotcreting, Brick & Stone Masonries, Application Of Fly Ash In Mining.

**UNIT V: Engineering Behavior of Some Materials**

Stress-Strain Curves of Typical Engg. Materials, Elastic And Plastic Deformation, Fracture, Fatigue And Creep.

**Text Books:**

1. Introduction to Engineering Materials by B.K. Agrawal
2. Elements of Mining Technology by D.J. Deshmukh, Vol.I

**Reference Books:**

1. Engineering Materials by Surendra Singh
2. Concrete Technology by M.L.Gambhir.

**Course Outcomes:**

1. The students are expected to enhance the technical knowledge on classification of engineering materials ,structure of metals and alloys and iron-carbon phase diagram.
2. The students are expected to possess ability to identify, formulate and solve treatment of iron & steel problem.
3. The students are expected to possess ability to use the techniques, skills, and modern engineering tools necessary for engineering materials.
4. Work effectively as an individual and as a member of a multidisciplinary team.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. IV<sup>th</sup> Sem.**

**Subject:- Mining Geology II**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code :- BT 463**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

**Course Objectives:**

1. Discuss the principles of stratigraphy, units of stratigraphy, classification and correlation of stratigraphy.
2. Discuss the important geological formations: Archeans, Cuddaphs, Vindhyan, Gondwanas and Tertiaries.
3. Discuss the mode of occurrence, origin, distribution and industrial use of important metallic and non-metallic minerals
4. Explain the geophysical and geochemical prospecting

**UNIT I: Stratigraphy**

Introduction, Definitions and Basic Principles Of Stratigraphy; Units of Stratigraphy; Criteria for Stratigraphic Classification and Correlation; Standard Geological Time Scale; Fossils-Elementary Idea about Their Conditions, Modes of Their Preservation and Their Uses; Broad Palaeontological Groups of Animals and Plants; Brief Palaeontological Study of Gondwana Fields.

**UNIT II: Indian Geology**

Major Geomorphic Divisions of India; General Review of Indian Stratigraphy; Descriptions of important Indian Geological formations – Archeans ,Cuddapahs , Vindhyan , Gondwanas and teriaries.

**UNIT III: Economic Geology-I**

Introduction and Scope of the subject; Fundamental Terms and Their Definitions; Distribution and Morphology of Minerals Deposits; Brief Review of the Processes of Mineral Formation and the Genetic classification of mineral deposits.

**UNIT IV: Economic Geology-II**

Mode Of Occurrence, Origin, Distribution, Association and Industrial Uses of Important Metallic(Au, Al, Cu, Fe, Mn, Sn, Pb And Zn) and Non Metallic (Diamond, Mica, Radioactive Minerals, Gypsum, Dolomites. Fire-Clay, Magnesite, Talc, Asbestos, Graphite, Kyanite, Sillimanite, Corundum, Fluorite, Phosphorite, precious and semi-precious stones, minerals, petroleum deposits of India.

**UNIT V: Prospecting and Exploration**

Prospecting and Exploration -Their Definitions and Classification Of Methods; Elementary Methods Of Geological, Geophysical, Geochemical Prospecting; Guides To Ores- Ringed Targets, Intersection Loci, Physiographical, Mineralogical, Stratigraphical and Structural Guides To Ores.



**References:**

1. Fundamentals of Historical Geology and Stratigraphy of India: Ravindra Kumar
2. Geology Of India and Burma :M.S. Krishnan
3. Economic Mineral Deposits :M.L.Jensen&A.Batman
4. India's Mineral Resources :S. Krishnaswamy
5. Geophysical Prospecting :M.Dorbin& B. Miller
6. Courses in Mining Geology :Arogyaswamy
7. Applied Geology : S. Banger

**Course Outcomes:**

1. The students are expected to enhance the technical knowledge on stratigraphy of India and important geological formation of India.
2. The students are expected to possess ability to identify, formulate and solve the problems of economic minerals
3. The students are expected to possess ability to use the techniques, skills, and modern engineering tools necessary for geophysical and geochemical prospecting.
4. Work effectively as an individual and as a member of a multidisciplinary team.

# MATS UNIVERSITY

## GULLU, ARANG, RAIPUR

**Semester: B.Tech. IV<sup>th</sup> Sem.**

**Subject: - Underground Coal Mining**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code :- BT 461**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

### Course Objectives:

1. Discuss the theories of coal, classification of coal, choice of coal mining method and distribution of coal in India.
2. Explain the board and pillar mining, depillaring by stowing method, and caving method.
3. Discuss the longwall mining of extraction of coal underground mines.
4. Explain thick seam mining and room & pillar mining.

### UNIT I: INTRODUCTION

Origin of Coal, Theories of Coal Formation, Classification of Coal, Coaking Coal, Coal Seam and its Classification, Coal Seam Structures and Abnormalities like Faults, Joints, Cleats, Folds etc., Coal Measuring Rocks and Their Characteristics, Distribution of Coal in India, Indian Coal Mining Industry; Choice of Coal Mining Methods.

### UNIT II: BOARD AND PILLAR METHOD

Important Terminology, Development Size and Shape of The Pillar, Galleries, Panel System and Without Panel System of Development, Size of Panel, Cycle Of Operation, Depillaring, Problems in Depillaring, Preparatory Arrangements, Depillaring by Stowing, Depillaring by Caving Methods, Pillar Extraction Techniques, Dangers Associated With Depillaring.

### UNIT III: LONGWALL MINING

Important Terminology, Types of Longwall Faces and Their Choice, Merits and Demerits of Longwall Mining, Development of Longwall Panels and Faces, Longwall Advancing Method, Longwall Retreating Method, Length of Longwall Faces, Rate of Face Advance, Double Unit Longwall Faces, Face organization and material supply.

### UNIT IV: THICK SEAM MINING

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, Cable-Bolting Method of Thick Seam Extraction.

### UNIT V: ROOM AND PILLAR MINING

Vermelles Method, Slant Method, Sublevel Method, Coal Saw Method, Mining of Contiguous Seams, Mining of Steeply Inclined Seam, Mining Under Water, Mining of Seams Prone to Spontaneous Heating, Bumps, Air blast etc.

### Textbook

1. Principle and practices of modern Coal Mining – R.D. Singh
2. Coal Mining in India – S.P. Mathur

## **ReferenceBook**

1. Wining & working coal – R.T. Deshmukh
2. U/G winning of Coal – T.N. Singh

## **Course Outcomes:**

1. The students are expected to enhance the technical knowledge on extraction of coal by board & pillar mining and longwall mining.
2. The students are expected to possess ability to identify, formulate and solve the problems of extraction of coal from the underground mines.
3. The students are expected to possess ability to use the techniques, skills, and modern engineering tools necessary for thick seam mining and room & pillar mining.
4. Work effectively as an individual and as a member of a multidisciplinary team.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. IV<sup>th</sup> Sem.**

**Subject: - Engineering Risk – Benefit Analysis**

Total Lecture Periods/Week : **3**

Total marks in end semester Exam:**100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code : - BT 4651**

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **00**

**Course Objective:**

To improve the knowledge of risk assessment , empirical reliability, time value of money, warranty analysis.

**UNIT I: Introduction**

Knowledge and Ignorance, Information Uncertainty in Engineering Systems, Introduction and overview of class; definition of Engineering risk; overview of Engineering risk analysis. Risk Methods: Risk Terminology, Risk Assessment, Risk Management and Control, Risk Acceptance, Risk Communication, Identifying and structuring the Engineering risk problem; developing a deterministic or parametric model 65

**UNIT II: System Definition and Structure**

System Definition Models, Hierarchical Definitions of Systems, System Complexity. Reliability Assessment: Analytical Reliability Assessment, Empirical Reliability Analysis Using Life Data, Reliability Analysis of Systems

**UNIT III: Consequence Assessment**

Types, Cause-Consequence Diagrams, Microeconomic Modelling, Value of Human Life, Flood Damages, Consequence Propagation. Engineering Economics: Time Value of Money, Interest Models, Equivalence

**UNIT IV: Decision Analysis**

Risk Aversion, Risk Homeostasis, Influence Diagrams and Decision Trees, Discounting Procedures, Decision Criteria, Tradeoff Analysis, Repair and Maintenance Issues, Maintainability Analysis, Repair Analysis, Warranty Analysis, Insurance Models

**UNIT V: Data Needs for Risk Studies**

Elicitation Methods of Expert Opinions, Guidance

**Text Books:**

1. Risk Analysis in Engineering and Economics, B. M. Ayyub, Chapman-Hall/CRC Press, 2003.

**Reference Books:**

1. Probability, Statistics, and Reliability for Engineers and Scientists, Ayyub & McCuen, 2003.
2. Probabilistic Risk Assessment and Management for Engineers and Scientists, by H. Kumamoto and E. J. Henley, Second Edition, IEEE Press, NY, 1996.
3. Bedford, T. and Cooke, R. Probabilistic Risk Analysis: Foundations and Methods. New York: Cambridge University Press, 2001.
4. Normal Accidents, Living with High-Risk Technologies, C. Perrow, Princeton University Press, 1999.
5. Accident Precursor Analysis and Management - Reducing Technological Risk Through Diligence, National Academy of Engineering, the National Academies Press, Washington, DC, 2004.

**Course Outcomes:**

Learners get all knowledge about risk benefit analysis.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. IV<sup>th</sup> Sem.**

**Subject: - Disaster Management**

Total Lecture Periods/Week : **3**

Total marks in end semester Exam: **100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code :- BT 4652**

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **00**

**Course Objectives:**

To improve knowledge about nature of disaster, Environmental impact assessment, construction of technology for mitigation of damage of structures.

**UNIT I:**

Nature of disasters – natural and other disasters, Earthquakes, floods, draught, cyclones, fire and other environmental disasters.

**UNIT II:**

Behaviour of structures in disaster prone areas, Disaster zoning, Hazard assessment, Environmental Impact Assessment.

**UNIT III:**

Methods of mitigating damage during disasters, disaster preparedness.

**UNIT IV:**

Management systems during disasters, Construction Technology for mitigation of damage of structures.

**UNIT V:**

Short-term and long-term relief measures.

**Name of Text Books:**

Design of Earthquake Resistant Buildings – Minoru Wakabayashi (McGraw Hill Publication)  
Dynamics of Structures: Theory and Application to Earthquake Engineering (2nd edition) – Anil K Chopra (Pearson Education Publication)

**Name of Reference Books:**

Fundamentals of Vibrations – Anderson, R.A. (McMillan)  
IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993  
Earthquake engineering damage assessment and structural design – S.F. Borg  
Disasters and development – Cuny F (Oxford University Press Publication)

**Course Outcomes:**

Learners get knowledge about disasters.

# MATS UNIVERSITY

## GULLU, ARANG, RAIPUR

**Semester: B.Tech. IV<sup>th</sup> Sem.**

**Subject: - Global Strategy and Technology**

Total Lecture Periods/Week : 3

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code :- BT 4653**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

### **Course Objectives:**

To improve knowledge about leadership, CEMEX, technology and productivity.

### **UNIT I: Introduction to Global Strategy**

What the motivations to expand abroad are and how firms can manage conflicting demands in terms of global integration, local responsiveness and worldwide learning. How Global are We? How global most MNCs are? The End of Corporate Capitalism Beyond Off shoring Distance Still Matters Going International.

### **UNIT II: Location and Global Strategy**

Home-Country Effects: Shifting global leadership in the watch industry Success of Swatch as a company in this industry Potential threat on the 68 horizon that could once again cause the decline of the Swiss watch industry. Distance and Global Strategy: Host Country Choices: The Globalization of CEMEX The benefits that CEMEX has derived from expanding across borders Challenges that CEMEX is likely to confront in the future How far can Cemex's competitive advantage travel. Industry Characteristics and Global Strategy: Host - country choices: Characteristics of the global large appliances industry Design of an effective competitive strategy Haier's current global strategy Good rationale for Haier to make global expansion its top strategic priority.

### **UNIT III: International Corporate Governance**

International Corporate Governance with Chinese Characteristics Corporate governance matters in China's capital market Corporate governance model in China differ from international standards Special problems associated with Petro China's corporate governance model Conditions required for further reforms in Petro China's corporate governance system. Cross-cultural Negotiation: Learn from the MOUSE negotiation Issues/factors affect positively or negatively & the negotiation outcome Issues crucial in aligning different parties interests. Negotiators attitudes and culture in reaching the agreement The role of information acquisition in reaching an agreement in this negotiation. Foreign Market Entry Strategies: Issues around geographic market diversification and different strategies of internationalization Different entry modes into a foreign market Stages of internationalization International operations Tensions of a familyowned enterprise going international.

### **UNIT IV: Technology: Productivity and Diffusion**

Productivity Impact and Managing Diffusion Science, Technology and Productivity. Technology, Markets and Competition Incumbents and Entrants Commercialization Intellectual Property and Complementary Assets.

### **UNIT V: Investing in R&D Capabilities**

Incentives to Innovate Investing in basic/applied research; Real options and other approaches. Applying the Concepts and Frameworks: R&D Investment Decisions: Applying the NPV, Real Options and Scenario-Planning Frameworks.

**Text/Reference Books:**

1. Sumantra Ghoshal, "Global Strategy: an organizing framework." Strategic Management Journal (1987), pp. 425-440.
2. Ghemawat & Hout (2008) Tomorrow's Global Giants? Not the Usual Suspects, HBR Michael E. Porter, "The Competitive Advantage of Nations" HBR, 1990.
3. Pankaj Ghemawat, "Distance Still Matters: The Hard Reality of Global Expansion" Harvard Business Review Sept. (2001), pp. 137-147.
4. George S. Yip, "Global Strategy in a World of Nations?" Sloan Management Review (Fall 1989), pp. 29-41.
5. Larker and Tayan, "Models of Corporate Governance: Who's the Fairest of them all?" Stanford Business School Case, 2008, CG11.

**Course Outcomes:**

Learners get about global strategy and technology.



**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. IV<sup>th</sup> Sem.**

**Subject: - Project Management**

Total Lecture Periods/Week : **3**

Total marks in end semester Exam:**100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code : - BT 4654**

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **00**

**Course Objectives:**

To improve knowledge about stages of Project Management, Project Planning Process, CPM/PERT Networks, Post-Project Analysis.

**UNIT I: Introduction to Project management**

Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization.

**UNIT II: Work definition**

Defining work content, Time Estimation Method, Project Cost Estimation and budgeting, Project Risk Management, Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, CPM/PERT Networks.

**UNIT III:**

Developing Project Plan (Baseline), Project cash flow analysis, Project scheduling with resource constraints: Resource Levelling and Resource Allocation. Time Cost Trade off: Crashing Heuristic.

**UNIT IV: Project Implementation**

Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management.

**UNIT V: Post-Project Analysis.**

**Text/Reference Books:**

1. Shtub, Bard and Globerson, Project Management: Engineering, Technology, and Implementation, Prentice Hall, India
2. Lock, Gower, Project Management Handbook.
3. Cleland and King, VNR Project Management Handbook. 4. Wiest and Levy, Management guide to PERT/CPM, Prentice Hall, India
5. Horald Kerzner, Project Management: A Systemic Approach to Planning, Scheduling and Controlling, CBS Publishers, 2002.
6. S. Choudhury, Project Scheduling and Monitoring in Practice.
7. P. K. Joy, Total Project Management: The Indian Context, Macmillan India Ltd.

**Additional Readings:**

1. John M Nicholas, Project Management for Business and Technology: Principles and Practice, Prentice Hall, India, 2002.
2. N. J. Smith (Ed), Project Management, Blackwell Publishing, 2002.
3. Robert K. Wysocki, Robert Back Jr. and David B. Crane, Effective Project Management, John Wiley, 2002.
4. Jack R Meredith and Samuel J Mantel, Project Management: A Managerial Approach, John Wiley, 2000.

**Course Outcomes:**

Learners get knowledge about all project planning and management techniques.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. IV<sup>th</sup> Sem.**

**Subject: - Software Engineering**

Total Lecture Periods/Week : 3

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT 4655**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objectives:**

To improve knowledge about development process models, Cyclomatic Complexity.

**UNIT I: Introduction**

Notion of Software as a Product – characteristics of a good Software Product. Engineering aspects of Software production – necessity of automation. Job responsibilities of Programmers and Software Engineers as Software developers.

**UNIT II: Process Models and Program Design Techniques**

Software Development Process Models – Code & Fix model, Waterfall model, Incremental model, Rapid Prototyping model, 62 Spiral (Evolutionary) model. Good Program Design Techniques – Structured Programming, Coupling and Cohesion, Abstraction and Information Hiding, Automated Programming, Defensive Programming, Redundant Programming, Aesthetics. Software Modelling Tools – Data flow Diagrams, UML and XML. Jackson System Development.

**UNIT III: Verification and Validation**

Testing of Software Products – Black-Box Testing and White-Box Testing, Static Analysis, Symbolic Execution and Control Flow Graphs – Cyclomatic Complexity. Introduction to testing of Real-time Software Systems.

**UNIT IV: Software Project Management**

Management Functions and Processes, Project Planning and Control, Organization and Intra-team Communication, Risk Management. Software Cost Estimation – underlying factors of critical concern. Metrics for estimating costs of software products – Function Points. Techniques for software cost estimation – Expert judgement, Delphi cost estimation, Work break-down structure and Process breakdown structure, COCOMO and COCOMO-II.

**UNIT V: Advanced Topics**

Formal Methods in Software Engineering – Z notation, Hoare's notation. Formalization of Functional Specifications – SPEC. Support environment for Development of Software Products. Representative Tools for Editors, Linkers, Interpreters, Code Generators, Debuggers. Tools for Decision Support and Synthesis, Configuration control and Engineering Databases, Project Management. Petrinets. Introduction to Design Patterns, Aspect-oriented Programming.

**Text Books:**

1. Fundamentals of Software Engineering – Carlo Ghezzi et. al.
2. Software Engineering – Design, Reliability Management – Pressman.

**Reference Books:**

1. Software Engineering – Ian Sommerville.
2. Software Engineering - Shoeman.
3. Software Engineering with Abstraction – Berzins and Luqi

**Course Outcomes:**

Learners get knowledge about some software.

**MATS UNIVERSITY  
GULLU, ARANG, RAIPUR**

**Department of Mining Engineering  
List of Experiment**

**Subject: Mining Geology II Lab.**  
**Code: BT-466**  
**Maximum Marks: 50**

Megascopic Description and Distribution of Ore Forming Minerals and Industrial Minerals.

Study of Plant Fossils.

Study of Advance Geological Maps and Preparation of Cross Sections.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Department of Mining Engineering**  
**List of Experiment**

**Subject: Mine Surveying II Lab.**  
**Code: BT-467**  
**Maximum Marks: 50**

**List of Practical's to be performed (minimum 10)**

1. Measurement of height of accessible and inaccessible point by trigonometric surveying.
2. Determination of stadia constant.
3. Distance and elevation determination by tachometric surveying.
4. Setting out of circular curve by chord and offset method.
5. Setting out of circular curve by Rankine's method.
6. Study of planimeter.
7. Study of Pantagraph/Eidograph.
8. Baseline measurement
9. Baseline extension
10. To connect the baseline to main triangulation network
11. Reduction to centre
12. Angle adjustments in triangulation network
13. Plotting the survey by co-ordinate methods
14. Correlation survey by Weisbach triangle method
15. Study of EDM
16. Study of Total station

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Department of Mining Engineering**  
**List of Experiment**

**Subject:       Underground Coal Mining Lab.**

**Code:         BT-468**

**Maximum Marks: 50**

1. Study of layouts of Board and Pillar development working by without panel system.
2. Study of layouts of Board and Pillar development working by panel system.
3. Study of layout of Logwall Advancing system.
4. Study of layout of Logwall Retreating system.
5. Study of various line of extraction used for pillar extraction.
6. Study of stook extraction method under difficult roof conditions.
7. Study of surface arrangement required for stowing.
8. Study of sublevel caving method of thick seam mining.
9. Study of layout of Blasting gallery method.
10. Study of layout of Double Unit Longwall Faces.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Department of Mining Engineering**  
**List of Experiment**

**Subject: Mine Environment I Lab**  
**Code: BT-469**  
**Maximum Marks: 50**

**List of Practical to be performed: 10**

1. Detection of presence and accumulation of firedamp in mine atmosphere.
2. Detection of presence and accumulation of CO in mine atmosphere
3. Study of various techniques of methane drainage.
4. Study of surface air conditioning plant.
5. Study of Underground air conditioning plant.
6. Study of different types of ventilation devices.
7. Study of cap lamp used in underground mine.
8. Design of a cap lamp room for a large underground coal mine.
9. Study of gravimetric dust sampler.
10. Study of thermal precipitator dust sampler.
11. Study of Flame safety lamps used in underground mine.

**School of Engineering & I.T.**

**MATS University**

**Raipur**



**Syllabus Scheme**  
**(V<sup>th</sup> Semester)**  
**For**  
**Bachelor of Technology**  
**Mining Engineering**



## Subject Code for School of Engineering & I.T. Deptt.

### V<sup>th</sup> Semester (Mining)

S.No.	Subject Code	Subject Name
1.	BT560	Mine Ventilation
2.	BT561	Mine Management
3.	BT562	Mine Legislation – I
4.	BT563	Mine Machinery – I
5.	BT564	Surface Mining - I
6.	BT565x	Open Elective – II
7.	BT566	Vocational & Industrial Training Evaluation and presentation
8.	BT567	Mine Ventilation Laboratory
9.	BT568	Mine Machinery – I Laboratory
10.	BT569	Surface Mining - I Laboratory

### Open Elective-II

Subject Code	Subject Name
BT5651	Environment and Ecology
BT5652	Energy Management
BT5653	Safety Engineering
BT5654	Construction Management
BT5655	Geo-tech Engineering



# MATS UNIVERSITY

## ARANG, RAIPUR (C.G.)



### Scheme of Teaching & Examination

#### V - Semester

S.N.	code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BT560	Mine Ventilation	4	0	-	70	30	4
2.	BT561	Mine Management	3	0	-	70	30	3
3.	BT562	Mine Legislation – I	4	0	-	70	30	4
4.	BT563	Mine Machinery – I	4	0	-	70	30	4
5.	BT564	Surface Mining – I	4	0	-	70	30	4
6.	BT565x	Open Elective – II	3	0	-	70	30	3
7.	BT566	Vocational & Industrial Training Evaluation and presentation	-	-	2	30	20	1
8.	BT567	Mine Ventilation Laboratory	-	-	2	30	20	1
9.	BT568	Mine Machinery – I Laboratory	-	-	2	30	20	1
10.	BT569	Surface Mining - I Laboratory	-	-	2	30	20	1
<b>Total</b>			<b>22</b>	<b>0</b>	<b>8</b>	<b>540</b>	<b>260</b>	<b>26</b>

L – Lecture, T – Tutorial, ESE – End Semester Examination,  
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

Subject Code	Subject Name
BT5651	Environment and Ecology
BT5652	Energy Management
BT5653	Safety Engineering
BT5654	Construction Management
BT5655	Geo-tech Engineering

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. V<sup>th</sup> Sem.**

**Subject: - Mine Ventilation**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT 560**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

**Course Objectives:**

1. Determine the quantity of air flow in mine roadways and mine ducts.
2. Discuss the mine doors, regulators, stoppings, air crossing and air locks.
3. Explain types of mine fans, their characteristics, suitability and selection of fans
4. Discuss the auxiliary and booster fans, series and parallel operation of fans.
5. Explain ventilation survey in underground mines and computer application in mine ventilation.

**UNIT I: Theory of Ventilation**

Objects and standard of ventilation, Flow of air in ducts and mine roadways, Resistance of air ways, Laws of ventilation, Chezy's and Atkinson's equations, Equivalent resistance and equivalent orifice of mine, Regulations related with above topics.

**UNIT II: Natural Ventilation**

Definition, Natural Ventilation and its Measurements, Thermodynamics of Natural Ventilation, Distribution and Control of air Current, Doors, Regulators, Stopping's and Their Types, air Crossings, Airlocks.

**UNIT III: Mechanical Ventilation**

Theory of mine fans, Types of mine fans, their characteristics & suitability, Selection of fans. Auxiliary and booster fans, series and parallel operation of fans, mine characteristic and selection of mine fans, fan drift and ease, forcing and exhaust ventilation, reversal of ventilation, ventilating of headings.

**UNIT IV: Ventilation Survey**

Objects of ventilation survey, Instruments for the measurement of pressure, velocity and quantity of air.

**UNIT V: Ventilation Systems & Planning**

Calculation of pressure and quantity requirements, network problems, Hardy-cross method, Ventilation planning and economic analysis, central and boundary ventilation, accessional and declensional ventilation, antitropical, homotropical ventilation

**Text Books:**

1. Mine Environment . By G.B. Mishra
2. Elements of Mining Tech. Vol.2 by D. J. Deshmukh

**Reference Books:**

1. H. L. Hartman, Mine Ventilation and Air Conditioning, John Wiley, Paperback edition, 1989.
2. H. L. Hartman, J. M. Mutmanský, R. V. Ramani and Y. J. Wang, Mine Ventilation And Air Conditioning, Wiley-interscience, 3rd Edition, 1997
3. Edition, 1997
4. S. P. Banerjee, Mine Ventilation, Lovely Prakashan, 1st Edition, 2003
5. M. A. Ramlu, Mine Disaster and Mine Rescue, Oxford & IBH, 1999.

**Course outcomes**

Learners get knowledge about underground ventilation system

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. V<sup>th</sup> Sem.**

**Subject: - Mine Management**

Total Lecture Periods/Week : **3**

Total marks in end semester Exam: **100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code :- BT 551**

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **02**

**Course Objective**

To choose proper method of sampling for different ore bodies and mineral heaps.

To estimate grade and reserves.

To choose proper method of mine valuation for valuation of any mine and also able to determine the NPV of any mine.

To perform various financial management aspects related with the mine

**UNIT 1: Evolution of Management**

Theory - Principle of Scientific management, Elements of management functions, Planning, Organizing and Control, Levels of Management. Structure and design of organization for mining enterprises.

**UNIT 2: Personnel Management**

Selection, training and development of human resources, Job evaluation, job analysis, incentive and theories of motivation, Productivity, its concept and measurement, Leadership and Communication

**UNIT 3: Production Management**

Determination of norms and standards of operations by work study, work measurements, production planning, Scheduling and control, Queuing theory, short and long term planning, Quality control, introduction to MIS, Material Management

**UNIT 4: Industrial Psychology**

Its relation with other branches of knowledge, studies of physical factors and their effect on man, Industrial relations, Human relations, trade union movements in India

**UNIT 5: Industrial Act and Laws**

Industrial Dispute Act, Industrial Trade Union Act, Analysis of industrial disputes, Prevention and settlement of industrial disputes, Payment of wages act, Workmen's compensation act, Contract labour laws. Payment of wages act, Strike & lockout, Illegal strikes & Lock out.

.

**References :**

1. Mine Management: V. N. Singh , Print Press Dhanbad
  2. Management & Administration: S.K.Gupta
  3. Introduction to management: O.P. Khanna , Dhanpat Rai Publication
- .

**Course outcomes:**

Apply knowledge of mine economics for understanding, formulating and solving problems related with the mine economics.

Identify analyze and solve financial management problems.

Acquire knowledge and hands-on competence in applying the concepts of management in the development of mine economics

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. V<sup>th</sup> Sem.**

**Subject: - Mine Legislation I**

Total Lecture Periods/Week : **4**

Total marks in end semester Exam: **100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code : - BT 562**

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **00**

**Course Objective**

- To know the various rules & regulations applicable in different conditions to the mine workers, managers and mine owner.
- To know the responsibility and duties of the various employee of the mine and owner of the mine accidents.

- \_ General Principles of Mining Law, Development of mining legislation in India.
- \_ Mines Act – 1952 & Mines Rules – 1956
- \_ Coal Mines Regulations –1957 & Metalliferous Mines Regulation-1961
- \_ Mine crèche Rules & Pit Head Bath Rule
- \_ Mine Vocational- training Rules.

**References: -**

- 1) Legislation in Indian Mines (A critical Appraisal) Vol. II & I By- S. D. Prasad & Prof. Rakesh
- 2) CMR-1957 & MMR-1961 L. C. Kaku.
- 3) Mines Act-1952 & Mines Rules-1955 L. C. Kaku.
- 4) Vocational Training Rules L. C. Kaku.
- 5) Mine Accidents S. J. Kejeriwal

**Course outcomes:**

- Apply knowledge of legislation in mines for the implementation of rules and regulations during their job.
- Work effectively with other engineering and science teams for suggesting any measures against any mine

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B. Tech. V<sup>th</sup> Sem.**

**Subject: - Surface Mining I**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code :- BT 564**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

**Course Objective**

- To choose proper surface mining methods to different mineral deposits depending on their geo-mining conditions.
- To design and analyze basic elements of surface mine.
- To learn various methods of surface mining.
- To choose various methods of transportation in any opencast mine.
- To learn the construction & working of various machineries used in open cast mine.

**UNIT I: Open Pit Design and Layouts**

Important parameters of Open pit design; Design of Benches, Ultimate pit design, Stripping ratio, Breakeven stripping ratio, Different methods of opening up the deposits; Box cuts, internal and external box cut, Methods of driving Box cuts; Layout of open pits; Layout of waste dumps, unit operations in opencast mining.

**UNIT II: Rock Breakage**

Theory of Rock Drilling, Different Types of Drill Machines Used in Open Pits; Rotary, Percussive and Rotary Percussive Drilling, Selection of Drill Machines; Computation of Productivity of Drill Machines; Inclined Drilling; Their Advantages and Disadvantages. Introduction to Different Types of Explosives Used in Open Cast Mining.

**UNIT III: Site preparation**

Dozers, Scrapers, Front-End Loaders etc.; Their Construction, Operation, Suitability and Applicability; Calculation of Their Productivity;

**UNIT IV: Loading and Excavation**

Different Types of Excavators used in Open Pits; Shovel, Dragline, Hydraulic Excavators, Multi Bucket Excavators, Their Construction, Operation, Suitability and Applicability; Calculation of Their Productivity.

**UNIT V: Transport in open pits**

Automobile Transport, Rail Transport and Conveyors; Their Suitability; Computation of Their Productivity; Land Reclamation and its Methods. Application of Computers in Open Pit Mining.



**References:**

1. Surface Mining: G.B. Misra
2. Surface mining equipment: Martin
3. Surface Mining: Pfeider
4. Mining: Boki
5. SME handbook: Hartman

**Course outcomes:**

- Apply knowledge of surface mining for understanding, formulating and solving problems related with the opencast mine.
- Acquire knowledge and hands-on competence in applying the concepts in the design and development of opencast mine
- Work effectively with other engineering and science teams.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. V<sup>th</sup> Sem.**

**Subject: - Mine Machinery I**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code :- BT 563**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

**Course Objective**

- To choose proper transportation system for shaft, incline and roadways in underground mines depending on the geo-mining conditions of the mineral deposit.
- To calculate and analyze basic element of haulage system and winding system.
- To learn the construction and working of various haulage system and winding system.
- To learn the construction and working of various pumps.

**UNIT I: HAULAGE**

Different systems of rope haulage, rope haulage calculations, Rope cattles and changing the Ropes, safety devices, tubs, haulage road and manholes, locomotive haulage and calculations based on it, track laying, mine cars.

**UNIT II: WINDING & SPEED CONTROL**

Head gear arrangement, shaft fittings, safety devices, cages & skips, their suspension arrangements. Location of winding engine, Electric winders, winding drums, types of construction, mechanical & electrical breaking, safety devices on winders, Electrical & Electronic methods of speed control, automatic winding, Torque- time & power- time diagram; Pit top and pit bottom arrangements.

**UNIT III: PUMPING**

Sources of mine water, types of pumps, design calculations, characteristics, operation, and maintenance and selection, pump fittings, special types of pumps used in mines.

**UNIT IV: Aerial rope ways**

Different types, their constructions & installation, operation & maintenance, design calculation, their layout including rope-tensioning arrangements.

**UNIT II: Conveyors**

Different types of belt conveyors, their construction, installation, maintenance & design calculations, Shaker conveyor, scraper chain conveyor and armored chain conveyor, their installation & construction maintenance. Safety Devices; Pit top and pit bottom arrangements.

**Text Books**

1. Elements of Mining Tech. Vol I & Vol III by D. J. Deshmukh
2. Mining Machinery By S. C. Walker

**Course outcomes:**

- Apply knowledge of mine machinery for understanding, formulating and solving transportation problems in underground mine.
- Acquire knowledge and hands-on competence in applying the concepts in the design and development of transportation systems.
- Work effectively with other engineering and science teams.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. V<sup>th</sup> Sem.**

**Subject: - Safety Engineering**

Total Lecture Periods/Week : 3

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT 5653**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 0

**Course Objective:**

To improve knowledge about accidents, cost analysis, Safety in Operation and Maintenance Operational activities and hazards

**UNIT – I**

Safety Philosophy and principles of Accident prevention Introduction, accident, injury, unsafe act, unsafe condition, reportable accidents, need for safety, break down of accidents, hazardous industries. Theories & Principle of accidents Casualty, cost of accident, computation of cost, utility of cost data. Accident reporting & Investigation Identification of the key facts, corrective actions, classification of facts. Regulation American (OSHA) and Indian Regulation.

**UNIT – II**

Safety Management Division of responsibility, Location of Safety function, size of safety department, qualification for safety specialist, safety committee – structure and functions.

**UNIT – III**

Safe Working Condition and Their Development SOP for various Mechanical equipments, Incidental safety devices and methods, statutory of provisions related to safeguarding of Machinery and working condition.

**UNIT – IV**

Safety in Operation and Maintenance Operational activities and hazards, starting and shut down procedures, safe operation of pumps ,Compressor, heaters, reactors, work permit system, entry into continued spaces.

**UNIT – V**

Safety in Storage and Emergency Planning Safety in storage, handling of chemicals and gases, storage layout, ventilation, safety in chemical laboratories, emergency preparedness on site plan, off site plan, toxic hazard control.

**TEXT BOOKS**

Safety and Accident Prevention in Chemical Operation – H.H. Fawcett and Wood Personal Protective Equipment – NSC Bombay

**REFERENCE BOOKS**

Ergonomics - P. Krishna Murthy

Fire Prevention Hand Book – Derek James

**Course outcomes:-**

Learners know about all safety knowledge use in mining fire

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. V<sup>th</sup> Sem.**

**Subject: - Geotech Engineering**

Total Lecture Periods/Week : 3

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT 5655**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objective:**

To improve knowledge about soil, Stokes law, effective stress,

**Unit I: INTRODUCTION**

Introduction to Geotechnical Engineering; Unique nature of soil; Soil formation and soil types, inter relationship of soil, soil mechanics and geotechnical engineering, aim and scope of soil mechanics. Index Properties of Soil, Basic definitions; phase relations; physical and engineering properties of soil, soil grain and properties, coarse and fine grained soils, Stoke's law, method of fine grained analysis.

**Unit II: SOIL CLASSIFICATION AND EFFECTIVE STRESS**

Indian standard soil classification system, Purpose of soil Classification, Different System of soil Classification, Field Identification, Principal of Effective Stress and Related Phenomena, Types of soil moisture, principal of effective stress; capillarity; seepage force and quicksand condition,

**Unit III: COMPACTION, PERMEABILITY AND SEEPAGE ANALYSIS OF SOIL**

Clay mineralogy, soil structure, compaction theory, laboratory compaction tests, method of compaction control, permeability, one dimensional flow, permeability of soil, Darcy's law, laboratory methods of determination, pumping out tests for field determination of permeability, seepage through soils, two-dimension flow problems, confined flow and unconfined flow, flow ness and their characteristics, exit gradient and failure due to piping, criteria for design of filters.

**Unit IV: STRESSES DUE TO APPLIED LOADS AND CONSOLIDATION**

Stresses due to applied Loads, Boussinesq equation of vertical pressure under concentrated loads, rectangularly loaded area, circular Loaded Area Newmart's Chart, Westergoard's equation, compressibility, effects of soil type, stress history and effective stress on compressibility, consolidation, factors affecting consolidation and compressibility parameters. normally consolidated and over consolidated soils, different forms of primary consolidation equation – transient flow condition, Terzaghi theory of one-dimensional consolidation and time rate of consolidation.

**Unit V: Shear Strength and Soil Exploration**

Introduction, stress at a point and Mohr's stress circle; Mohr-Columb Failure criterion: Laboratory tests for shear strength determination; shear strength parameters; UU, CU and CD tests and their relevance to field problems; Shear strength characteristics of normally consolidated and reconsolidated clays; Shear strength Characteristics of sands, Soil Exploration, Various Method of field Exploration, Undisturbed Soil Sampling equipments and Field test (Static & Dynamic Penetration Test, PLT), cyclic plate load test and modern electronic test of site characterisation.

**Name of Text Books:**

Soil Mechanics and Foundation Engineering – B.C. Punmia (Laxmi Publication)

Soil Engineering in Theory and Practice (Vol-II) – Alam Singh (Asia Publishing House, New Delhi)

Name of Reference Books:

Soil Mechanics and Foundation Engineering – S.N. Murthy (Dhanpat Rai Publications)

Basic and Applied Soil Mechanics – Gopal Ranjan & Rao A.S.R. (New Age International, New Delhi, 1998)

Design Aids in Soil Mechanics and Foundation Engineering – S.R. Kaniraj (Tata McGraw Hill, New Delhi)

**Course outcomes:**

Learners get knowledge about geo-tech engineering.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. V<sup>th</sup> Sem.**

**Subject: - Environment & Ecology**

Total Lecture Periods/Week : 3

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code :- BT 5651**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objective**

To learn various kind of pollutants and their causes and preventive measures.

To know the salient features of environmental laws in India.

To know the various types of occupational diseases in the mine.

To measure the level of pollution i.e. Noise level, air pollution level etc..

**UNIT I: General:**

Environmental segments, environmental degradation, environmental impact assessment. Concept of Ecosystem: Fundamental of Ecology and Ecosystem, components of ecosystem, food-chain, foodweb, trophic levels, energy flow, cycling of nutrients, major ecosystem types (forest, grass land and aquatic ecosystem).

**UNIT II: Air Pollution:**

Atmospheric composition, energy balance, classification of air pollutants, source and effect of pollutants – Primary (CO, SO<sub>x</sub>, NO<sub>x</sub>, particulates, hydrocarbons), Secondary [photochemical smog, acid rain, ozone, PAN (Peroxy Acetyl Nitrate)], green house effect, ozone depletion, atmospheric stability and temperature inversion, Techniques used to control gaseous and particulate pollution, ambient air quality standards.

**UNIT III: Water Pollution:**

Hydrosphere, natural water, classification of water pollutants, trace element contamination of water, sources and effect of water pollution, types of pollutants, determination and significance of D.O., B.O.D., C.O.D. in waste water, Eutrophication, methods and equipment used in waste water treatment preliminary, secondary and tertiary.

**UNIT IV: Land Pollution & Noise Pollution:**

Lithosphere, pollutants (agricultural, industrial, urban waste, hazardous waste), their origin and effect, collection of solid waste, solid waste management, recycling and reuse of solid waste and their disposal techniques (open dumping, sanitary land filling, thermal, composting). Noise Pollution: Sources, effect, standards and control.

**UNIT V: Environmental Biotechnology:**

Definition, current status of biotechnology in environmental protection, bio-fuels, bio-fertilize, bio-surfactants, bio-sensor, bio-chips, bio-reactors. Pollution Prevention through Biotechnology: Tannery industry, paper and pulp industry, pesticide industry, food and allied industry.

**TEXT BOOKS:**

1. Environment and Ecology by Piyush Kant Pandey and Dipti Gupta (Sum India Publication)
2. A Textbook of Environmental Chemistry and Pollution Control by S.S. Dara (S. Chand and Company)

**REFERENCE BOOKS:**

1. Masters, G.M. Introduction to Environment Engineering and Science (Prentice Hall of India).
2. Environmental Chemistry by A.K. Dey (Eastern Ltd.).
3. Environmental Chemistry by B.K. Sharma (Krishna Prakashan).
4. Nebel B.J. Environmental Science (Prentice Hall of India-1987).
5. Environmental Biotechnology by S.N. Jogdand (Himalaya Publishing House).
6. Introduction to Environmental Biotechnology by A.K. Chatterji (Prentice Hall of India).

**Course outcomes:**

- Apply knowledge of pollution control for understanding and solving different types of environmental pollution problem in any mine.
- Identify, analyze, control and solve environmental pollution problems.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. V<sup>th</sup> Sem.**

**Subject: - Energy Management**

Total Lecture Periods/Week : 3

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT 5652**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objective:** To improve knowledge about energy performance, optimizing input energy requirements.

**Unit -01: General Aspects**

General Philosophy and need of Energy Management: Definition and Objective of Energy Management, General Principles of Energy Management, Energy Management Skills, Energy Management Strategy. Energy Audit: Need, Types, Methodology and Approach. Energy Management Approach, Understanding Energy Costs, Bench marking, Energy performance, Matching energy usage to requirements, Maximizing system efficiency, Optimizing the input energy requirements, Fuel and Energy substitution.

**Unit -02: Procedures and Techniques**

Data gathering : Level of responsibilities, energy sources, control of energy and uses of energy get Facts, figures and impression about energy /fuel and system operations, Past and Present operating data, Special tests, Questionnaire for data gathering. Analytical Techniques: Incremental cost concept, mass and energy balancing techniques, inventory of Energy inputs and rejections, Heat transfer calculations, Evaluation of Electric load characteristics, process and energy system simulation. Evaluation of saving opportunities: Determining the savings in Rs, Noneconomic factors, Conservation opportunities, estimating cost of implementation. Energy Audit Reporting: The plant energy study report- Importance, contents, effective organization, report writing and presentation.

**Unit -03: Energy Policy Planning and Implementation**

Key Elements: Force Field Analysis, Energy Policy-Purpose, Perspective, Contents and Formulation. Format and Ratification, Organizing: Location of Energy Manager, Top Management Support, Managerial functions, Role and responsibilities of Energy Manager, Accountability. Motivating – Motivation of employees, Requirements for Energy Action Planning. Information Systems: Designing, Barriers, Strategies, Marketing and Communicating Training and Planning.

**Unit -04: Energy Balance & MIS**

First law of efficiency and Second law of efficiency, Facility as an Energy system, Methods for preparing process flow, Materials and Energy Balance diagram, Identification of losses, Improvements. Energy Balance sheet and Management Information System (MIS) Energy Modeling and Optimization.

**Unit -05: Energy Audit Instruments**

Instruments for Audit and Monitoring Energy and Energy Savings, Types and Accuracy

**Reference Books:**

1. Energy Management: W.R.Murphy, G.Mckay (Butterworths).
2. Energy Management Principles: C.B.Smith (Pergamon Press).
3. Efficient Use of Energy : I.G.C.Dryden (Butterworth Scientific)
4. Energy Economics -A.V.Desai (Wiley Eastern)
5. Industrial Energy Conservation : D.A. Reay (Pergammon Press)
6. Energy Management Handbook – W.C. Turner ( John Wiley and Sons, A Wiley Interscience Publication)

**Course outcomes:**

Learners know about energy management.

## **Department of Mining Engineering**

### **List of Experiment**

**Subject: Mine Machinery Lab**  
**Code: BT-568**  
**Maximum Marks: 50**

#### **List of experiments:**

1. Study of different types of Rope cable.
2. Study of Clifton pulley.
3. Study of various safety devices on rope haulages.
4. Study of Exhaust conditioner on a diesel locomotive.
5. Study of cage suspension gear.
6. Study of Detaching safety hook.
7. Study of Lilly controller.
8. Study of Turbine Pump.
9. Study of Mono-cable aerial Ropeway & Bi-cable aerial Ropeway
10. Study of Loop take-up and tensioning arrangement of a belt conveyor.
11. Study of pit top and pit bottom arrangements for a belt conveyor.
12. Study of an Armoured face Conveyor.



## **Department of Mining Engineering**

### **List of Experiment**

**Subject:       Surface Mining Lab**  
**Code:         BT-569**  
**Maximum Marks: 50**

#### **List of experiments:**

1. Study of Drivage of Internal and External Box Cut
2. Determination of Ultimate Pit Slope, Overall Ramp slope and Inter ramp slope and Design of Ultimate pit by manual methods
3. Study of Constructional features of Scrapers and the machine operation
4. Study of Constructional features of Electric Rope Shovel and the machine operation
5. Study of Constructional features of Dragline and the machine operation
6. Determination of Productivity of shovel dumper combination and synchronization of shovel dumper operated face.
7. Study of Dragline side casting operation and drawing of layout of Dragline operated faces
8. Study of Constructional features of Multi bucket Excavators and the machine operation
9. Study of working of Jack Hammer Drilling Machine
10. Study of working of Down the hole Drilling Machine

# **Department of Mining Engineering**

## **List of Experiment**

**Subject:        Mine Ventilation Lab**  
**Code:            BT-567**  
**Maximum Marks: 50**

### **List of Experiments to be performed:**

1. Study of installation of axial flow fan.
2. Study of installation of centrifugal flow fan.
3. Study of installation and positioning of booster fan.
4. Study of characteristic curve of different fans and their comparison
5. Study of principal and working of vane anemometer
6. Study of principal and working of velometer.
7. Study of principal and working of pitot tube.
8. Study of central and boundary ventilation system.

# Department of Mining Engineering

**Subject:** Vocational & Industrial Training Evaluation and presentation. (at least 6 week)

**Code:** BT-566

**Maximum Marks:** 50

## **Course Objective:**

Whatever may be the research and developments in Rock Mechanics, the behaviour of rock is less predictable accurately. Mining Engineering is hence said to be an art more than engineering and the knowledge gained through experience is more valuable.

## **Instructional Objective:**

The training enables the students to experience with the practical applications of the theoretical learning. The outcome at the place of work is always much more than what can be learned in the class room.

## **Teaching Scheme:**

The industrial training phase I will be organised during summer vacation after IV semester examinations for a minimum duration of six weeks. The class shall be divided into batches of 4 or 5 students and sent to pre-determined mines from where the permissions are obtained. Students may camp at the mines or elsewhere and undergo training as per the direction of mine management. Notional teaching scheme: 4 hrs /week Practical for guidance of students.

## **Examination Scheme:**

Students shall maintain a Daily Diary to record their daily activities. They shall collect the necessary data and prepare a detail training report within two months of completion of training. The training Report neatly typed and attached with sketches, diagrams and maps shall be submitted to the department for evaluation and record.

## **Oraganisation of Training:**

The training places are grouped into four as below and training at any one mine each of two different groups is compulsory

### **1. Mechanised Opencast Metal Mines:**

Iron ore mines in Goa, Malanjkhand Copper Mines of HCL(Madhya Pradesh), Kudremukh Iron Ore Mine(Karnataka), RampuraAgucha Mines of HZL (Rajasthan), Bailadilla Mines of NMDC (Chattisgarh), any other mechanised opencast mines.

### **2. Mechanised opencast mines in Coal:**

Neyveli mines of M/s Neyveli Lignite Corporation, Kusmunda Mines of South Eastern Coalfields Ltd (Bilaspur, M.P.), Ramagundem mines of Singreni collieries co Ltd, mines of Central Coalfields Ltd., any similar mines.

### **3. Underground Metalliferous Mines:**

Mines of Manganese Ore India Ltd., Khethri or Kolihan mines of HCL (Rajasthan), Surda or Rakha mines of HCL (Jharkhand), Dariba or Zawar mines of HZL, Hutti Gold Mines Ltd, any similar underground metal mines.

### **4. Underground Coal Mines:**

Mines of Singreni Collieries Co Ltd (Andhra Pradesh), Mines of Western Coalfields Ltd, Mines of South Eastern Coalfields Ltd.

### **Essential Contents of Training Report:**

1. Name of the mine along with names of owner, agent, manager and other senior officials.
2. Location and a brief history of the mine.
3. Brief geological description along with characteristics of the ore and its marketing scenario.
4. The surface features including mine entries, loading & transport arrangement of ore, disposal of waste, ore beneficiation.
5. Method of working including strata control in underground mines and dump management in opencast mines.
6. Sampling, survey, training and rescue sections.
7. Acknowledgement

**School of Engineering & I.T.**

**MATS University**

**Raipur**



**Syllabus Scheme**  
**(VI<sup>th</sup> Semester)**  
**For**  
**Bachelor of Technology**  
**Mining Engineering**

## Subject Code for School of Engineering & I.T. Deptt.

### VI<sup>th</sup> Semester (Mining)

S.No.	Subject Code	Subject Name
1.	BT660	Mineral Dressing
2.	BT661	Underground Metal Mining
3.	BT662	Blasting Technology
4.	BT663	Mine Legislation - II
5.	BT664	Mine Machinery - II
6.	BT665x	Professional Elective – I
7.	BT666	Minor Project
8.	BT667	Mining Machinery - II Lab
9.	BT668	Blasting Engineering Lab
10.	BT669	Mineral Dressing Lab

### Professional Elective-I

Subject Code	Subject Name
BT6651	Coal & Non-Coal Mineral Processing
BT6652	Small Scale & Dimensional Stone Mining
BT6653	Surface Mining-II
BT6654	Mine power Systems
BT6655	Electrical Machinery in Mines



# MATS UNIVERSITY

ARANG, RAIPUR (C.G.)



## Scheme of Teaching & Examination

### VI - Semester

S.N.	code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BT660	Mineral Dressing	4	0	-	70	30	4
2.	BT661	Underground Metal Mining	3	0	-	70	30	3
3.	BT662	Blasting Technology	4	0	-	70	30	4
4.	BT663	Mine Legislation - II	3	0	-	70	30	3
5.	BT664	Mine Machinery - II	4	0	-	70	30	4
6.	BT665x	Professional Elective – I	3	0	-	70	30	3
7.	BT666	Minor Project	-	-	3	30	20	2
8.	BT667	Mining Machinery - II Lab	-	-	2	30	20	1
9.	BT668	Blasting Engineering Lab	-	-	2	30	20	1
10.	BT669	Mineral Dressing Lab	-	-	2	30	20	1
<b>Total</b>			<b>21</b>	<b>0</b>	<b>09</b>	<b>540</b>	<b>260</b>	<b>26</b>

L – Lecture, T – Tutorial, ESE – End Semester Examination,  
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

Subject Code	Subject Name
BT6651	Coal & Non-Coal Mineral Processing
BT6652	Small Scale & Dimensional Stone Mining
BT6653	Surface Mining-II
BT6654	Mine power Systems
BT6655	Electrical Machinery in Mines

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VI<sup>th</sup> Sem.**  
**Subject: - Mineral Dressing**

Total Lecture Periods/Week : **4**  
Total marks in end semester Exam: **100**  
Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**  
**Code :- BT 660**

Total Tutorial Periods/Week: **00**  
Total Practical Periods/Week: **02**

**Course Objective**

- To choose proper method of size reduction and concentration methods for particular ores
- To design and analyze basic element of machine e.g. crushers, mills jigs, tables etc.
- To design and analyze various special methods of separations like HMS, Magnetic Separator etc.
- To prepare flow sheets for the beneficiation of different ores and coal.

**UNIT I: CRUSHING & GRINDING**

Introduction, definition, scope and economic justification, main steps in ore dressing operations, general preliminary mineralogical investigations, comminution-crushing-principles of crushing, reduction jaw crushers, gyratory crushers, cone crushers, rolled crushers, gravity stamps their classifications and applications, grinding-principles of grinding units, application and classification of ball mills, rod mills, tube mills and pebble mills.

**UNIT II: SIZING**

Object of sizing, scale of sizing, laboratory sizing, screening and classification, different type of screens, their mode of operations and application and limitation, classification-principles of classification, movement of solids through fluids, Stoke's law, Reynold's Number, different types of classifiers, hydraulic and pneumatic classifiers, sampling-importance of sampling and methods used.

**UNIT III: GRAVITY CONCENTRATION**

Jigging, Flowing film concentrators like spirals and shaking tables, heavy media separation theory, applications and limitations of methods.

**UNIT IV: FLOTATION**

Physico-chemical principles, function of various floatation reagents, important machines, their principles, and working, floatation of sulphide, oxide and non sulphide ores.

**UNIT V: ELECTROSTATIC AND MAGNETIC SEPARATION**

Principle and operation and field of application, Pelletisation of low grade iron ore, Drying and dewatering - thickening, filtration and drying. Coal washing- Simplified flow sheets for beneficiation of coal and typical ores of copper, lead, zinc, iron and manganese ores with special reference to Indian deposits.



## **Text Books**

1. Ore Dressing by Gaudin
2. Ore Dressing by B. A. Wills

## **Course outcomes:**

- Apply knowledge of mineral dressing for understanding, formulating and solving problems related with mineral dressing.
- Acquire knowledge and hands-on competence in applying the concepts in the design and development of machines for separating the low grade ore economically.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. V<sup>th</sup> Sem.**

**Subject: - Underground Metal Mining**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT 561**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objective**

- To choose proper extraction methods to different mineral deposits depending on their geo-mining conditions.
- To learn how to develop a metal mine.
- To choose proper support system for the metal mines.
- To learn the various metal mining methods.

**UNIT I: General**

Status and scope of Underground metal mining methods; Definitions of important terms used in Underground metal mining methods.

**UNIT II: Development**

Mode of access; Variables affecting the choice of mode of access; Crosscuts, Levels, Raises; Their method of drivages with the description of various unit operations; Introduction to Raise boring and Introduction to tunnel boring.

**UNIT III: Stopping Methods-I**

Classification of mining methods; Factors affecting the choice of mining methods; Overhand, Underhand and Breast stopping methods; Open stopping; Vertical Crater Retreat method; Sub level stopping Room and Pillar method.

**UNIT IV: Stopping Methods-II**

Shrinkage stopping; Cut and fill stopping, Introduction to Square set stopping, Sub level caving, Block caving, Top slicing.

**UNIT V: Support Systems**

Pillars; Back fill, Cable bolting, Steel Rock bolts, Grouting, Shotcreting etc.,code of timbering rules.

**Text Books**

1. Elements of Mining Tech. Vol II by D. J. Deshmukh
2. S M E Handbook

**Course outcomes:**

- Apply knowledge of metal mining for understanding metal mining problems.
- Acquire knowledge and hands-on competence in applying the concepts in the design and development of metal mine.
- Apply knowledge of metal mining for designing a metal mines

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VI<sup>th</sup> Sem.**

**Subject: - Blasting Technology**

Total Lecture Periods/Week : **4**

Total marks in end semester Exam: **100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code :- BT 662**

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **02**

**Course Objective**

- To choose proper explosives to different rock beds.
- To design and analyze basic element of blast holes in open cast mine and underground mine.
- To learn various blasting accessories.
- To learn various blasting nuisances.

**UNIT I: COMMERCIAL EXPLOSIVES**

Commercial Explosives and their properties, Bulk Explosive Systems, Selection of explosive. Transportation and Handling of explosives & related regulations.

**UNIT II: INITIATION SYSTEM & BLASTING ACCESSORIES**

Detonators of various types, Detonating cord, Safety fuse, Detonating relays, Non electric initiation and Blasting accessories

**UNIT III: SURFACE BLAST DESIGN**

Factors affecting blast design, Selection of various blast parameters Burden, Spacing, Stemming distance, Sub-grade drilling, Depth of hole, Bench height, Diameter of hole, Safe charge calculation, Deck Charging, Drilling patterns, Inclined hole drilling, Secondary blasting.

**UNIT IV: UNDERGROUND BLAST DESIGN**

Various cut patterns, U/G blast design, Series & Parallel connection of detonators, Precautions during blasting

**UNIT V: ROCK BREAKAGE MECHANISM**

Breakage mechanism, rock fragmentation, Factors affecting rock fragmentation, Back break, over break, Fly rock, Ground Vibration, Noise, Control Blasting Techniques

**References:**

1. Explosives and Blasting Technology: G.K.Pradhan
2. Surface Blast Design: C.J.Konya
3. Rock Blasting: SushilBhandari
4. Indian Explosive Act 1884
5. Legislation in Indian Mines – A Critical Appraisal: Rakesh and Prasad

**Course outcomes:**

- Apply knowledge of blasting engg. for understanding, formulating and solving blast hole design problems.
- Acquire knowledge and hands-on competence in applying the concepts in the design and development of blast hole.
- Work effectively with other engineering and science teams as well as with multidisciplinary designs.

**MATS UNIVERSITY**  
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**Semester: B.Tech. VI<sup>th</sup> Sem.**

**Subject: - Mine Legislation II**

Total Lecture Periods/Week : **3**

Total marks in end semester Exam: **100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code : - BT 663**

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **00**

**Course Objective**

- To know the various rules & regulations applicable in different conditions to the mine workers, managers and mine owner.
- To know the responsibility and duties of the various employee of the mine and owner of the mine

Principal Provisions of Mines & Minerals (Regulation & Development) Act Coal Mines Conservation & Development Act. Mineral Concession Rules, Indian Electricity Rules related to mining activity.

Byelaws & D.G.M.S. Circulars. Mines Rescue Rules Mine Accident, their classification, and causes & preventive measures, Cost of accident, Preparation of Inquiry report. Safety Campaign, Causes of major mining accidents those have occurred in India & Suggested remedial measures.

**References: -**

- 1) Legislation in Indian Mines (A critical Appraisal) Vol. II & I  
By- S. D. Prasad & Prof. Rakesh
- 2) CMR-1957 & MMR-1961 L. C. Kaku.
- 3) Mines Act-1952 & Mines Rules-1955 L. C. Kaku.
- 4) Vocational Training Rules L. C. Kaku.
- 5) Mine Accidents S. J. Kejeriwal
- 6) Mines Rescue Rules
- 7) Indian Electricity Rules

**Course outcomes:**

- Apply knowledge of legislation in mines for the implementation of rules and regulations during their job.
- Work effectively with other engineering and science teams for suggesting any measures against any mine accidents

Principal Provisions of Mines & Minerals (Regulation & Development) Act Coal Mines Conservation & Development Act. Mineral Concession Rules, Indian Electricity Rules related to mining activity.

Byelaws & D.G.M.S. Circulars. Mines Rescue Rules Mine Accident, their classification, and causes & preventive measures, Cost of accident, Preparation of Inquiry report. Safety Campaign, Causes of major mining accidents those have occurred in India & Suggested remedial measures.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VI<sup>th</sup> Sem.**

**Subject: - Mine Machinery II**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT664**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

**Course Objective**

- To choose proper transportation system for mines depending on the geo-mining conditions of the mineral deposit.
- To calculate and analyze basic element of haulage system and winding system.
- To learn the construction and working of various haulage system and winding system.

**UNIT I: Skip & Koepe Winding**

Skip types & Construction, pit top & pit bottom arrangements, advantages and disadvantages Types of koepe Winder, Koepe wheel, floating platforms, two winders working in the same shaft, winding with side by side and up and down sheaves, advantages and disadvantages. Multi rope winding. Calculation of H.P.

**UNIT II: HYDRULIC TRANSMISSIONS**

Fundamental of hydrostatic compression, hydraulic fluids, hydraulic pumps, motors, cylinders and accumulators, different types of valves, hydraulic coupling and torque converters, Application in mines, Advantages of hydraulic transmission.

**UNIT III: FACE MACHINERY**

Drills for coal and stone, their constructional details, drill jumbos, their applications, operation and maintenance, introduction to coal cutting machines.

**UNIT IV: LOADER AND TRANSPORTING MACHINE**

Rocker shovel, gathering arms loaders, LHD and SDL machines- their construction and operation and maintenance, cavo loader, shuttle car and underground trucks, its construction, operation and application. Different types of cutter loaders suitable for long wall and short wall faces, their constructions, operation and maintenance, different types of road headers their construction, operation and conditions of applicability, mechanics of rock cutting, rock cutting tools and their performance.

**UNIT V: USE OF ELECTRICITY & COMPRESSED AIR IN MINES**

Flame proof apparatus, intrinsically safe circuits, underground cables, drill panel, gate end box, circuit breakers, remote control (pilot circuit), underground substation, Electrical signaling provisions of IER related to mines. Basic concept, compression process, working and constructional features of single stage and multistage compressor, unloading arrangement of compressor, layout of pipelines, transmission of compressed air, testing of compressor, in bye compressors.

**Text Books**

1. Elements of Mining Tech. Vol I & Vol III by D. J. Deshmukh
2. Mining Machinery By S. C. Walker
3. Coal Mining Practice By Stathum

**Reference books:**

1. UMS Booklet
2. Winning and Working of Coal : R. T. Deshmukh& D. J. Deshmukh
3. Modern Coal Mining Practices : R. D. Singh
4. Longwall Mining : Syd. S. Chaining & Peng

**Course outcomes:**

- Apply knowledge of mine machinery for understanding, formulating and solving transportation problems in mine.
- Acquire knowledge and hands-on competence in applying the concepts in the design and development of transportation systems.
- Work effectively with other engineering and science teams

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VI<sup>th</sup> Sem.**

**Subject: - Small Scale Dimension Stone Mining**

Total Lecture Periods/Week : 3

Total marks in end semester Exam: 100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT 6652**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objective.**

- To understand small scale mining and problem related with it
- To choose proper method of mine development and the extraction to different mineral deposit depending on the size and depth of the small scale mine.
- To deal with the royalty, access and dead rent for the minerals
- To understand the environmental aspects of a small scale mine

**UNIT I:**

A Scenario of small scale mining in India, Definition of small mine, strength and weaknesses of small scale mining, Problems and difficulties of small scale mine owners, minerals- major & minor, royalty, dead rent, cess etc.

**UNIT II:**

Development of small scale mine, preparation of mine plan, extraction, development of benches, drilling & blasting practice in small scale mining, cutting techniques & transportation.

**UNIT III:**

Small scale mining of limestone, sandstone, gypsum, talc, soapstone etc., extraction techniques and procedure.

**UNIT IV:**

Dimensional stone mining of granite, marble, black stone etc., extraction techniques and procedure.

**UNIT V:**

Environmental Impact of small scale mining, Environmental management plan, Env. Protection measures.

**Reference Books :**

1. An Introduction to Mineral Economics by K.K. Chatterjee.
2. Proceedings of the National Seminar on Small Scale Mining 2001 By MBM Engg. College, Jodhpur

**Course outcomes:**

- Apply knowledge of small scale & dimensional stone mining for understanding, formulating and solving problems related with small scale mining.
- Acquire knowledge and hands-on competence in applying the concepts in the design and development of small scale mine

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VIII<sup>th</sup> Sem.**

**Subject: - Surface Mining II**

Total Lecture Periods/Week : 3

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT6653**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objective**

To learn various layout of opencast mine and waste dump.

To choose suitable excavators for any deposit extracted by opencast method.

To be able to design an opencast mine and mine waste dump.

To understand the pit slope stability and its impact on mining activity

**UNIT I:**

Layouts of open pit mines, Methods of side casting, Side casting by Stripping Shovel and Dragline, Range Diagram, calculation of operating radius. Explosive casting, Layouts of waste dumps. Design of Haul roads.

**UNIT II:**

Introduction to continuous surface mining equipment, Continuous surface miner, their construction, basic operation and productivity. Bucket wheel excavators, their construction, basic operation and productivity, Face Layouts.

**UNIT III:**

Ultimate pit design, Factors affecting ultimate pit limits; Significance of ultimate pit limits; Manual methods of developing ultimate pit limits. Floating cone technique, Production planning, Some basic mine life and plant size concepts, Mine and Mill plant sizing,

**UNIT IV:**

Introduction to rock slope engineering, Slopes in surface mines and their formation, Pitslopes and their influence on mine economics, Slope stability, Factors influencing slope stability, Various types of slope failure and their conditions.

**UNIT V:**

Determination of factor of safety of a slope under plane and circular failure, Planning of slope stability investigations, Stabilization and protection methods for stability of slopes.

**References:**

1. Surface Mining : G.B. Misra
2. Surface mining equipment : Martin
3. Surface Mining : Pfleider
4. Rock slope engg. : Hoek& Bray
5. SME handbook : Hartman
6. Surface Mine Planning & Design : Hustralid&Kuchha

**Course outcomes:**

- Apply knowledge of surface mining for understanding, formulating and solving slope stability problem in any opencast mine.
- Identify, analyze and solve opencast mining problems
- .Acquire knowledge and hands-on competence in applying the concepts in the development of opencast mine planning



## **Department of Mining Engineering List of Experiment**

**Subject: Minor Project (150 Marks)**

**Code: BT-666**

**Maximum Marks: 50**

### **Allocation of project:**

1. Information regarding broad area must be made available to the students well in advance (may be during previous semester).
2. Information must cover following parameters.
  - i. **Broad area:** Subject or expertise/application area.
  - ii. **Required skills:** Knowledge of subject(s), software, tools & other characteristics.
  - iii. **Type of project:** Hardware, software, design, survey, study based etc.
  - iv. **Guide available:** Name of Guide (S) from Department & Institute.
  - v. **Other related information** depending upon specific branch & institute.
3. It is also recommended to give proper counseling to pick up suitable project.
4. Students must get chance to select projects as per their choice or decided mutually between students and department faculty (HoD) concern.
5. One project group must contain maximum four students.

### **Monitoring of project:**

1. It is recommended to give projects as per the specializations of existing faculty of the department instead of outside person/agency.
2. Project must be allocated, developed and monitored by department / institution itself, but not by outside agencies.
3. Regular review by guide is recommended to ensure development & contribution of students.

### **Internal Evaluation & Submission of project:**

1. Evaluation of project would be as per the examination scheme of the University, which is based on internal as well as external evaluation.
2. Internal assessment requires submission of project report for getting approved by the concern authority. However printing and binding would be as per the conventional format.
3. Evaluation will be based on Live demonstration / presentation and Viva.
4. Final submission of project is expected as:
  - (a) One copy to the Institution central library,
  - (b) One copy to the department.

### **External Evaluation:**

External assessment of project would be like conduction of practical exams of University, and must be executed as per the norms of practical exams.

## **Department of Mining Engineering List of Experiment**

**Subject:       Blasting Engineering Lab**  
**Code:         BT-668**  
**Maximum Marks: 50**

### **List of Experiments to be performed:**

1. Measurement of ground vibration by seismograph
2. Development of predictor equation from the recorded data
3. Measurement of VOD by VOD mate and its analysis
4. Study of various fragmentation assessment techniques
5. Study of WIPFRAG software
6. Design of blast for coal face
7. Design of blast for underground metal mine
8. Design of blast for bench blasting
9. Study of various blasting tools
10. Study of bulk explosive systems

## **Department of Mining Engineering List of Experiment**

**Subject: Mining Machinery II Lab**  
**Code: BT-667**  
**Maximum Marks: 50**

### **List of Experiments to be performed :10**

1. Study of Various Koepe Arrangements
2. Study of various types of skips.
3. Study of pit top and pit bottom arrangements for a Skip.
4. Study of hydraulic Couplings and Torque Converters.
5. Study of construction and working of coal cutting Machine.
6. Study of construction and working of SDL.
7. Study of construction and working of LHD.
8. Study of construction and working of Drill jumbo.
9. Study of different types of valve.
10. Study of different types of cutter loaders.

**Department of Mining Engineering**  
**List of Experiment**

**Subject: Mineral Dressing Lab**  
**Code: BT-669**  
**Maximum Marks: 50**

**List of Experiments to be performed :**

1. Study of Jaw crusher
2. Study of roll crusher
3. Study of grinding mills
4. Study of Akin's classifier
5. Study of shaking table
6. Study of Mineral jig.
7. Study of spiral concentrator
8. Study of floatation cell
9. Study of thickeners
10. Study of washability curves

**MATS School of Engineering & Technology**

**MATS University**

**Raipur**



**Syllabus Scheme**  
**(VII<sup>th</sup> Semester)**  
**For**  
**Bachelor of Technology**  
**Mining Engineering**

**Subject Code for School of Engineering & I.T. Deptt.**

**VII<sup>th</sup> Semester (Mining)**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject Name</b>
1.	BT760	Mine Economics
2.	BT761	Rock Mechanics
3.	BT762	Mine Environment-II
4.	BT763	Mine Planning& Development
5.	BT764x	Professional Elective – II
6.	BT765	Mine Environment-II Laboratory
7.	BT766	Rock Mechanics Laboratory
8.	BT767	Vocational & Industrial Training Evaluation & Presentation
9.	BT768	Computer Application in Mining Laboratory

**Professional Elective – II**

<b>Subject Code</b>	<b>Subject Name</b>
BT7641	Computer Applications in Mining
BT7642	Advance Surface Mining
BT7643	Mine Health and Safety
BT7644	Advanced Mining Geology
BT7645	Advance Mine Machinery



# MATS UNIVERSITY

## ARANG, RAIPUR (C.G.)

### Scheme of Teaching & Examination

#### VII - Semester

S.N.	code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BT760	Mine Economics	4	0	-	70	30	4
2.	BT761	Rock Mechanics	4	0	-	70	30	4
3.	BT762	Mine Environment-II	4	0	-	70	30	4
4.	BT763	Mine Planning & Development	4	0	-	70	30	4
5.	BT764x	Professional Elective – II	4	0	-	70	30	4
6.	BT765	Mine Environment-II Laboratory	-	-	2	30	20	1
7.	BT766	Rock Mechanics Laboratory	-	-	2	30	20	1
8.	BT767	Vocational & Industrial Training Evaluation & Presentation	-	-	2	30	20	1
9.	BT768	Computer Application in Mining Laboratory	-	-	2	30	20	1
<b>Total</b>			<b>20</b>	<b>0</b>	<b>8</b>	<b>470</b>	<b>230</b>	<b>24</b>

L – Lecture, T – Tutorial, ESE – End Semester Examination,  
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

Subject Code	Subject Name
BT7641	Computer Applications in Mining
BT7642	Advance Surface Mining
BT7643	Mine Health and Safety
BT7644	Advanced Mining Geology
BT7645	Advance Mine Machinery

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VII<sup>th</sup> Sem.**

**Subject: - Mine Economics**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code :- BT 760**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objective**

To choose proper method of sampling for different ore bodies and mineral heaps.

To estimate grade and reserves.

To choose proper method of mine valuation for valuation of any mine and also able to determine the NPV of any mine.

To perform various financial management aspects related with the mine.

**UNIT I**

Sampling- Methods of sampling, errors in sampling, analysis of samples, estimation grade and reserves, salting and precautions against salting. Different types of reserves.

**UNIT II**

Mine Valuation - Different methods, depreciation, amortization and redemption of capital, life and present value of a mine.

**UNIT III**

Financial Management - Methods of framing and financing industrial enterprises ,memorandum and articles of association, shares, debentures, dividends and interest .Break even chart and inventory control.

**UNIT IV**

Investment Decisions - discounted cash flow methods, non-discounted cash flow methods, advantages and disadvantages of them, Internal rate of return, Net Present Value.

**UNIT V**

Book Keeping, Preparation of Balance sheet, Profit and Loss Account.

**Reference Books :-**

1. Mineral Economics by R.T. Deshmukh
2. SME Handbook Vol. I
3. Mineral Economics by Sinha and Sharma

**Course outcomes:**

- Apply knowledge of mine economics for understanding, formulating and solving problems related with the mine economics.
- Identify analyze and solve financial management problems.
- Acquire knowledge and hands-on competence in applying the concepts of management in the development of mine economics



**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VII<sup>th</sup> Sem.**

**Subject: - Rock Mechanics**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT 761**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

**Course Objective**

To learn various physico mechanical & rheological properties of rock and the rock mass classification.

To determine the RMR of any mine

To measure the insitu stress in the underground mines. Course outcomes:

**UNIT I:**

Application of rock mechanics in mining, Definition of important terms used in Rockmechanics, Classification of rock mass, Parameters of rock mass classification, Importance of rock mass classification, RQD, Q –system and C- factor , Bieniskiwi's Geomechanics classification of rock mass.

**UNIT II:**

Physico-mechanical properties of rock as per ISRM standard testing procedures, Preparation and testing of specimen in the laboratory, ISRM standards, Determination of , Strength indices and their importance. Point load, Protodyaknov, Impact and Cone Indenter strength Index.

**UNIT III:**

Rock as an elastic medium, Principle of elastic analysis, Rheological properties of rock, Importance of rheological models, Different types of rheological models, Dynamic properties of rocks, Anisotropy and Creep.

**UNIT IV:**

Principal stress and Principal plane, Analytical method of determining the magnitudes and directions of normal and shear stress on failure plane, Mohr's circle, Theories of failure of rock, Coulomb-Navier theory, Mohr's theory, Griffith's theory, Empirical theories of failure of rock, Different modes of failure of rock.

**UNIT V:**

Earth stresses, Importance of measurements of in situ stress, measurements of insitu stress by Flat jack, Overcoring and Hydraulic fracturing technique. Design of circular and elliptical openings. Determination of safe span of roof.

**Text Books**

1. Rock Mechanics By Obertabd Duvall
2. Rock Mechanics By Goodman
3. Rock Mechanics By Jager& Cook
4. Rock Mechanics by B.S. Verma

**Course outcome**

1. Apply knowledge of rock mechanics for understanding, formulating and solving strata control problem in any underground mine.
2. Identify, analyze and solve rock mechanics problems.3.
3. Acquire knowledge and hands-on competence in applying the concepts in the development of rock mechanics.

# MATS UNIVERSITY

## GULLU, ARANG, RAIPUR

**Semester: B.Tech. VII<sup>th</sup> Sem.**

**Subject: - Mine Environment II**

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT 762**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

### Course Objective

- To learn the sampling of dust and physiological effect of the dust to the miner.
- To learn about the various miner occupational diseases and its preventive measures
- To prepare the enquiry report of a mine accident.
- To know the major accident occurred in Indian mines and their causes.

### UNIT I : MINE FIRES

Mine fires, fires in quarries and surface storage systems, control of fires and fires extinguishers, study of atmosphere behind sealed off areas, conditions and procedure of reopening a sealed off area, fire fighting organisations.

### UNIT II: SPONTANEOUS HEATING

Causes, detection and preventive measures in underground and surface coal mines, stacks and dumps, control of spontaneous heating, fire stopping and sealing off an area.

### UNIT III: EXPLOSION

Fire damp and coal dust explosions, their causes and prevention, stone dust and waterbarriers, investigations after explosion.

### UNIT IV: RESCUE AND RECOVERY

Types of rescue equipment and their use, rescue stations, first aid appliances, training of personnel, and organisation of rescue and recovery work during mine fires, explosion, inundation.

### UNIT V: MINE INNUNDATION

Causes and precautionary measures, bulk head doors, barriers, dams, precautions to be taken while approaching old workings, recovery of flooded mines and de watering of old workings.

### Text Books:

1. Mine Env. By G.B. Mishra
2. Elements of Mining Tech. Vol.2 by D. J. Deshmukh
3. U/G Mine Env. by Mcpherson
4. Mine fires by Dr. Ramlu

### Course outcomes:

- Apply knowledge of Health, Safety and Environmental Engg. to the miners for keeping them safe and improving their efficiency and productivity.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mining engineering in particular.
- Make awareness among the miner to avoid any accident and health hazard

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VII<sup>th</sup> Sem.**

**Subject: - Mine Planning & Development**

Total Lecture Periods/Week : 3

Total marks in end semester Exam: 100

Minimum Number of Class test to be conducted: 02

**Branch: - Mining Engineering**

**Code : - BT 763**

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

**Course Objective**

To prepare feasibility report and detailed project report for any mine.

To work out planning and scheduling for any mine.

To choose proper mode of opening and method of underground mine for any coal seam / mineral deposit

**UNIT I:**

Coal reserves and their estimation, Geological and technological data needed for mine planning, Preparation of project and feasibility reports, Planning and scheduling of various mining operations.

**UNIT II:**

Planning and scheduling of various mining operations, linear programming, Simplex methods and transportation problem. Operation Research - Scope of application in mining, Linear programming, formulation and solution, Network planning with special reference to CPM/PERT, System approach for project scheduling.

**UNIT III:**

Division of mine area into units and sub units, Area, Reserve, Life and Capacity of mine, Panel size, Design of long wall face.

**UNIT IV:**

Cost of various mining operations, Optimum size of mines, Mode of opening up of deposits, Choice of opening, Location and size of Development openings.

**UNIT V: Mine Services**

Design of haulage, hoisting and drainage systems, Design of pit top and pit bottom, Coal handling plants, Railway siding etc.

**Books Recommended.**

1. Advance Coal Mining by R.T. Deshmukh and V.S. Vorobjev
2. Mine Planning by S.P. Mathur
3. Mine Planning by J. Bhattacharya

**Course outcomes:**

- Apply knowledge of mine planning for understanding, formulating and solving mine planning & scheduling problems.
- Identify, analyze and solve mining problems.
- Acquire knowledge and hands-on competence in applying the concepts in the development of mine planning

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VII<sup>th</sup> Sem.**  
**Subject: - Computer application in Mining**

**Branch: - Mining Engineering**  
**Code : - BT 7641**

**Unit 1**-Introduction to Software Packages Applicable to Mining

**Unit 2**-Development of Algorithms Slope stability.

**Unit3** - Pillar design. Open pit configuration. Design of mine ventilation system. Optimisation of cycle of operations.

**Unit4** -Blast design. Simplex technique for mining. Rock reinforcement design

**Unit 5**-. Modelling of mining pollution phenomena. Management information systems. Development of Programs Simple computer programs based on the above algorithms.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VII<sup>th</sup> Sem.**

**Subject: - Mine Health and Safety.**

Total Lecture Periods/Week : **3**

Total marks in end semester Exam: **100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code :- BT7643**

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **00**

**Course Objective**

To choose proper fire fighting method for different types of fire.

To be able to perform reopening a sealed off area.

To investigate accidents caused by various types of explosions, fires strata fall and inundation in an underground coal mines.

To perform rescue and recovery works during any accident in the mine.

Mine accidents. Planning for safety. Safety analysis. Safety prevention. Information system and safety audits. Hazard Control - engineering approach, systems approach. Hazard analysis. Safety management. Economics of safety and cost-effectiveness. Occupational hazards in mines- occupational hygiene, occupational diseases.

**References:**

Ridley, J & Channing, J.; Safety at Work; Butterworth-Heineman, Oxford, 2001. Rodgers, W.P.; Introduction to System Safety Engineering; John Wiley & Sons Inc., New York, 1971. Green, A.R.; Safety in Mines Research; A.A. Balkena; Rotterdam; 1985.

**Course outcomes:**

Apply knowledge of mine environment for understanding, and solving problems related with mine accidents.

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**Department of Mining Engineering  
List of Experiment**

**Subject:       Rock Mechanics Lab**  
**Code:         BT766**  
**Maximum Marks: 50**

**List of Practical to be Performed**

1. Determination of moisture content of rock sample by ISRM standard method
2. Determination of density and porosity of rock samples using saturation and caliper techniques.
3. Determination of slake durability strength index of rock sample by ISRM standard method
4. Determination of point load strength index of rock sample
5. Determination of Proto-dyakov strength index of rock sample
6. Determination of Uni-axial Compressive strength of rock sample by ISRM standard method
7. Determination of Tensile strength of rock sample by Brazilian method
8. Determination of Single Shear and Double Shear strength of rock sample
9. Determination of Tri-axial Compressive strength of rock sample by ISRM standard method
10. Determination of Young' Modulus of rock sample by ISRM standard method

**MATS UNIVERSITY  
GULLU, ARANG, RAIPUR**

**Department of Mining Engineering  
List of Experiment**

**Subject: Mine Environment- II Lab**  
**Code: BT765**  
**Maximum Marks: 50**

**List of Practical's to be Performed**

1. Study of erection of sand bag fire stopping
2. Study of working of soda acid fire extinguishers.
3. Study of working of foam extinguishers.
4. Study of erection of German type stone dust barriers
5. Study of erection of Polish type stone dust barriers
6. Study of erection of Double brick fire stopping
7. Study of principal and working of self contained breathing apparatus Dragger 174-A
8. Study of principal and working of Aero lox Liquid oxygen apparatus.
9. Study of principal and working of self rescuers.
10. Study of various types of water dam constructed in U/G mines

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**Department of Mining Engineering  
List of Experiment**

**Subject: Advance surface mining**

**Code: BT-7642**

**Maximum Marks: 50**

**Unit 1- Classification and Basic Parameters**

General information and classification of surface mining methods – associated terms, determination of major dimensions and main parameters. Annual production and life of mine. Surface mining methods – Scope, applicability and limitations.

**Unit 2- Opening of Deposits**

Opening of deposits and formation of benches – trenching, non-trenching and underground methods and their combinations. Width & slope of entry trenches. Driving of opening and entry trenches.

**Unit 3-Overburden Removal**

Systems for removal and disposal of overburden – overcasting haulage and combination methods with scope and limitations. Design of waste dumps.

**Unit 4- Basic Layouts**

Layout planning for horizontal, inclined and steep deposits. Factors influencing the choice of layouts. Design of benches.

**Unit 5-Special Mining Situations**

Quarrying of dimensional stones, hydraulicking, dredging of placers and deep-sea mining. Mining over old underground workings. Ultimate Pit Design Global and



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**Department of Mining Engineering  
List of Experiment**

**Subject: Advance mining geology**

**Code: BT-7644**

**Maximum Marks: 50**

**Unit 1- Geological Time Scale**

Petrology Definition and scope, main classes of rocks forming minerals. Igneous, sedimentary and metamorphic rocks – origin, characteristics, classification, uses and mining importance. Significance of texture and structure of rocks on geomechanical properties of rock mass.

**Unit 2-Stratigraphy**

Definition and scope. Stratigraphic correlation. Standard stratigraphic scale. Fossils – conditions, mode of preservation and uses. Major geological formations of India – Dharwar, Cuddapah, Vindhyan, Gondwana, Tertiary & Quaternary systems and their economic significance.

**Unit 3- Fuel Geology**

Coal and lignite - origin, occurrences, petrography. Structural features of coal-seam. Grades of coal. Occurrences in India. Petroleum and natural gas – formation of gas and oil basins, traps and reservoirs, occurrences in India. Coal bed methane.

**Unit 4- Geohydrology**

Sources of water in mines. Classification of rocks based on porosity and permeability. Water table and types of ground water. Geological controls on ground water movement in mines.

**Unit 5- Environmental Geology**

Geological hazards and their management. Weathering of ore and overburden – environmental complications.

**MATS UNIVERSITY  
GULLU, ARANG, RAIPUR**

**Department of Mining Engineering  
List of Experiment**

**Subject: Advance Mining Machinery**

**Code: BT-7645**

**Maximum Marks: 50**

**Unit 1-Surface and Underground Layout**

Pit top and pit bottom circuits. Surface structures. Surface handling systems – coal and ore handling plants. Storage bunkers. Railway siding. Pit bottom layouts.

**Unit 2-Winding**

Drum and friction winding, headgears, headgear pulleys, cages and skips, suspension gear, keps and guides. Steam and electric winders, safety devices in winders, duty cycle. Automatic winding. Multilevel winding.

**Unit 3-Trackless Haulage**

Types of conveyors and their sequence control. High angle conveyor. Free steered vehicles - shuttle cars, LHD, SDL and low profile dump trucks (LPDT).

**Unit 4-** Aerial Ropeways Types, construction and installation. Loading, unloading and angle stations,

**Unit 5-** Man-riding Systems , Statutory Provisions

**School of Engineering & I.T.**

**MATS University**

**Raipur**



**Syllabus Scheme**  
**(VIII<sup>th</sup> Semester)**  
**For**  
**Bachelor of Technology**  
**In**  
**Mining Engineering**



# MATS UNIVERSITY

## ARANG, RAIPUR (C.G.)



### Scheme of Teaching & Examination

### VIII - Semester

S.N.	code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BT860	Strata Control	4	0	-	70	30	4
2.	BT861X	Professional Elective – III	4	0	-	70	30	4
3.	BT862X	Open Elective – III	3	0	-	70	30	3
4.	BT863	Strata Control Lab	-	-	2	30	20	1
5.	BT864	Major Project Work	-	-	18	120	80	12
		<b>Total</b>	<b>11</b>	<b>0</b>	<b>20</b>	<b>470</b>	<b>230</b>	<b>24</b>

L – Lecture, T – Tutorial, ESE – End Semester Examination,  
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

Professional Elective :

Subject Code	Subject Name
BT8611	Application of Computer, Geographical Information System (GIS) and Remote Sensing (RS) in Mining.
BT8612	Supply Chain Management-Planning
BT8613	Rock Excavation Engineering
BT8614	Fire & Safety Engineering
BT8615	Production Drilling for Oil wells

Open Elective :

Subject Code	Subject Name
BT8621	Engineering System Analysis and Design
BT8622	Engineering System Design Optimization
BT8623	Engineering System Modeling and Simulation
BT8624	Game Theory with Engineering Applications
BT8625	Pollution Control in Mining

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VIII<sup>th</sup> Sem.**

**Subject: - Strata Control**

Total Theory Periods: - **40**

Total marks in end semester Exam: **100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code :- BT 860**

Total Tutorial Periods: **15**

**Course Objective**

To understand characteristics of various materials used as supporting material.

To be able to select the suitable support for any underground mine.

To be able to design support system for any underground mine.

To measure the subsidence for any underground mines.

To understand the ground movement and its controlling techniques.

**UNIT I: SUPPORTS**

Timber & steel supports, Examination of roof, Roof bolting, roof stitching, method of supporting roadways. Supporting under different conditions viz. Pit bottom, crossing, junctions, faulted area, longwall faces, depillaring areas and stoping areas, support loads.SSR, CTR, Support plan, Support withdrawal.

**UNIT II: POWERED SUPPORTS**

Powered supports - their principles of operation, Classification, designation, constructional features and applications, Hydraulic fluids.

**UNIT III : STOWING**

Principal methods of stowing, their relative merits and applicability, Hydraulic stowing,Pneumatic stowing, Mechanical stowing, Hand packing, face arrangements, pipe wear,pipe jams.

**UNIT IV: STRATA CONTROL**

Theories of ground movement, Rock pressure due to Narrow and Wide excavation, Frontabutment and back abutment, Failure of roof and floor, measurement of stratamovement, rock burst, bumps. gas outbursts, pot holes.

**UNIT V: SUBSIDENCE**

Theories of subsidence, damage and loss due to subsidence, vertical and lateral movements and their estimation, angle of fracture and angle of draw, factors affecting subsidence, subsidence control, protection of surface structures, design of protection pillars including shaft pillars. Pot holes.

**References:**

- 1 Strata control in mines : Chaing & Peng
1. Winning and Working of Coal : R. T. Deshmukh& D. J.Deshmukh
2. Modern Coal Mining Practices : R. D. Singh
3. D.G.M.S. Circulars (Tech.) 1995 onwards

**Course outcomes:**

- Acknowledge of strata control for understanding, formulating and solving strata control problem in any underground mine.
- Identify, analyze and solve strata movement problems.
- Acquire knowledge and hands-on competence in applying the concepts in the development of strata control.

**MATS UNIVERSITY**  
**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VIII<sup>th</sup> Sem.**

**Subject: - Pollution Control Engg.**

Total Theory Periods: - **40**

Total marks in end semester Exam: **100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code :- BT 8625**

Total Tutorial Periods: **15**

**Course Objective**

To learn various kind of pollutants and their causes and preventive measures.

To know the salient features of environmental laws in India.

To know the various types of occupational diseases in the mine.

To measure the level of pollution i.e. Noise level, air pollution level etc.

**UNIT I: ENVIRONMENTAL POLLUTION**

Introduction and classification of environmental pollution, ecological conservation. Salient features of the environmental laws in India and Occupational disease.

**UNIT II: AIR POLLUTION**

Air pollution due to various gases and suspended particulate materials, causes, consequences, preventive measures, dust sampling equipments.

**UNIT III: WATER POLLUTION**

Water pollution, its causes and preventive measures, acid-mine drainage, water pollution in mines and mineral beneficiation plants, water purification schemes in brief.

**UNIT IV: LAND POLLUTION**

Land scape pollution and land reclamation, methods of land reclamation.

**UNIT V: NOISE POLLUTION**

Pollution due to noise and its consequences, noise produced by different machinery, control and safety, measurement of noise levels.

**Reference Books :**

1. Air & Water Acts
2. Forest Conservation acts
3. Legislation in Indian Mines – A Critical appraisal by Rakesh and Prasad
4. Env. Impact of Mining By Down and Stokes

**Course outcomes:**

- Apply knowledge of pollution control for understanding and solving different types of environmental pollution problem in any mine.
- Identify, analyze, control and solve environmental pollution problems

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**GULLU, ARANG, RAIPUR**

**Semester: B.Tech. VIII<sup>th</sup> Sem.**

**Subject: - GIS & Remote Sensing in Mining**

Total Theory Periods: - **40**

Total marks in end semester Exam: **100**

Minimum Number of Class test to be conducted: **02**

**Branch: - Mining Engineering**

**Code : - BT 8611**

Total Tutorial Periods: **15**

**Course object :**

To improve knowledge about remote sensing, Hardwares and Softwares related to Remote Sensing, Raster based GIS ,Vector based GIS,Data Capture and Basic Operations of Spatial Analysis

**UNIT I:**

Introduction to Remote Sensing: Terminology In Remote Sensing, Types Of Remote Sensing,Advantages And Disadvantages Of Remote Sensing Data, Electromagnetic Radiation, Atmospheric Windows, Remote Sensing Platforms And Sensors Systems, Path-Row Referencing System, Remote Sensing Data Product, Procedure For Obtaining Satellite Data. Hardwares and Softwares related to Remote Sensing.

**UNIT II:**

Image Interpretation And Analysis: Elements of Visual Image Interpretation, Digital Image Pre-Processing, Radiometric Correction, Geometric Correction, Resolution Of Remote Sensing Data, Image Enhancement, Contrast Enhancement, Spatial Filtering, Band Ratioing Image Classification, Supervised And Unsupervised Classification. Remote Sensing Applications in Forestry, Geology, Hydrogeology, Landuse and Land Cover Mapping.

**UNIT III:**

Fundamentals of GIS: Basic Concepts including Definition and History of GIS, Essential Elements of GIS, Uses and Users of GIS, General GIS Applications, Advantages of GIS. Geodesy, Grids, Datum's and Projection Systems, GIS Data Formats, GIS Layers and Digitization. Overview of GPS and its Applications. Hardwares and Softwares related to GIS.

**UNIT IV:**

Raster and Vector Based GIS: Raster based GIS, Definition and Concept of Raster Based GIS, Spatial Referencing, Definition and Representation of Raster Data. Vector based GIS, Definition and Concept of Vector Based GIS, Data Structures, Data Capture and Basic Operations of Spatial Analysis, Advantages and Disadvantages in Raster and Vector Based GIS, Introduction to Networks in GIS. GIS-Project Planning, Management and Implementation.

**UNIT V:**

Application of computers in mining



## Reference Books

Digital Image Processing - R.C. Gonzalez & R.E. Woods Pearson Edu. Asia  
Principles of Geographical Information Systems- P.A. Burrough& R.A. McDonnell Oxford  
Text Book of Remote Sensing - C.S.Agawal&P.K.Garg Wheeler  
Remote Sensing of The Environment - J.R. Jensen Pearson Education  
Dictionary of Remote Sensing - S. M. Rashid  
Introduction to GIS - I. Heywood, S. Cornelius & S. Carver Pearson Edu. Asia  
Introduction to GIS - Demers

**Course outcomes:** learners know about , Electromagnetic Radiation, Remote ,Sensing Data Product ,Spatial Filtering ,Band Rationings Image Classification GIS-Project Planning, Management and Implementation.

## **Department of Mining Engineering List of Experiment**

**Subject:        Strata Control Lab**  
**Code:           BT-863**  
**Maximum Marks: 50**

### **List of Practical to be Performed:**

1. Study of Conventional support systems.
2. Study of constructional features and working of Friction props
3. Study of constructional features and working of hydraulic props
4. Study of methods to support roof by roof bolts, roof stitching and cable bolts
5. Study of withdrawal of supports by Sylvester prop withdrawer
6. Study of methods to support junctions and faulted area
7. Study of constructional features and working of powered supports
8. Study of Hydraulic stowing System and the arrangement required for it
9. Study of pneumatic stowing System and the arrangement required for it
10. Study of Subsidence measurement techniques.

## Department of Mining Engineering List of Experiment

**Subject: Major Project**  
**Code: BT-864**  
**Maximum Marks: 200**

### Guidelines

#### **Allocation of project:.**

1. Information regarding broad area must be made available to the students well in advance (may be during previous semester).
2. Information must cover following parameters.
  - I. **Broad area:** Subject or expertise/application area.
  - II. **Required skills:** Knowledge of subject(s), software, tools & other characteristics.
  - III. **Type of project:** Hardware, software, design, survey, study based etc.
  - IV. **Guide available:** Name of Guide (S) from Department & Institute.
  - V. **Other related information** depending upon specific branch & institute.
3. It is also recommended to give proper counseling to pick up suitable project.
4. Students must get chance to select projects as per their choice or decided mutually between students and department faculty (HOD) concern.
5. One project group must contain maximum four students, however students can do project individually but it should be approved by department.
6. Compiled list of projects must be submitted to the University within 25 days of start of semester.
7. Compiled list may contain following parameters.

Sr. No.	Title of Project	Name of Students	Name of Guide

Name of HOD  
Signature of HOD

Signature of Principal

#### **Monitoring of project:**

1. It is recommended to give projects as per the specializations of existing faculty of the department instead of outside person/agency.
2. Project must be allocated, developed and monitored by department / institution itself, but not by outside agencies.
3. Regular review by guide is recommended to ensure development & contribution of students.

**Internal Evaluation & Submission of project:**

1. Evaluation of project would be as per the examination scheme of the University, which is based on internal as well as external evaluation.
2. Internal assessment requires submission of project report for getting approved by the concern authority. However printing and binding would be as per the conventional format.
3. Evaluation will be based on Live demonstration / presentation and Viva.
4. Final submission of project is expected as,
  - Submission of a copy to the University,
  - One copy to the Institution central library,
  - One copy to the department.

**External Evaluation:**

External assessment of project would be like conduction of practical exams of University, and must be executed as per the norms of practical exams.

*NOTE: Completion of Project outside the department/Institution should not be*

**MATS UNIVERSITY**  
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**Subject: Fire & Safety Engineering**  
**Code: BT-8614**  
**Maximum Marks: 50**

**Unit I Introduction:**

Safety management systems in Indian mining industry; Need for Mine safety; Mine safety statistics.

**Unit II Risk Management:**

Risk Management related terms and definitions; Basic concept of risk; Difference between hazards and risks; Risk components and types, Risk management objectives, Risk management process; Risk analysis objectives in hazardous system life cycle; Functions of a risk manager; Hazards Identification and Risk Assessment (HIRA).

**Unit III Risk Analysis Methods:**

Hazard and Operative (HAZOP) Analysis; Failure Mode and Effect Analysis (FMEA); Failure Mode Effect and Critical Analysis (FMECA); Job Safety Analysis (JSA); Preliminary Hazard Analysis (PHA); Appraisal of advanced techniques fault tree analysis.–

**Unit IV Mine Accident Analysis:**

In-depth study of accidents due to various causes; and Human Behavioral Approach in mine safety. Safety audits and control:

**Unit V**

Safety audit methods;

Training of Miners

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**Subject:       ROCK EXCAVATION ENGINEERING**

**Code:         BT-8613**

**Maximum Marks: 50**

**Unit I Introduction:**

Scope and importance of rock excavation engineering in mining and construction industries; physico-mechanical and geotechnical properties of rocks vis-à-vis excavation method; selection of excavation method. Rock breaking processes: Primary, Secondary and Tertiary, Energy consumption computations

**Unit II Drilling:**

Advances in drilling equipment, pneumatic versus hydraulic, design and operating parameters of surface and underground drilling; evaluation of drill performance; mechanism of bit wear; bit selection; economics of drilling.

**Unit III Blasting:**

Explosives and their selection criteria for rock excavation; blast design for surface excavations and optimisation; advanced blast initiation systems; blast performance evaluation; cast blasting; techno-economic and safety aspects of surface and underground blasting; advances in blast design for underground excavations; contour blasting; computer aided blast designs. Under water drilling and blasting –

**Unit IV Rock Cutting:**

Theories of rock tool interaction for surface excavation machinery rippers, dozers, scrapers, BWE, continuous surface miners, auger drills; theories of ploughs, shearers,–rock tool interaction for underground excavation machinery roadheaders, continuous miners and tunnel boring machines; selection criteria for high pressure water jet assisted–cutting tools; advanced rock cutting techniques

**Unit V Recent Developments**

rock excavation machinery.