MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

ACADEMIC REGULATIONS FOR B. TECH.
(Effective from 2020)

1.0 Vision, Mission and Objectives

1.1 The Vision of the University is "To become a world class center in providing globally relevant education".

The University has identified itself with a mission to provide every individual with a conducive environment suitable to achieve his / her career goals, with a strong emphasis on personality development, and to offer quality education in all spheres of engineering, technology, applied sciences and management, without compromising on the quality and code of ethics.

1.2 Further, the University always strives

To train our students with the latest and the best in the rapidly changing fields of Engineering, Technology, Management, Science & Humanities.

To develop the students with a global outlook possessing, state of the art skills, capable of taking up challenging responsibilities in the respective fields.

To mould our students as citizens with moral, ethical and social values so as to fulfil their obligations to the nation and the society.

To promote research in the field of Science, Humanities, Engineering, Technology and allied branches.

1.3 Aims and Objectives of the University are focused on

Providing world class education in engineering, technology, applied sciences and management.

Keeping pace with the everchanging technological scenario to help the students to gain proper direction to emerge as competent professionals fully aware of their commitment to the society and nation.

To inculcate a flair for research, development and entrepreneurship.

2.0 Admission

2.1. The admission policy and procedure shall be decided from time to time by the Board of Management (BOM) of the University, following guidelines issued by Ministry of Human Resource Development (MHRD), Government of India. The number of seats in each branch of the B.Tech programme will be decided by BOM as per the directives from MHRD, Government of India and taking into account the market demands. Some seats for Non Resident Indians and a few seats for foreign nationals shall be made available.

2.2. (i) Full-Time:

At the time of applying for admission, the candidates should have passed / appeared and be awaiting results of the final examination of the 10+2 system or its equivalent with Mathematics, Physics and Chemistry as subjects of study.

(ii) Lateral Entry:

At the time of applying for admission, the candidates should have a Diploma in Engineering/Technology in the relevant branch of specialization awarded by the State Board of Technical Education, C.G or any other authority accepted by the Board of Management of the University as equivalent thereto.

2.3. The selected candidates will be admitted to the third semester of the B.Tech programme after he/she fulfils all the admission requirements set by the University and after the payment of the prescribed fees.

2.4. In all matters relating to admission to the B.Tech programme, the decision of the Universityand its interpretation given by the Chancellor of the University shall be final.

2.5. If at any time after admission, it is found that a candidate has not fulfilled any of the requirements stipulated by the University, the University may revoke the admission of the candidate with information to the Academic Council.

3.0 Structure of the B.Tech Programme

3.1 The programme of instruction will consist of:

i) A general Core foundation (CF) programme comprising

English;

Basic Sciences (BS) including Physics, Chemistry, Mathematics;

Engineering Sciences (ES), including Materials, Workshop, Drawing, Basics of Electrical/Electronics/Mechanical/Computer Engineering, and Instrumentation;

ii) Compulsory Core courses (CC) consisting of

a. Professional Core (PC), an engineering core programme introducing the students to the foundations of engineering in his/her branch (Department) comprising theory and Practical/ field work/ Mini project/ Project ;

b. Professional Electives (PE) - an elective programme enabling the students to take up a group of courses for specialisation/ interest to him/her in his/her branch (Department);

iii) Engineering Electives (EE) - Engineering electives offered by other engineering departments;

iv) Open Electives (OE) - Courses offered by non-Engineering departments (Humanities and Management Schools) other than communication skills and personality development credit courses;

In addition, a student should satisfactorily complete NSS/NCC/NSO and Professional practice like Seminar and/or Internship in Industry or elsewhere, Soft skill development.

3.2 The complete programme will consist of 4 categories: Core Foundation (CF) consists of English, Basic Sciences, Engineering Sciences; Core Courses (CC) consists of Professional Core (PC), Professional Elective (PE), and Practical/field work/projects; Engineering Elective (EE) and Open Electives (OE) distributed over seven semesters with two semesters per year. The eighth semester may be left for the project work so that the student can take up industrial project.

3.3 All the Professional Electives shall be from VI semester onwards and VIII semester may be left for the project work.

3.4 The Open Elective shall start from IV semester.

3.5 Every B. Tech. Programme will have a curriculum and syllabi (course contents) approved by Academic Council.

3.6 Credits are assigned to the courses based on the following general pattern:

- One credit for one hour/week/Semester for *Theory/Lecture (L)* or *Tutorials (T) Courses;* and,
- One credit for three hours/week/Semester for *Laboratory/Practical (P) Courses;*
- *One credit for 4 weeks of Industrial Training and*
- *One credit for 4 hours of project per week per semester.*

NOTE: Other student activities not demanding intellectual work or enabling proper assessments like, practical training, study tour and guest lecture not to carry *Credits;*

Practice Lectures (hrs/wk/Sem.)	Tutorials (Hrs/wk/Sem.)	Practical Work (Hrs/wk/Sem.)	*Credits* (L: T: P)	Total *Credits*
3	*0*	*0*	*3:0:0*	*3*
3	*1*	*0*	*3:0:0*	*4*
2	*1*	*0*	*2:1:0*	*3*
2	*0*	*2*	*2:0:1*	*3*
2	*1*	*2*	*2:1:1*	*4*
0	*0*	*3*	*0:0:1*	*1*
0	*0*	*6*	*0:0:2*	*2*

3.7 The curriculum of any branch of the B. Tech. programme is designed to have a minimum total of 180 credits for the award of B. Tech. degree.

3.8 No semester shall have more than six lecture based courses and four laboratory courses as prescribed in the curriculum carrying a maximum of 30 credits, subject to the following:

Students are permitted to register for an additional course for earning additional credits from the Vth semester onwards provided the student have at least 75% in earlier semester without any arrears .

However, in special cases, students of VII semester will be permitted to take two additional subjects to the following conditions:

a) The maximum number of credits registered in any semester shall not exceed 30.

b) No withdrawal from any of the courses for which a student has registered will be allowed, except as per regulation 8.0.

c) The student's Faculty Adviser and Head of the Dept. recommends the same.

4.0 Maximum Duration of the Programme

(i) Full-Time:

A student is expected to complete the B.Tech programme in eight semesters. However, a student may complete the programme at a slower pace, but in any case not more than 12 semesters, excluding semesters withdrawn on medical grounds, etc.

(ii) Lateral Entry:

A student is expected to complete the B.Tech programme in six semesters. However, a student may complete the programme at a slower pace, but in any case not more than 12 semesters, excluding semesters withdrawn on medical grounds, etc.

5.0 Discipline

5.1 Every student is required to observe discipline and decorous behaviour both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the University.

5.2 Any act of indiscipline of a student reported to the Dean (Academic) will be referred to a Discipline Committee so constituted. The Committee will enquire into the charges and decide on a suitable punishment if the charges are substantiated. The committee will also authorize the Dean (Academic) to recommend to the Vice Chancellor the implementation of the decision. The student concerned may appeal to the Vice Chancellor whose decision will be final. The Dean (Academic) will report the action taken at the next meeting of the Council.

5.3 Ragging of any form is a criminal and non-bailable offence in our country. The current State and Central legislations provide for stringent punishment including imprisonment. Once the involvement of student(s) is established in ragging, the offending student(s) will be dismissed from the institution. Every senior student of the institute, along with the parent, shall give an undertaking every year in this regard and this should be submitted at the time of enrolment.

6. Declaration of results

6.1 (i) A candidate who secures not less than 40% of total marks prescribed for a course with a minimum of 45% of the marks prescribed for the end semester examination shall be declared to have passed the course and earned the specified credits for the course.

6.2 After the valuation of the answer scripts, the tabulated results are to be scrutinized by the Result Passing Boards of UG programmes constituted by the Vice-Chancellor. The recommendations of the Result Passing Boards will be placed before the Standing Sub Committee of the Academic Council constituted by the Chancellor for scrutiny. The minutes of the Standing Sub Committee along with the results are to be placed before the Vice-Chancellor for approval. After getting the approval of the Vice-Chancellor, the results will be published by the Controller of Examination/Registrar.

6.3 If a candidate fails to secure a pass in a course due to not satisfying the minimum requirement in the end semester examination, he/she shall register and re-appear for the end semester examination during the following semester. However, the sessional marks secured by the candidate will be retained for all such attempts.

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SCHOOL OF ENGINEERING & I.T.

PROGRAMME OUTCOME:

These 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 pro
2. blems.
3. An ability to identify, critically analyzes, formulate and solve engineering problems using principles of mathematics, sciences, and engineering sciences.
4. An ability to select appropriate engineering tools and techniques and use them with skill and proficiency.
5. An ability to use the modern tools, resources and IT tools for complex engineering problems.
6. 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.
7. An ability to create and conduct experiments, interpret data, design of experiments and provide well informed conclusions.
8. 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.
9. 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.
10. An ability to function professionally with ethical response ability as an individual as well as in multidisciplinary teams with positive attitude for engineering practice.
11. An ability to communicate effectively on complex engineering activities and effective documentation.
12. An ability to appreciate the importance of goal setting and to recognize the need for life-long learning for technological change.
13. An ability to become a good mining engineer to give good and safe working condition to the workers and employees.

PROGRAMME SPECIFIC OUTCOMES:

1. Professional

Ability to utilize the knowledge of mining/aerospace engineering in innovative, dynamic and challenging environment for design and development of new technology or concept.

2. Industrial skills

Ability to impart knowledge through simulation language skills and general purpose CAD/CAE packages to solve practical, design and analysis problems of components to complete the challenge of airworthiness for flight vehicles.

3. Practical implementation and testing skills

Providing different types of in house training and industry practice to develop and test the experimental setup for products with more innovative technologies.

4. Successful career and entrepreneurship

To prepare the students with broad aerospace knowledge to design, developed systems and subsystems of aerospace to become technocrats and entrepreneurs.

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Scheme of Teaching & Examination

I - Semester

S. No.	Code	Subject	Periods per Week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1	BT100	Engineering Mathematics – I	3	1	-	70	30	4
2	BT101	Engineering Physics	3	1	-	70	30	4
3	BT102	Programming for Logic Building	3	0	-	70	30	3
4	BT103	Engineering Graphics & Design	2	0	-	70	30	2
5	BT104	Environmental Sciences	1	0	-	70	30	1
6	BT105	Technical English	2	0	-	70	30	2
7	BT106	Engineering Physics Laboratory	-	-	2	30	20	1
8	BT107	Programming & Soft Skills Laboratory	-	-	2	30	20	1
9	BT108	Engineering Graphics & Design Laboratory	-	-	4	30	20	2
10	BT109	Communication Skills Laboratory	-	-	2	30	20	1
11	BT 110	Manufacturing Practices – I Laboratory	-	-	4	30	20	2
		Total	**14**	**2**	**14**	**570**	**280**	**23**

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

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SCHOOL OF ENGINEERING & I.T.

Semester	:	I B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Engineering Mathematics-I
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BT 100

COURSE 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-I MATRICES

Real vector space, Subspace, Linear span, Linear dependence and linear independence of vectors, Basis, Dimension, Linear transformation, Matrix associated with a linear transformation, Rank and inverse by elementary transformation (Gauss Jordan method), System of linear equations, Eigenvalues and eigenvectors, Cayley-Hamilton theorem, Diagonalization of matrices.

UNIT- II DIFFERENTIAL CALCULUS

Successive differentiation, Lebnitz theorem, Rolle's Theorem, Taylor's theorem with Lagrange's form of remainder, Expansions of functions in Taylor's and McLaurin's series

UNIT-III PARTIAL DIFFERENTIATION

Functions of two variables: Limit, continuity and partial derivatives, derivatives of higher order, Euler's theorem on homogeneous functions, Total derivative, Change of variables, Jacobians, Maxima, minima and saddle points of functions of two variables

UNIT-IV ORDINARY DIFFERENTIAL EQUATION

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations of first order and higher degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Ordinary differential equations of higher order linear differential equations with constant coefficients & variable coefficients, method of variation of parameters, Cauchy-Euler equation, Legendre polynomials and their properties

UNIT-V MULTIPLE INTEGRAL

Beta and Gamma functions – elementary properties, Double and triple integrals, change of order of integration, Application to area and volume.

OUTCOMES:

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

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-ll –Pune VidyarthiGrihaPrakasan, Pune.
4. Integral Calculus by Gorakh Prasad-Pothisala Private Limited.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	I B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Engineering Physics
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BT 101

COURSE OBJECTIVES:

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

UNIT –I THEORY OF RELATIVITY SPACE

Time and motion, frame of reference, Galilean Transformation Outline of relativity, Michelson-Morley experiment, Special theory of Relativity, transformation of space and time, Time dilation, Doppler effect ,length contraction, addition of velocities, Relativistic mass: variation of mass with velocity, kinetic energy, equivalence of mass and energy, Relation between energy and momentum.

UNIT- II LASERS

Temporal and spatial coherence of light wave Principle of laser, Laser characteristics, components of laser, Principle of Ruby, He-Ne &Nd -YAG lasers, application, basic concepts of Holography (only introductory part, No detail derivation)

FIBRES OPTICS:

Optical fibers: Introduction & advantages, structure & classification, Option of propagation in fiber, attenuation & distortion, acceptance angle and cone, numerical aperture (only introductory part, No detail derivation).

UNIT –III NUCLEAR PHYSICS

Controlled and uncontrolled chain reaction, criteria of critical mass, nuclear reactor and its site selection & numerical ,nuclear forces, Nuclear fusion in stars . Introduction of elementary particles. Electron ballistic: Motion of charged particles in electric and magnetic field. Aston and Bainbridge mass spectrograph.

UNIT -IV WAVE OPTICS

Wedge shaped films, Interferences by division of amplitude: Newton's rings and its applications Interference by division of wave front: Fresnel's bi prism, fringe width, diffraction grating, resolving power of grating,

UNIT-V SOLID STATE DEVICES

Transistor: Input and Output characteristics in CE mode, Transistor as an amplifier, Hartley Oscillator. FET: Input and output characteristics of J-FETs & MOSFETs, Operational amplifiers (Op-Amp).

COURSE 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.

TEXT BOOKS:

1. Gaur and Gupta "Engineering Physics"
2. Avadhanulu and Kshirsagar "Engineering Physics".
3. Verma H.C.: Concepts of Physics, Part-1 & Part-2, BharatiBhawan (P&D)
4. A.K. Tayal: Engineering Mechanics (Statics and Dynamics)

REFERENCE BOOKS:

1. Jenkins and White: "Optics", MeGrew-Hill Book Company.
2. Singh R.B.: "Physics of Oscillations and Waves"
3. Ghatak A.K.: "Optics"
4. Mani and Mehta: "Modern Physics", Affiliated East-West Press Pvt. Ltd, 1998.
5. Sanjeev Puri: Modern Physics, narosa Pub. Co.2004.
6. Azroff: Solid State Physics, Tata McGraw-Hill, 2004.
7. Theraja: B.L., Basic Electronics, S.Chand, 2002.
8. Puri: Digital Electronics, Tata McGraw-Hill, 2002.
9. Millman, J and Halkias: integrated Electronics, Tata MeGraw-Hill, 2004.
10. Tyagrajan and Ghatak: Lasers, Macmillan, 2001

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SCHOOL OF ENGINEERING & I.T.

Semester	:	I B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Programming For Logic Building
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 102

COURSE OBJECTIVE:

- To distinguish and recognize low-level and high-level programming languages
- To know fundamental concepts of structured programming
- To understand logic development
- To design pseudo logic for various programming problems.
- To understand the basic structure of a program including sequence, decisions and looping.
- To design solutions to real world problems using C language.
- To use C language for problem solving and numerical computations.
- To apply computer-programming concepts to new problems or situations.

UNIT-I ELEMENTS OF C LANGUAGE

Tools for Problem Solving: Problem Analysis, Flowchart, Algorithm Development. Top-Down Program Design, Structured Design Approach, Origin of C, Features & Characteristic of C, C Compiler, Character Set, Keywords, Identifiers, Constants, Variables, Input/ Output Statements, Basic Data Types, Operators and Expressions, Basic structure of C programs, A simple C Program.

UNIT-II CONTROL FLOW CONSTRUCTION

Decision making and branching: Simple if statement, if else statement, Nesting of if-else statement, else - if Ladder, Switch statement, Operator, goto statement, Decision making and looping, While statement, Do-While statement, For statement, Jumps in loops, Break and Continue statement.

UNIT-III DEFINING AND MANIPULATING ARRAYS

One Dimensional Arrays: Declaration of Arrays, Initialization of Arrays, Reading and Writing of integer, real and Character arrays, sorting and Searching in Arrays, Multi-Dimensional Arrays, Handling of Character Strings.

UNIT-IV USER DEFINED FUNCTIONS

Syntax of Function, Calling functions, Actual & Formal Arguments, Categories of Functions, Function prototype, Scope Rules: Local & Global variables, Recursion, Recursion vs. iteration, Passing Arguments: call by values & call by reference, passing array to function.

Structures: Declaration and initialization of Structure, Array of structures, Array within structure, structure within structure, Structures and functions, Introduction to unions.

UNIT-V POINTER DATA TYPE AND ITS APPLICATION

Pointer Operator, Pointer Expression, Initialization of pointers, Pointer Arithmetic, Pointer and Function Arguments, Pointer to function, Pointer and Arrays, Pointers and String, Arrays of Pointers, Pointers to Pointers, Dynamic memory allocation.

Files in C: Defining and Opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, Random access to files.

COURSE OUTCOME:

- After completion of the course study, students are going to be in a position to
- Analyze issues and style algorithms in pseudo code.
- Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems
- Read, perceive and trace the execution of programs written in C language.
- Develop confidence for self-education and ability for life-long learning needed for Computer language.
- Write down C program for a given algorithm by means of modular approach.

TEXT BOOKS:

1. The C programming Language, Dennis M Ritchie and Kernighan, PHI.
2. Let us C, Yashwant Kanetkar, BPB Publication.
3. Programming in C, E. Balaguruswamy, TMH.

REFERENCE BOOKS:

1. Programming in C, Byron Gottfried, Schaum's series outline TMH.
2. Programming in C, Ghosh, PHI.
3. Computer Programming in C, V. Raja Raman, PHI.

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Semester	:	I B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Engineering Graphics and Design
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	02
Code	:	BT 103

COURSE 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.

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 and Involutes.

UNIT-II

a) PROJECTION: Introduction, Principle of Projection, method of projection, planes of projection, four quadrants, first and third angle projection and 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.

COURSE 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.

TEXT BOOKS:

1. Bhatt, N.D., "Elementary Engineering Drawing", Charotar Book Stall, Anand
2. George Omura, "Mastering AutoCAD" B.P.B. Publication, New Delhi

REFERENCE BOOKS:

1. Engineering Graphics – Laxminarayanan V. and VaishWanar, R.S. Jain Brothers, New Delhi
2. Engineering Graphics – Chandra, AM & Chandra Satish 1998.
3. Engineering Graphics – K.L. Narayan and P. Kannaih, Tata McGraw Hill
4. A Text book of Engineering Drawing (Plane & Solid Geometry) – N.D. Bhatt & V.M. Panchal, Charotar Publishing House
5. The Fundamental of Engineering Drawing and Graphics Technology – French and Vireck, McGraw Hill.

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Semester	:	I B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Environmental Sciences
Total Theory Periods	:	15
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 104

COURSE OBJECTIVES:

- To create and disseminate knowledge to the students about environmental problems at local, regional and global scale.
- To provide practical training on modern instrumentation and analytical techniques for environmental analyses.
- To sensitize students towards environmental concerns, issues, and impacts of climate change and related mitigation strategies.
- To make the students to apply their knowledge for efficient environmental decision-making, management and sustainable development.
- To prepare students for successful career in environmental departments, research institutes, industries, consultancy and NGOs, etc.

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.

UNIT-V 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.

COURSE OUTCOMES:

- Acquired fundamental knowledge of different aspects of environment and local, regional and global environmental problems.
- Developed environmental monitoring skills, including conduct of experiments and data analysis.
- Obtained exposure to the environmental pollution control technologies.
- Acquired the knowledge and skills needed for the environmental design and management.
- Acquired skills in the preparation, planning and implementation of environmental projects.

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. 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.

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Semester	:	I B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Technical English
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	02
Code	:	BT 105

COURSE 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.

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- nonverbal communication- listening- corelating verbal and nonverbal 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.

COURSE 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.

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 meerabanerjee, ‘developing communication skills’ Macmillan india limited
3. Edger thrope, showickthrope, ‘objective english’ second edition,pearson education,2007

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

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

Semester	:	I B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Engineering Physics Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 106

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.

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Semester	:	I B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Programming & Soft Skills laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 107

LIST OF PROGRAMS:

1. Write a program to take the radius of a sphere as input and print the volume and surface area of that sphere.
2. Write a program to take a 5-digit number as input and calculate the sum of its digits.
3. Write a program to take three sides of a triangle as input and verify whether the triangle is an isosceles, scalene Oran equilateral triangle.
4. Write a program that will take 3 positive integers as input and verify whether or not they form a Pythagorean triplet or not.
5. Write a program to print all the Prime numbers between a given ranges.
6. Write a program to define a function that will take an integer as argument and return the sum of digits of that integer**.**
7. Write a program to define a macro that can calculate the greater of two of its arguments. Use this macro to calculate the greatest of 4 integers.
8. Write a program to define a recursive function that will print the reverse of its integer argument.
9. Write a program to print the sum of first N even numbers using recursive function.
10. Write a program to sort an array using Bubble sort technique.
11. Write a program that will take the elements of two integer arrays of 5 element each, and insert the common elements of both the array into a third array (Set intersection)
12. Write a program to take 5 names as input and print the longest name.
13. Write a program to check whether two given strings are palindrome or not using user defined function.
14. Write a program to find sum of all array elements by passing array as an argument using user define functions.
15. Write a program to convert decimal number to binary number using the function.
16. Write a program to get the largest and smallest element of an array using the function.

17. Write a program to define a structure Student that will contain the roll number, name and total marks of a student. The program will ask the user to input the details of 5 students and print the details of all the students whose total marks is greater than a given value.
18. Write a program to define a union Contact that will contain the members Mobile no and E-mail id. Now define structure Employee that will contain name, roll number, mode of contact (mob/e-mail) and a variable of type Contact as members. The program will ask the user to give the details of two Employees including mode of contact and the contact num/ E-mail. Print the details of both the Employees.
19. Write a program to count vowels and consonants in a string using pointer.
20. Write a program to swap two numbers using pointers.
21. Write a program to find sum of array elements using Dynamic Memory Allocation.
22. Write a program that will ask the user to input a file name and copy the contents of that file into another file.
23. Write a program that will take any number of integers from the command line as argument and print the sum of all those integers.
24. Write a program to process sequential file for payroll data.
25. Write a program to process random file of library data.

Smart Working with MS-Office

MS-Word

a) Creating, editing, saving and printing text documents
b) Font and paragraph formatting
c) Simple character formatting
d) Inserting tables, smart art, page breaks
e) Using lists and styles
f) Working with images
g) Using Spelling and Grammar check
h) Understanding document properties
i) Mail Merge

MS-Excel

a) Spreadsheet basics
b) Creating, editing, saving and printing spreadsheets
c) Working with functions & formulas

d) Modifying worksheets with color &auto formats
e) Graphically representing data : Charts & Graphs
f) Speeding data entry : Using Data Forms
g) Analyzing data : Data Menu, Subtotal, Filtering Data
h) Formatting worksheets
i) Securing & Protecting spreadsheets

MS-PowerPoint

a) Opening, viewing, creating, and printing slides
b) Applying auto layouts
c) Adding custom animation
d) Using slide transitions
e) Graphically representing data : Charts & Graphs
f) Creating Professional Slide for Presentation.

LIST OF EQUIPMENT'S / MACHINE REQUIRED:

PCs, C-Compiler, C Online Compiler, Microsoft Office (version 2007 or above)

COURSE REFERENCES:

1. Programming in ANSI C – E. Balaguruswamy Tata Mc-Gcraw Hill.
2. Let us C, YashwantKanetkar, BPB Publication
3. C: The Complete Reference, Herbert Schildt, McGraw Hill.
4. Office 2007 for Dummies, Wallace Wang, Wiley Publishing
5. MS-Office 2010 Training Guide, Satish Jain/M.Geeta/Kratika, BPB Publications

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

Semester	:	I B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Engineering Graphics and Design Laboratory
Total Theory Periods	:	60
Total Tutorial Periods	:	00
Total Credits	:	02
Code	:	BT 108

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 modifies 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.

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

Semester	:	I B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Communication & Soft Skills Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 109

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.
9. 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.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	I B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Manufacturing Practices-I Laboratory
Total Theory Periods	:	45 + (15 Instructional Periods)
Total Tutorial Periods	:	00
Total Credits	:	02
Code	:	BT 110

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 an 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 ascracks, 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

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Scheme of Teaching & Examination

II - Semester

S. No.	Code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BT200	Engineering Mathematics –II	3	1	-	70	30	4
2.	BT201	Engineering Chemistry	3	-	-	70	30	3
3.	BT202	Basic Electrical & Electronics Engineering	3	-	-	70	30	3
4.	BT203	Object Oriented Programming	3	-	-	70	30	3
5.	BT204	Constitution of India, Professional Ethics and Human Rights	1	-	-	70	30	1
6.	BT205	Professional Elective	3	-	-	70	30	3
	BT2051	Fundamental of Mechanical Engineering (For Aero/Mech/Mining/Civil)						
	BT2052	Introduction to Scripting (For CSE/Elex/Electrical)						
7.	BT206	Engineering Chemistry Laboratory	-	-	2	30	20	1
8.	BT207	Basic Electrical & Electronics Engineering Laboratory	-	-	2	30	20	1
9.	BT208	Advance Programming Laboratory	-	-	2	30	20	1
10.	BT209	Professional Elective Laboratory	-	-	2	30	20	1
	BT2091	Fundamental of Mechanical Engineering Laboratory (For Aero/Mech/Mining/Civil)						
	BT2092	Java Script Laboratory (For CSE/Elex/Electrical)						
11.	BT210	Manufacturing Practices – II Laboratory	-	-	4	30	20	2
Total			**16**	**1**	**12**	**570**	**280**	**23**

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

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

MATS School of Engineering &I.T

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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

COURSE OBJECTIVES:

- To make the scholars perceive the series analysis could be a powerful methodology wherever the formulas square measure integrals and to possess information of increasing periodic functions that explore sort of applications of Fourier series.
- To possess intensive information of PDE those arise in mathematical descriptions of things in engineering. To review a few amount which will take any of a given vary of values that will not be foreseen because it is however can be delineated in terms of their likelihood.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To produce a sound background of advanced analysis to perform an intensive investigation of major theorems of complex analysis and to use these ideas to a large vary of issues that features the analysis of each complex line integrals and real integrals.
- 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.

UNIT-I FOURIER SERIES

Fourier series, Even odd function, Half range sine and cosine series, Parseval's theorem, practical harmonic analysis & Fourier Transform

UNIT-II 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 & application of PDE

UNIT-III COMPLEX ANALYSIS

Derivative, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Flow problems, Complex integration, Cauchy theorem, Cauchy integral formula, Taylor & Laurent series, Singularity, Residue

UNIT-IV LAPLACE TRANSFORMATION

Definition, Transform of elementary functions, Properties of Laplace transform, of derivatives & integrals, Multiplication by tn, Division by t, Evaluation of integrals, Inverse Laplace function,

Convolution theorem, Unit step functions, Unit impulse function, periodic function. Application to solution of ordinary differential equations

UNIT-V VECTOR CALCULUS

Directional derivative, Gradient, Divergence and curl, Line, Surface and Volume integrals, Green's, Gauss's & Stoke's theorem (without proof) and applications

COURSE OUTCOMES:

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

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-ll –Pune VidyarthiGrihaPrakasan, Pune

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SCHOOL OF ENGINEERING & I.T.

Semester	:	II B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Engineering Chemistry
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 201

COURSE 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

UNIT-I:

(a) 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.

(b) 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_2 and Li-ion batteries.

(c) FUEL CELLS:

Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H_2SO_4 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, levelers, 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:

(a)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 Fishcher-Tropsch process, reformation of petrol, octane and cetane numbers. Gasoline and diesel knocking and their mechanism, anti-knocking agents, power alcohol & biodiesel.

(b)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 (Tg): Factors influencing Tg-Flexibility, inter molecular forces, molecular mass, branching & cross linking and stereo regularity. Significance of Tg. 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

(a)WATER TECHNOLOGY:

Introduction, boiler troubles with disadvantages & prevention methods-scale and sludge formation, priming and foaming, boiler corrosion (due to dissolved O2, CO2 and MgCl2). 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).

(b)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.

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.

TEXT BOOKS:

1. B.S.Jai Prakash, R.Venugopal, Sivakumaraiah&PushpaIyengar., "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, "Nano chemistry 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.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	II B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Basic Electrical & Electronics Engineering
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 202

COURSE OBJECTIVES:

- Understand the basic concepts of DC and AC circuits.
- Analyse the series, parallel and series, parallel ac circuits.
- Acquire knowledge about working principle, construction and losses of a transformer.
- Understand the working, characteristics and applications of diodes.
- Understand the construction, working, characteristics and applications of a transistor.

UNIT-I D.C. NETWORKS:
Elementary idea about power generation, transmission and distribution. Node voltage and mesh current method. Superposition, Thevenin's and Norton's theorems. Star- delta and Delta- star conversions.

UNIT-II SINGLE PHASE A.C. CIRCUITS:
Single phase EMF generation, Effective & Average values of sinusoids and determination of form-factor, Analysis of simple series R-L, R-C and RLC circuits, power and power factor

UNIT-III
(a) Three Phase AC circuits:
Introduction, Generation of Three-phase EMF, Phase sequence, Connection of Three-phase Windings - Delta and Star connection: Line and Phase quantities, phasor diagrams, Power equations in balanced conditions.
(b)Magnetic Circuits:
Introduction, Magneto motive force (MMF), Magnetic field strength, Reluctance, B-H curve, Comparison of the Electric and Magnetic Circuits, Series-Parallel Magnetic Circuit, Leakage flux and fringing, Magnetic Hysteresis, Eddy currents.

UNIT – IV
(a)Single phase Transformers:
Introduction, Principles of operation, Constructional details, Ideal Transformer and Practical Transformer, EMF equation, Rating, Phasor diagram on no load, Losses, Efficiency calculations.
(b)Direct current machines:
Basic concepts and elementary idea of AC and DC machines, construction and working principal of DC Generator, emf and torque equation dc machine and types of dc motor.

UNIT – V

(a)Semiconductor Devices and Applications

Introduction - Characteristics of PN Junction Diode – Zener Effect - Zener Diode and its Characteristics - Half wave and Full wave Rectifiers - Voltage Regulation. Bipolar Junction Transistor - CB, CE, CC Configurations and Characteristics - Elementary Treatment of Small Signal Amplifier

(b)Digital Electronics Binary Number System – Boolean algebra theorems, Digital circuits - Introduction to sequential Circuits, Flip-Flops - Registers and Counters – A/D and D/A Conversion.

COURSE OUTCOMES:

- Apply the knowledge of basic laws to electric and magnetic circuits.
- Distinguish between various types of representation of ac quantities.
- Draw the phasor diagrams of an ideal and a practical transformer at no load.
- Analyse and design basic circuits which include diode, LED and seven segment display.
- Analyse and design circuits consisting of transistors.

TEXT BOOKS:

V.N. Mittle and Arvind Mittal, “Basic Electrical Engineering”, Second Edition, Tata McGraw Hill.
2 Del Torro, Vincent “Electrical Engineering Fundamentals”, Second Edition Prentice Hall of India Pvt. Ltd.

REFERENCE BOOKS:

1. Fitzrald and Higgonbothom, “Basic Electrical Engineering”, Fifth Edition, McGraw Hill.
2. D.P. Kothari and I.J. Nagrath, “Theory and Problems of Basic Electrical Engineering”, PHI.
3. I.J. Nagrath and D.P. Kothari, ”Electrical Machines”, Tata McGraw Hill.
4. Ashfaq Hussain, “Fundamentals of Electrical Engineering”, Third Edition, Dhanpat Rai and Co.
5. H. Cotton, ”Advance Electrical Technology,” ISSAC Pitman, London. 6. Parker Smith S. (Ed. Parker Smith N.N.), “Problems in Electrical Engineering”, Tenth edition, Asia publication

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Semester	:	II B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Object Oriented Programming
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 203

COURSE OBJECTIVES:

- To learn the object-oriented programming concepts using C++.
- To design and implement C++ programs with the concept of OOP.
- To understand implementation issues related to object-oriented techniques.
- To learn how to build good quality software using object-oriented programming technique.

UNIT-I INTRODUCTION TO OOP AND C++

Concept of Object Oriented Programming, Procedural programming Vs. Object oriented programming (OOP), Features and Benefits of OOPs, Object Oriented Languages, Introduction to C++, C++ Compiler, C++ Standard library, Basics of a typical C++ environment and C++ program, Pre-processors directives, and illustrative simple C++ programs. Header files and namespaces, library files, Data Types, Keywords, Operators and Expressions, Control Structure, Loops, Arrays, Structures, Functions.

UNIT-II CLASSES & OBJECT, CONSTRUCTORS&DESTRUCTORS

Introduction to class, class object creation, Access of class members, Scope of class and its member, Nested class, Data hiding & encapsulation, Friend function, Array within a class, Array of object as function argument, Function returning object, Static member. Constructor function, Parameterized multiple constructor, Default constructor, Dynamic memory allocation with new and delete, Copy constructor, Constant and class, Data conversion between objects of different classes, Destructor function.

UNIT- III INHERITANCE, POINTER, VIRTUAL FUNCTIONS & POLYMORPHISM

Fundamentals of operator overloading, restrictions on operators overloading, operator functions as class members vs. as Friend functions, Overloading, <<, >> Overloading unary operators, overloading binary operators. Introduction to inheritance, Base classes and derived classes, protected members, Casting base class pointers to derived class pointers, Using member functions, Overriding base class members in a derived class, public, protected and private inheritance, Using constructors and destructors in derived classes, Implicit derived class object to base class object conversion, Composition Vs. Inheritance. Introduction to virtual functions, Abstract base classes and concrete classes, new classes and dynamic binding, virtual destructors, polymorphism, dynamic binding.

UNIT-IV FILE I/O, TEMPLATES& EXCEPTION HANDLING

Files and streams, Creating a sequential access file, Reading data from a sequential access file, Updating sequential access files, Random access files, creating a random access file, Writing data randomly to a random access file, reading data sequentially from a random access file. Stream Input/output classes and objects, Stream output, Stream input, Unformatted I/O (with read and write), Stream manipulators. Function templates, Overloading template functions, Class template, Class templates and non-type parameters, Templates and inheritance, Templates and friends, Templates and static members. Basics of C++ Exception handling: Try Throw, Catch, Throwing an exception, catching an exception, rethrowing an exception, Exception specifications, processing unexpected exceptions.

UNIT-V OOPS CONCEPTS WITH PYTHON

Python Basics, Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types. Creating classes and objects, inheritance in python.

COURSE OUTCOME:

- After completion of the course study, students will be able to
- Explain the basics of Object Oriented Programming concepts.
- Design and develop a C++ program with concept of Object Oriented Programming.
- Apply the object initialization and destroy concept using constructors and destructors.
- Apply the concept of polymorphism to implement compile time polymorphism in programs by using overloading methods and operators.
- Use the concept of inheritance to reduce the length of code and evaluate the usefulness.
- Apply the concept of run time polymorphism by using virtual functions, overriding functions and abstract class in programs.
- Use I/O operations and file streams in programs.
- Make an application/project using C++.

TEXT BOOKS:

1. Object Oriented Programming in C++, Robert Lafore, CourseSams Publishing.
2. Object Oriented Programming with C++, E. Balagurusamy, McGraw Hill Education.
3. Python 3 Object-Oriented Programming - Third Edition

REFERENCE BOOKS:

1. The Complete Reference C++, Herbert Schildt, McGraw Hill Education.
2. Let Us C++, YashavantKanetkar, BPB Publication.
3. Programming with C++, John R. Hubbard, Schaum's Outlines, McGraw Hill Education.
4. Programming with C++, D. Ravichandran, McGraw Hill Education.
5. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

MATS UNIVERSITY
ARANG, RAIPUR (C.G.)

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 204

COURSE OBJECTIVES:

- To assimilate and get familiarized with basic information about Indian constitution and provide overall legal literacy to the young technocrats to manage complex societal issues in the present scenario.
- To identify their individual roles and ethical responsibilities towards society.
- To understand engineering ethics & responsibilities, through the learning of these topics students will be able to understand human rights/ values and its implications in their life.

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 PROFESIONAL ETHICS

Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.

COURSE OUTCOMES:

- At the end of the course students will be able to...
- Understand the meaning and importance of Constitution

- Explain about making of Indian Constitution - contribution of Constituent assembly on it.
- Describe the Salient (Outstanding) features of Indian Constitution.
- Describe the importance of Preamble of the Indian Constitution and its significance.

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.

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ARANG, RAIPUR (C.G.)

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

Semester	:	II B.Tech.
Branch	:	Aero., Aero (Hons) Civil, Mining and Mechanical Engg.
Subject	:	Fundamentals of Mechanical Engineering
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 2051

COURSE OBJECTIVES:

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

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.

COURSE OUTCOMES:

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

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.ShankaraSubramaniyam, Vikas Publications
5. Engineering Mechanics: BasudebBhatytacharya , Oxford

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SCHOOL OF ENGINEERING & I.T.

Semester	:	II B.Tech.
Branch	:	Comp. Sci. and Engg. and CSE(Hons)
Subject	:	Introduction to Scripting
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 2052

COURSE OBJECTIVE:

- Design and develop static and dynamic web pages.
- Familiarize with Client-Side Programming,
- Learn web page validations.
- To design and implement web page scripts.
- To learn how to build good interactive web pages using HTML and Javascript.

UNIT-I INTRODUCTION TO SCRIPTING LANGUAGES

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT-II HTML BASICS

HTML basics, Elements, Attributes and Tags, Basic Tags, Advanced Tags, Frames, Images. Cascading style sheets: Adding CSS, CSS and page layout. JavaScript: Introduction, Variables, Literals, Operators, Control structure, Conditional statements, Arrays, Functions, Objects, Predefined objects, Object hierarchy, Accessing objects.

UNIT-III JAVASCRIPT PROGRAMMING OF REACTIVE WEB PAGES ELEMENTS

Events, Event handlers, multiple windows and Frames, Form object and Element, Advanced JavaScript and HTML, Data entry and Validation, Tables and Forms. Introduction to Python Programming: History of Python, Need of Python Programming, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation, Types - Integers, Strings, Booleans.

UNIT-IV OPERATORS AND EXPRESSIONS

Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations. Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences.

UNIT-V CONTROL FLOW

if, if-else, for, while, break, continue, pass Functions - Defining Functions, Calling Functions, Passing Arguments, Default Arguments, Variable-length arguments, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. Development of sample scripts and web applications. Client Side Scripting, Server-Side Scripting, Managing data with SQL, Cookies, use the cookies, advantages of the cookies and how to create cookies. Introduction to Node.js.

COURSE OUTCOME:

- After completion of the course study, students will be able to
- Explain the basics of websites and Web Pages concepts.
- Design and develop a Web Page with DOM Elements.
- Apply the validation and verification of data at client end.

TEXT BOOKS:

1. Beginning PERL, Curtis Poe, Wrox Publication
2. Sams Teach Yourself HTML, CSS and Java Script, Julie C, Meloni.
3. Javascript by Example, Ellie Quigley, Prentice Hall.
4. Programming Python, Mark Lutz, O'Reilly.

REFERENCE BOOKS:

1. Learning Perl: Making Easy Things Easy and Hard Things Possible 7th Edition, O'Reilly
2. Mastering HTML, CSS &Javascript Web Publishing, Laura Lemay, Rafey Colburn, BPB Publications.
3. Eloquent Javascript, MarjinHaverbeke
4. Programming Javascript Applications, Eric Elliott, O'Reilly Media.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	II B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Engineering Chemistry Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 206

LIST OF EXPERIMENTS

1. Acid-base titration (estimation of commercial caustic soda)

2. Redox titration (estimation of iron using permanganometry)

3. Complexometric titration (estimation of hardness of water using EDTA titration).

4. Preparation and analysis of metal complex (for example thiourea/copper sulfate or nickel chloride/ammonia complexes).

5. Chemical kinetics (determination of relative rates of reaction of iodide with H2O2 at room temperature (Clock reaction).

6. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity).

7. Detection of functional groups in organic compounds.

8. Utilization of paper/thin layer/column chromatographic techniques in the separation of organic compounds

9. Conduct metric titration (determination of the strength of a given HCl solution by titration against a standard NaOH solution).

10. Determine the amount of oxalic Acid and sulphuric Acid/Hydrochloric Acid in one liter of solution given standard Sodium Hydroxide and Potassium Permangate.

11. To determine the Carbonate, Bicarbonate and Chloride contents in irrigation water.

12. Determination of dissolved Oxygen in given sample of water.

13. Determination of calorific value of fuel by Bomb Calorimeter.

14. Determination of Flash Point and Fine Point of Lubricant by Abels and Pensky Martin apparatus.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	II B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Basic Electrical & Electronics Engineering Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 207

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.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	II B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Advance Programming Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 208

LIST OF EXPERIMENT (To perform minimum 10 experiments)

1. Write a program to check whether a given number is Prime or not.
2. Write a program to read number and to display the largest value between two, three or four numbers by using switch-Case statements.
3. Write a program to find sum of first natural numbers : sum= 1+2+3+4+……. 100 by using
   a. for loop b. while loop c. do-while loop
4. Write a program to find sum of the following series using function:
   Sum= $x-(x)^3/3!+(x)^5/5!-\ldots\ldots\ldots..(x)^n/n!$
5. Write a program to read the elements of two matrices & to perform the matrix multiplication.
6. Write a program to swap the contents of two variable by using
   a. call by value b. Call by reference
7. Write a program to perform the following arithmetic operations on complex numbers using structure
   a. Addition of the two complex numbers b. Subtraction of two complex numbers
   c. Multiplication of two complex numbers d. Division of two complex numbers
8. Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.
9. Write an object-oriented program (OOP) using C++ to exchange the private data members of two different functions using friend functions.
10. Write an OOP using C++ to count how many times a particular member function of a class is called by:
    a. A particular object b. Any objects

11 Write an OOP using C++ to define a constructor for a "Date" class that initializes the Date objects with initial values. In case initial values are not provided, it should initialize the objects with default values.

12 Write an OOP using C++ to overload:

a. + Operator b. = operator c. >> operator d. ++ operator

13 Write a C++ program to demonstrate how ambiguity is avoided using scope resolution operator in the following:

a. Single Inheritance b. Multiple Inheritance

14 Write a C++ Program to demonstrate function overloading for swapping of two variables of the various data types (integer, floating-point number and character type).

15 Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

16 Write a C++ program to access the private data of a class by non-member function through friend function where the friend function is declared:

a. in the location of public category b. in the location of private category

c. within the scope of a class definition itself d. defined with inline code subtraction

17 Write a C++ program to demonstrate how a pure virtual function is defined, declared and invoked from the object of derived class through the pointer of the base class.

18 Write a C++ program to open a file and count the number of characters, number of vowels and number of newline characters present in the file.

19 Write a program to copy the contents of one text file to another and display both the files using a text Menu.

20 Create a database of 10 students. The database should contain the name, marks of 5 subjects, aggregate marks, aggregate percentage and division according to the following conditions:

a. Percentage greater or equal to 60 – First division

b. Percentage between 50 and less than 60 – Second division

c. Percentage between 40 and less than 50 – Third division

d. Percentage below 40 – Improvement required

Display the above database of every student in a tabulated form. Implement the above program using Structures, Text-Menu and File I/O operations.

21 Write an OOP using a class template to read any five parameterized data type such as float and integer, and print the average.

22 Write a program for sorting of numbers with Bubble Sort using template function.

23 Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

24 Write a C++ program to read two numbers and find the division of these two numbers using exception handling.

25 Write a C++ program to create a function which take a parameter, if the value of parameter is > 0 then throw integer type, if parameter is = 0, then throw character type, if parameter is < 0 then throws float type exception but for all design use only one catch block.

26 Write a python program for finding biggest number among 3 numbers.

27 Implement Python Script to generate prime numbers series up to n

28 Implement python script to read person's age from keyboard and display whether he is eligible for voting or not.

29 Write a python program to work with classes and objects.

30 Write a python program that makes use of function to display all such numbers, which are divisible by 7 but are not a multiple of 5, between 1000 and 2000.

LIST OF EQUIPMENT/ MACHINE REQUIRED

PCs, Turbo C++ compiler, Online C++ Compiler, Python 3/Python IDE, Online python compiler

REFERENCES:

1. Programming with C++, D. Ravichandran, McGraw Hill Education.
2. Object Oriented Programming with C++, E. Balagurusamy, McGraw Hill Education.
3. Mastering C++, K. R. Venugopal, Mcgraw Hill Education.
4. The Complete Reference C++, Herbert Schildt, McGraw Hill Education.
5. Object Oriented Programming in C++, Robert Lafore, CourseSams Publishing.
6. Let Us C++, YashavantKanetkar, BPB Publication.
7. Head-First Python: A Brain-Friendly Guide (2nd Edition), Paul Barry, Oreilly.
8. Python Programming: An Introduction to Computer Science (3rd Edition), John Zelle,

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

Semester	:	II B.Tech.
Branch	:	Aero., Aero. (Hons.) Civil, Mining and Mechanical Engg.
Subject	:	Fundamentals of Mechanical Engineering Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 2091

LIST OF EXPERIMENTS

Note: MINIMUM TEN NUMBERS OF EXPERIMENTS IS TO BE PERFORMED

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.

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

Semester	:	II B.Tech.
Branch	:	Comp. Sci. and Engg. and CSE(Hons)
Subject	:	Java Script Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 2092

LIST OF EXPERIMENTS

Note: MINIMUM TEN NUMBERS OF EXPERIMENTS IS TO BE PERFORMED

1. Design a HTML page describing your profile in one paragraph. Design in such a way that it has a heading, a horizontal rule, three links and your photo also write three HTML documents for the links.
2. Design HTML page describing your academic career. The page will tell about the degrees, Institutions and your hobbies. Add some lists too**.**
3. Design HTML page demonstrating concept of Internal Hyper-link
4. Design HTML page which gives the list of grocery Items by using Unordered List bullets are of form disc, square and circle.
5. Design a HTML page for partitioning browser window in frames display the different pages in partitioned windows.
7. Design HTML page to partition window, Design in such a way that link clicked in on page can display the corresponding pages in other window.
8. Write a Java script to prompt for users name and display it on the screen.
9. Write a java script program to test the first character of a string is uppercase or not.
10. Write a java script program for pattern that matches e-mail addresses.
11. Write a java script program to check whether a given number is Prime or not.
12. Write a java script function to print an integer with commas as thousands separators.
13. Write a java script program to sort a list of elements using any sorting algorithm.
14. Write a java script for loop that will iterate from 0 to 15. For each iteration, it will check if the current number is odd or even, and display a message to the screen.
15. Write a java script program which compute, the average marks of the following students then this average is used to determine the corresponding grade.
16. Write a java script program to sum the multiple s of 3 and 5 under 1000.
17. To design the scientific calculator and make event for each button using java script.
18. Write a java script program to find sum of first natural numbers : sum= 1+2+3+4+……. 100 by using

a. for loop b. while loop c. do-while loop

19 Write a java script program to find sum of the following series using function:
Sum= $x-(x)^3/3!+(x)^5/5!-\ldots\ldots\ldots..(x)^n/n!$

20 Design HTML form for keeping student record and validate it using Java script.
21 Write programs using Java script for Web Page to display browsers information.

List of Equipment/ Machine Required

PCs, Java script supported Browser, Node.js

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SCHOOL OF ENGINEERING & I.T.

Semester	:	II B.Tech.
Branch	:	All Streams of Engineering
Subject	:	Manufacturing Practices– II Laboratory
Total Theory Periods	:	60(15 Instructional Periods)
Total Tutorial Periods	:	00
Total Credits	:	02
Code	:	BT 210

Note: MINIMUM TEN NUMBERS OF EXPERIMENTS IS TO BE PERFORMED

Machining:
Introduction to machining and common machining operations. Cutting tool materials. Definition of machine tools, specification and block diagram of lathe, shaper, drilling machine and grinder. Common lathe operations such as turning parting, chamfering and facing. Quick return mechanism of shaper. Difference between drilling and boring. Files-material and classification.
Fitting:
Need of fitting, different types of instruments used in fitting shop.
Forging:
Forging principle, materials, operations like drawing, upsetting, bending and forge welding, use of forged parts.

LIST OF EXPERIMENTS

1. Job on lathe with one step turning and chamfering operations
2. Job on shaper for finishing two sides of a job
3. (a) Drilling two holes of size 5 and 12 mm diameter on job used/to be used for shaping.

(b) Grinding a corner of above job on bench grinder
4. Finishing of two sides of a square piece of filling
5. Tin smithy for making mechanical joint and soldering of joints
6. Perform step cutting on mild steel plate.

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Aarang, Raipur (C.G.)

Scheme & Syllabus

(III-Semester)

Bachelor of Technology

Mining Engineering

MATS School of Engineering &I.T.

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Aarang, 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.	BT300	Engineering Mathematics – III	3	0	-	70	30	3
2	BT361	Mechanics of Solids & Fluid Mechanics	3	1	-	70	30	4
3.	BT362	Mining Geology-I	3	1	-	70	30	4
4.	BT363	Mine Surveying-I	3	0	-	70	30	3
5.	BT364	Basics of MiningEngineering	3	0	-	70	30	3
6.	BT305	Universal Human Values	1	0	-	70	30	1
7.	BT366	Mechanics of Solids & Fluid Mechanics Laboratory	-	-	2	30	20	1
8.	BT367	Mining Geology-I Laboratory	-	-	2	30	20	1
9.	BT368	Mine Surveying-I Laboratory	-	-	2	30	20	1
10.	BT369	Mine Development Laboratory	-	-	2	30	20	1
		Total	**16**	**2**	**8**	**540**	**260**	**22**

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

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Aarang, Raipur (C.G.)

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

Semester	:	III B.Tech.
Branch	:	Mining Engineering
Subject	:	Engineering Mathematics-III
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 300

COURSE OBJECTIVE:

- To make the scholars perceive the series analysis could be a powerful methodology wherever the Formulas square measure integrals and to possess information of increasing periodic functions That explores sort of applications of Fourier series.
- To produce information of mathematician remodel of elementary functions together with its Properties and applications to solve normal differential equations.
- To produce a sound background of advanced analysis to perform an intensive investigation of major theorems of complex analysis and to use these ideas to a large vary of issues that features the analysis of each complex line integrals and real integrals.
- To possess intensive information of PDE those arise in mathematical descriptions of things in engineering.
- To review a few amount which will take any of a given vary of values that will not be foreseen because it is however can be delineated in terms of their likelihood.

UNIT-I STATISTICS

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

UNIT-II NUMERICAL SOLUTIONS OF ALGEBRAIC, TRANSCENDENTAL AND SIMULTANEOUS LINEAR EQUATIONS

Errors in numerical computation, Error type, Bisection Method, Regula–Falsi Method, Secant Method, Newton Raphson Method, Direct Methods: Gauss Elimination, Gauss-Jordan &Crout'sTriangularisation Method, Iterative Methods: Jacobi, Gauss-Seidel & Relaxation Methods.

UNIT-III INTERPOLATION AND CURVE FITTING

Finite differences, Forward, Backward & Central Difference Interpolation, Lagrange's method and Newton's Divided Difference method, Principle of Least Squares, Fitting a Straight Line, Fitting a Parabola, Exponential Function, Method of Group Averages.

UNIT-IV NUMERICAL DIFFERENTIATION AND INTEGRATION

Derivatives using Forward, Backward and Central Difference methods, Derivatives using unequally spaced values, Newton-Cote's Quadrature method, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule.

UNIT-V NUMERICAL SOLUTION OF ODE & PDE

Numerical solution of ODE's by Taylor's series method, Picard's method, Euler's method, Euler's modified method, Runge–Kutta methods, Predictor-corrector methods-Milne's method, Adams-Bash forth method.

Numerical solution of PDE's , Classifications of second order PDE, Elliptic equations , solution of Laplace equations, solution of poisons equation, Solution of elliptic equation by relaxation method, Parabolic equations, Solution of one dimensional and 2-D heat equations, Hyperbolic equation, Wave equations.

COURSE OUTCOME:

After completion of this course the students are going to be able to Apply series, transformation, and theory of advanced variable, partial differential equations
and variant to technology issues and solve them. Hands on these Mathematical
topics can build them equipped to organize for higher studies through competitive examinations.

TEXT BOOK

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publications (2007)

REFERENCE BOOK

1. Glyn James, "Advanced Modern Engineering Mathematics, Pearson Education (2007)
2. B. V. Ramana, "Higher Engineering Mathematics" Tata McGraw Hill 2007.
3. N. P. Bali, and Manish Goyal, "A Text Book of Engineering 7th Edition (2007) Lakshmi Publications
4. (P) Limited, New Delhi.

MATS UNIVERSITY

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

Semester	:	III B.Tech.
Branch	:	Mining Engineering.
Subject	:	MOS & FM
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BT361

COURSE OBJECTIVES:

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

UNIT-I CONCEPT OF STRESS AND STRAIN

Stress and strain at a point; Axial and 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 Compassion; Thermal stresses in composite shear stresses' Ultimate an working stresses; Relation between stress and strain' Poisson's Ratio; Two 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.

COURSE OUTCOME:

- The students are expected to enhance the technical knowledge on relation between stress & strain, Mohr's circle, principal stress & principal strain.
- 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.
- The students are expected to possess ability to use the techniques, skills and modern engineering tools necessary for mechanics of solid & fluid mechanics.
- Work effectively as an individual and as a member of multidisciplinary team.

TEXT BOOKS:

1. A text book of fluid mechanics by R. K. Bansal
2. A text book of fluid mechanics and Hydraulic mechanics in SI Units by R. K. Rajput(S. Chand and company)

REFERENCE BOOKS:

1. Strength of Materials – R.K. Rajput (S. Chand & Co.)
2. Mechanics of Materials – B.C. Punamia (Laxmi Publication)

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

Semester	:	III B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Geology-I
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BT362

COURSE OBJECTIVES:

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

UNIT-I EARTH & SPACE.

How elements are formed and finally distributed and concentrated over the Earth at specific places depending on their chemical affinity, Different planets and their structure composition . Internal structure of the Earth and large-scale processes responsible for first order element partitioning.

UNIT-II GEOMORPHOLOGY

What are the tectonic/lithospheric plates and how they shaped the Earth using internal heat source . Geological time scale, relative and absolute dating, and important geological events . Classification of minerals and their formation pathways from magma. How different types of magma and their crystallization process cause element/mineral partitioning

UNIT-III IGNEOUS, SEDIMENTARY & METAMORPHIC PETROLOGY

Classification of Igneous, Sedimentary, and Metamorphic rocks, their texture and properties . Coal: An organic sedimentary rock, its texture, structure, properties and formation through sedimentary processes . Importance of rock type, pressure, and temperature for forming geological structures through brittle-ductile style of deformation.

UNIT-IV STRUCTURAL GEOLOGY.

Classification of the geological structures like fold, faults, dyke, dip-strike, joints etc. and where and how do they form. How knowing the structure of the rock body helps in making a successful exploration strategy

UNIT-V MAPPING

Stereo net and its utility in understanding- interpretation-representing structural data/map. Mineral/coal/petroleum resource map of India and why they are there.

COURSE OUTCOME:

- The students are expected to enhance the technical knowledge on shape, size, mass & density of earth, age of earth, structure of the earth.
- 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
- The students are expected to posses ability to use the techniques, skills and modern engineering
- tools necessary for Engineering Geology.

- Work effectively as an individual and as a member of multidisciplinary team

TEXT BOOKS:

1. Geological Maps : G.W.Chiplonkar
2. A Text Book of Geology : P.K. Mukherjee
3. Structural Geology : M.P.Billings

REFERENCE BOOKS:

1. Principles of Engineering Geology : K.M. Bangar
2. Engineering And General Geology : Parbin Singh
3. Physical And Engineering Geology : S.K. Garg
4. Rutley's Elements of Mineralogy : H.H.Read
5. Principles Of Petrology : G.W.Tyrell

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

Semester	:	III B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Surveying-I
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT363

COURSE OBJECTIVES

- The objective of this course is to give an overview of basic surveying.
- Use of rudimentary tools, fundamental techniques of linear and angular measurements along with its application in mines.

UNIT-I SURVEYING

Definition, objective, classification and principles of surveying. Linear and Angular Measurement – Instruments for measuring distances and angles such as EDM, Total Station, Miner's Dial. Prismatic compass: principle and construction and measurement techniques. EDM equipment; Geodimeter, Tellurometer, Total Station, Distomat, Software

UNIT-II CHAIN SURVEY & COMPASS 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 forsetting out right angles Compass surveying- 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 LEVELLING

Definition of levelling terms; levelling instruments; different types of levelling; booking and reduction methods; differential, profile, cross-sectional and reciprocal levelling; underground levelling; shaft depth measurement. Contouring: Characteristics, methods of contouring and uses of contours; problem solving.

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 adjustmentsof Theodolites; Sources of errors and their prevention.

UNIT-V 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.

COURSE OUTCOME:

- Determine elevation by applying different techniques.
- Deal with the minor instruments and will be familiar with there functioning
- Do transverse computations, detect and rectify errors.
- Understand various type of regulations regarding surveying

TEXT BOOKS:

1. Surveying- Vol.I, by B.C. Punamia
2. Surveying & Labelling. Vol-I by T.P.Kanethar & S.V.Kulkarni.

REFERENCE BOOKS:

1. Metalliferous Mine Surveying : Frederick Winniberg
2. Surveying – by Husain & Nagnas

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SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech.
Branch	:	Mining Engineering.
Subject	:	Basic of Mining Engineering.
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 364

COURSE OBJECTIVES:

- Discuss the various drilling machines are used .for exploratory drilling.
- Explain the drives of inclines, drifts and adits for the opening of the underground mines.
- Explain the drilling, blasting, loading, transportation, ventilation, lightening and drainage operation used in-shaft sinking in the underground mines.
- Discuss the various methods of shaft sinking.
- 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-1 EXPLORATION METHOD AND TECHNIQUES
Various drilling machines viz. Rotary & Percussive drilling technique and their equipment ; Single and double tube Core Barrel; Conditions of applicability of drilling methods; Borehole Survey, Bore hole deviation, Directional drilling, Underground methods of exploratory drilling.

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

UNIT-III UNDERGROUND MINING METHOD
Definition of important terminology, mine development and their planning Activities involved in development of a mine, Mine life, Introduction to unit operations in underground mining. Productivity calculation, methane drainage method, underground coal gasification method, Choice of method of mining, Introduction to various Underground Mining methods Introduction to various types of machineries used in Underground mining.

UNIT-IV SURFACE MINING METHOD
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, spacing and burden, productivity of machineries

UNIT-V 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.

COURSE OUTCOME:

- The students are expected to enhance the technical knowledge on exploratory drilling, drivage of inclines, adits and shaft sinking.

- The students are expected to possess ability to identify, formulate and solve engineering problems in drilling and shaft sinking.
- The students are expected to possess ability to use the techniques, skills, and modern engineering tools necessary for mine development practice.
- Work effectively as an individual and as a member of a multidisciplinary team.

TEXT BOOKS:

1. Modern Coal Mining : Samir Das
2. Coal Mining : R.D.Singh
3. Mining : Boki
4. Introduction to mining:

REFERENCE BOOKS:

1. Surface Mining : G.B. Mishra
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

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

Semester	:	III B.Tech.
Branch	:	Mining Engineering.
Subject	:	Universal Human Values
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 305

COURSE OBJECTIVE:

- Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT-I COURSE INTRODUCTION: NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION

Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration what is it? - and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels, Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT-II UNDERSTANDING HARMONY IN THE HUMAN BEING: HARMONY IN MYSELF

Understanding human being as a co-existence of the sentient 'I' and the material 'body', Understanding the needs of Self ('I') and 'Body': Happiness and Physical facility, Understanding the body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of 'I' with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health, Include practice sessions to discuss the role others have played in making, Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT-III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY: HARMONY IN HUMAN-HUMAN RELATIONSHIP

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values

in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals,Visualizing a universal harmonious order in society- Undivided Society, Universal Order-from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships, Discussion.

UNIT-IV UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE: WHOLE EXISTENCE AS COEXISTENCE

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence, include practice sessions to discuss human being as cause of imbalance and role of technology etc.

UNIT-V IMPLICATIONS OF HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. **Competence in professional ethics:** Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers, At the level of society: as mutually enriching institutions and organizations, Summary, include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g., to discuss the conduct as an engineer or scientist etc.

COURSE OUTCOME:

- By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to- day settings in real life, at least a beginning would be made in this direction.

TEXT BOOK:

1. Human Values and Professional Ethics by R. R. Gaur,R.Sangal, G. P.Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

1. Jeevan Vidya: EkParichaya,A. Nagaraj,JeevanVidyaPrakashan,Amarkantak,1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal

9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

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

Semester	:	III B.Tech.
Branch	:	Mining Engineering.
Subject	:	MOS & FM Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 366

LIST OF EXPERIMENTS

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

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SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mining Geology-I Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 367

LIST OF EXPERIMENTS

1. Megascopic identification and description of Rock Forming Minerals.
2. Megascopic identification and description of important Igneous, Sedimentary, Metamorphic Rocks.
3. Practices on Basic Concept of Contours, Attitude of Beds, Width of Out crop, True and Apparent Dips.
4. Study of Geological Maps, preparation and description of Geological Cross Sections.

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

Semester	:	III B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mining Surveying -I Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 368

LIST OF EXPERIMENTS

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.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Development Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT 369

LIST OF EXPERIMENTS

(At least 10 experiments are to be performed)

1. Study of exploratory drilling by manual and power operated percussive drilling machine.
2. Study of working of diamond drilling machine.
3. Study of different types of drilling tools and bits required for exploratory drilling.
4. Study of Single tube and double tube Core barrel.
5. Study of surface arrangements required during shaft sinking and its cycle of operation.
6. Study of various special methods of Shaft sinking
7. Study of drivage of Incline/Adit by conventional method using drilling and blasting, cycle of operation and calculation of manpower.
8. Study of drivage of Incline using tunnel boring machine.
9. Study of erection of temporary lining during shaft sinking operation.
10. Study of erection of permanent brick/concrete lining during shaft sinking.
11. Study of development of a coal mine by Board & Pillar method.
12. Study of development of a coal mine by Longwall advancing & retreating method.

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Scheme of Teaching & Examination

IV - Semester

S. No.	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	3	0	-	70	30	3
3.	BT462	Mining Geology – II	3	0	-	70	30	3
4.	BT463	Mine Surveying-II	3	0	-	70	30	3
5.	BT464	Mining Geology – II Laboratory	-	-	2	30	20	1
6.	BT465	Mine Surveying-II Laboratory	-	-	2	30	20	1
7.	BT466	Underground Coal Mining Laboratory	-	-	2	30	20	1
8.	BT467	Mine Environment-I Laboratory	-	-	2	30	20	1
9.	BTP6XX	Professional Elective	3	0	-	70	30	3
10.	BTOXX	Open Elective	3	0	-	70	30	3
		Total	**18**	**0**	**8**	**540**	**260**	**22**

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

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

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SCHOOL OF ENGINEERING & I.T.

Semester	:	IV B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Environment-I.
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 460

COURSE OBJECTIVES:

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

UNI- I MINE ATMOSPHERE
Underground and Surface mine pollution, Atmosphere and Mine atmosphere, Mine Gases, Their Origin, Occurrence, Effects and Detection and their presence, 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.

COURSE OUTCOMES:

- 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.
- Work effectively as an individual and as a member of a multidisciplinary team.

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, Vidyasewa Prakashan, 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. Pennman, J.S. Penman, The principles and practice of Mine Ventilation, Charles Griffin.
6. H. Rabia, Mine Environmental Engineering, Entrac Software Pub.

MATS UNIVERSITY

Aarang, Raipur (C.G.)

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

Semester	:	IV B.Tech.
Branch	:	Mining Engineering.
Subject	:	Underground Coal Mining
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 461

COURSE OBJECTIVES

- The basic objective of the course is to provide knowledge of different theories of coal formation, coal classification, methods of coal mining.
- The course will also deal with Bord & Pillar and Longwall method of extraction.
- Thick seam mining and various specialized coal mining methods namely, Room & pillar mining, Shortwall mining, Hydraulic mining and underground gasification of coal.

UNIT-I INTRODUCTION

Theories of Coal Formation, Classification of Coal, Coal Seam and its Classification, Coal Seam Structures and abnormalities, Coal Measuring Rocks and their Characteristics, Distribution of Coal in India, Indian Coal Mining Industry

UNIT-II BORD AND PILLAR METHOD

Development by Bord & Pillar system, Panel & without Panel system, Size and Shape of the Pillar, Galleries, Cycle of Operations, Depillaring, Problems in Depillaring, Preparatory arrangements, Pillar Extraction techniques, Depillaring with Stowing and Caving Methods, Dangers associated with Depillaring, Numerical problems based on bord & pillar system.

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, Variants of Longwall Mining, Numerical problems based on longwall mining

UNIT-IV OVERVIEW OF 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 OVERVIEW OF SPECIAL METHODS OF MINING

Short wall Mining, Room & Pillar mining, Hydraulic Mining, Underground gasification of Coal, Introduction to CBMrecovery

COURSE OUTCOMES:

- Show the knowledge about formation of coal theory
- To understand the various type of coal extraction methods by underground
- To understand the characteristics and applicability conditions of various type of underground mining method.

TEXT BOOKS:

1. Principle and practices of modem Coal Mining by R.D. Singh
2. Coal Mining in India by S.P. Mathur
3. Wining & working coal by R.T. Deshmukh

REFERENCE BOOKS

1. Underground winning of Coal by T.N. Singh
2. Longwall Mining by S. Peng

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SCHOOL OF ENGINEERING & I.T.

Semester	:	IV B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mining Geology-II.
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 462

COURSE OBJECTIVES:

- Discuss the principles of stratigraphy, units of stratigraphy, classification and correlation ofstratigraphy.
- Discuss the important geological formations: Archean's, Cuddaphs, Vindhyans, Gondwanas and Tertiaries.
- Discuss the mode of occurrence, origin, distribution and industrial use of important metallic and non-metallic minerals
- 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 , Vindhyans , 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.

COURSE OUTCOMES:

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

TEXT BOOKS:

1. India's Mineral Resources :S. Krishnaswamy
2. Geophysical Prospecting :M.Dorbin & B. Miller.

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

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Aarang, Raipur (C.G.)

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

Semester	:	IV B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Surveying-II.
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 463

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 Plan &section.

UNIT- I TACHEOMETRY

Principles of Stadia Methods; Determination of constants; Theory of anallactic lens; Distance and elevation formulae, Subtense and Tangential Methods; Auto- Reduction Tacheometer.

UNIT-II CURVE SETTING

Elements, laying of simple circular curves on surface and below ground. Transition curve and super elevation. Development surveys: Setting a point of known coordinate, control of direction and gradient in drifts, tunnels, raises and winzes; application of lasers; Problems of underground traversing.

UNIT-III 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.

UNIT-IV ASTRONOMICAL SURVEY, PHOTOGRAPHIC SURVEYING

Definitions of important terms; Determination of azimuth by astronomical observations.
General Principles; Photo-theodolite; Stereo photographic Surveying; Aerial Surveying -Field of application; Vertical and oblique photographs; Aerial photography; Preparation of photographical maps by simple methods.

UNIT V TRIANGULATION

Classification, reconnaissance, measurement, procedures for angles and base-line Theory of errors: Calculation of most probable values, adjustment of observations.

COURSE OUTCOMES:

- Deal with various aspects of trilateration and triangulation.
- Gain and apply the knowledge of tacheometry, various systems, instruments etc.
- Apply the concepts of photographic and aerial surveying.
- Set out various curves with the field problems.

TEXT BOOKS

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

REFERENCE BOOKS

1. Metalliferous Mine Surveying : Frederick Winniberg
2. Surveying – by Husain & Nagnas

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

Semester	:	IV B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mining Geology -II Laboratory.
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 464

LIST OF EXPERIMENTS

1. Megascopic Description and Distribution of Ore Forming Minerals and Industrial
2. Minerals.Study of Plant Fossils.
3. Study of Advance Geological Maps and Preparation of Cross Sections.

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

Semester	:	IV B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Surveying -II Laboratory.
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 465

LIST OF EXPERIMENTS

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 /Endograph.
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

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

Semester	:	IV B.Tech.
Branch	:	Mining Engineering.
Subject	:	Underground Coal Mining Laboratory.
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 466

LIST OF EXPERIMENTS

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 Longwall Advancing system.
4. Study of layout of Longwall 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.

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

Semester	:	IV B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Environment-I Laboratory.
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 467

LIST OF EXPERIMENTS

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.

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Scheme of Teaching & Examination

V- Semester

S.No.	Code	Subject	Periods per Week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1.	BT560	Mine Ventilation	3	0	-	70	30	3
2.	BT561	Mine Legislation	3	0	-	70	30	3
3.	BT562	Mine Machinery – I	3	0	-	70	30	3
4.	BT563	Surface Mining-I	3	1	-	70	30	4
5.	BT564	Mine Ventilation Laboratory	-	-	2	30	20	1
6.	BT565	Mine Machinery – I Laboratory	-	-	2	30	20	1
7.	BT566	Surface Mining – Laboratory	-	-	2	30	20	1
8.	BT567	Vocational Training & Internship-1	-	-	-	-	50	3
9.	BTP6XX	Professional Elective	3	0	-	70	30	3
		Total	**15**	**1**	**6**	**440**	**260**	**22**

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

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

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

Semester	:	V B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Ventilation
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT-560

COURSE OBJECTIVES

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

UNIT-I VENTILATION SYSTEM

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, Quantity and quality Survey, Various Instrument used for measuring pressure and quantity

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, antitropal, homotropal ventilation, Grahams Ratio, Respiratory Question.

COURSE OUTCOMES

- Learners Get Knowledge About Underground Ventilation System

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. Mutmansky, R. V. Ramani and Y. J. Wang, Mine Ventilation and Air Conditioning, Wiley-interscience, 3rd
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.

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Aarang, Raipur (C.G.)

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

Semester	:	V B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Legislation-I
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT-561

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 mineaccidents

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

COURSE OUTCOME:

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

TEXT BOOKS:

1. Vocational Training Rules L. C. Kaku.
2. Mine Accidents S. J. Kejeriwal

REFERENCE BOOKS:

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

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

Semester	:	V B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Machinery-I
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT-562

COURSE OBJECTIVE

- To choose proper transportation system for shaft, incline and roadways in underground minesdepending 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 WIRE ROPE

Wire ropes used in Mines and their installation, Application of wire ropes in Mines, Testing of wire ropes, Factor of safety, Examination of Wire ropes, Care of wire ropes. Rope splicing: Rope capels

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, andmaintenance and selection, pump fittings, special types of pumps used in mines.

UNIT- IV ARIAL ROPEWAYS

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

UNIT-V HAULAGE

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

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 anddevelopment
- of transportation systems.
- Work effectively with other engineering and science teams.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Handbook of Metalliferous Mining Methods by Y.P. Chacharkar, Lovely Prakashan, Dhanbad
2. Mine Transport by Kerlin

MATS UNIVERSITY

Aarang, Raipur (C.G.)

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

Semester	:	V B.Tech.
Branch	:	Mining Engineering.
Subject	:	Surface Mining-I
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BT-563

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

Classification of surface mining methods, mineral deposits suitable for open pit mining, important parameters of open pit design; design of benches, ultimate pit, stripping ratio, break even 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 DRILLING

Theory of rock drilling, different types of drill machines used in open pits; rotary, percussive and rotary percussive drilling, selection of drill machines on the basis of drillability; computation of productivity of drill machines; inclined drilling; their advantages and disadvantages.

UNIT-III PIT PREPARATION

Development of an open pit mine and its various activities, introduction to site preparation equipment's such as dozers, scrapers, front-end loaders, grader, back hoe, etc.; their construction, machine 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, surface miners, their construction, specifications, machine operation, suitability and applicability; calculation of their productivity.

UNIT-V TRANSPORT IN OPEN PITS

Automobile transport such as dumpers, its various types, applicability and limitations, computation of their productivity; synchronization of shovel dumper combination, automation in open pit transport such as truck dispatch system. rail transport and conveyors; their suitability, in-pit crushing & conveying, high angle conveying, specialized conveying.

COURSE OUTCOMES:

- Apply knowledge of surface mining for understanding, formulating and solving problems relatedwith the opencast mine.
- Acquire knowledge and hands-on competence in applying the concepts in the design anddevelopment of

opencast mine

- Work effectively with other engineering and science teams.

TEXR BOOKS:

1. Surface Mining: G.B. Misra
2. Surface mining equipment: Martin
3. Mining: Boki

REFERENCES BOOKS:

1. Surface Mining : Pfleider
2. Rock slope engg. : Hoek& Bray
3. SME handbook : Hartman
4. Surface Mine Planning & Design : Hustralid&Kuchha

MATS UNIVERSITY

Aarang, Raipur (C.G.)

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

Semester	:	V B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Ventilation Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT-564

LIST OF EXPERIMENTS

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.

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

Semester	:	V B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Machinery -I Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	04
Code	:	BT-565

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 Armoured face Conveyor.

MATS UNIVERSITY

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

Semester	:	V B.Tech.
Branch	:	Mining Engineering.
Subject	:	Surface Mining -I Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT-566

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 ofUltimate 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 shoveldumper 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

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

Semester	:	V B.Tech.
Branch	:	Mining Engineering.
Subject	:	Vocational & Industrial Training Evaluation and presentation
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT-567

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 theknowledge 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.

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

.

MECHANISED OPENCAST METAL MINES:
Iron ore mines in Goa, Malanjkhand Copper Mines of HCL (Madhya Pradesh), Kudremukh Iron Ore Mine(Karnataka), Rampura Agucha Mines of HZL (Rajasthan), Bailadilla Mines of NMDC (Chhattisgarh), any other mechanised opencast mines.

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.

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.

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

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Aarang, 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	3	1	-	70	30	4
2.	BT661	Blasting Technology	3	1	-	70	30	4
3.	BT662	Mine Machinery -II	3	0	-	70	30	3
4.	BT663	Mining Machinery- II Laboratory	-	-	2	30	20	1
5.	BT664	Mineral Dressing Laboratory	-	-	2	30	20	1
6.	BT665	Blasting Engineering Laboratory	-	-	2	30	20	1
7.	BT666	Project-I	-	-	4	70	30	2
8.	BTP6XX	Professional Elective-III	3	0	-	70	30	3
9.	BTOXX	Open Elective-II	3	0	-	70	30	3
			15	**2**	**10**	**510**	**240**	**22**

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

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

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

Semester	:	VI B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mineral Dressing
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BT-660

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, commination-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 ofball 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 FLOATATION
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, Palletisation 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 Indiandeposits.

COURSE OUTCOMES:

- Apply knowledge of mineral dressing for understanding, formulating and solving problems relatedwith mineral dressing.
- Acquire knowledge and hands-on competence in applying the concepts in the design anddevelopment of

machines for separating the low grade ore economically.

- Work effectively with engineering and science teams as well as with multidisciplinary designs

TEXT BOOKS:

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

REFERENCE BOOK:

1. Mineral processing design and operation An Introduction by A. Gupta

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SCHOOL OF ENGINEERING & I.T.

Semester	:	VI B.Tech.
Branch	:	Mining Engineering.
Subject	:	Blasting Technology
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BT-661

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, Precautionsduring blasting

UNIT-V ROCK BREAKAGE MECHANISM
Breakage mechanism, rock fragmentation, Factors affecting rock fragmentation, Back break,overbreak, Fly rock, Ground Vibration, Noise, Control Blasting Techniques.

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 anddevelopment of blast hole.
- Work effectively with other engineering and science teams as well as with multidisciplinary designs

TEXT BOOKS:

1. Explosives and Blasting Technology: G.K.Pradhan
2. Surface Blast Design: C.J.Konya

REFERENCE BOOKS:

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

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Semester	:	VI B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Machinery- II
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT-662

COURSE OBJECTIVE

- To choose proper transportation system for mines depending on the geo-mining conditions of themineral 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, circuitbreakers, remote control (pilot circuit), underground substation, Electrical signalling 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.

COURSE OUTCOMES:

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

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
4. Reference books:
5. UMS Booklet

REFERENCE BOOKS:

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

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SCHOOL OF ENGINEERING & I.T.

Semester	:	VI B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mining Machinery-II Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT-663

LIST OF EXPERIMENTS

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.

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Semester	:	VI B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mineral Dressing Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT-664

LIST OF EXPERIMENTS

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

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SCHOOL OF ENGINEERING & I.T.

Semester	:	VI B.Tech.
Branch	:	Mining Engineering.
Subject	:	Blasting Engineering Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT-665

LIST OF EXPERIMENTS

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.

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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	Rock Mechanics	3	0	-	70	30	3
2.	BT761	Mine Environment-II	3	0	-	70	30	3
3.	BT762	Mine Economics & System Engineering	3	0	-	70	30	3
4.	BT763	Mine Environment-II Laboratory	-	-	2	30	20	1
5.	BT764	Rock Mechanics Laboratory	-	-	2	30	20	1
6.	BT765	Internship	-	-	-	30	20	3
7.	BT766	Project-2	-	-	-	100	50	2
8.	BTP6XX	Professional Elective-IV	3	0	-	70	30	3
9.	BTOXX	Open Elective-III	3	0	-	70	30	3
		Total	**16**	**2**	**8**	**540**	**260**	**22**

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

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

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Semester	:	VII B.Tech.
Branch	:	Mining Engineering.
Subject	:	Rock Mechanics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT-760

COURSE OBJECTIVES:

- To learn various physico mechanical & rheological properties of rock and the rock massclassification.
- To determine the RMR of any mine
- To measure the in-situ stress in the underground mines. Course outcomes.

UNIT-I GEOTECHNICAL INVESTIGATIONS AND CLASSIFICATIONOF ROCK MASS AND SOIL

Engineering properties of intact rock – physico-mechanical, Overview of requirements, methods and analysis of engineering-geological investigation methods, Rock mass classification methods and their applications, Soil classification methods and their applications

UNIT-II CONCEPT OF STRESS, STRAIN AND FAILURE OF ROCK

Analysis of stress, Analysis of strain, Constitutive relations, Parameters influencing strength/stress- strain Behaviours, Failure Criteria for Rock and Rock Mass Classical theories of rock failure: Coulomb's criterion, Mohr's criterion, Griffith's theory, Empirical failure criteria, Behaviour of jointed rock mass, Pre-mining state of Stress Stresses in rockmass, Factors influencing the in situ state
Of stress, estimating in situ stresses; Methods ofStress determination- Hydro fracturing, stressrelief
Methods. Overview of shear strength and compressibility of soil.

UNIT- III ROCK MASS PROPERTIES

Strength and Deformability of Rock Mass In situ shear tests; Evaluation of shear strength; In situ bearing strength test; In situ deformability tests- Plate Loading Test, Plate Jacking Test and Borehole jack tests field measurement of soil properties.

UNIT-IV RESPONSE OF ROCK MASS AND SOIL TO EXCAVATION

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 IN-SITU STRESS

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

1.

COURSE OUTCOME:

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

TEXT BOOKS:

1. Rock Mechanics by B.S. Verma
2. Rock Mechanics by Brady & Brown

REFERENCE BOOKS:

1. Rock Mechanics By Obertabd Duvall
2. Rock Mechanics By Goodman
3. Rock Mechanics By Jager& Cook

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Semester	:	VII B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mining Environment-II
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT-761

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 is 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, firefighting 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 water barriers, 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.

COURSE OUTCOMES:

- Apply knowledge of Health, Safety and Environmental Engineering. 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.

TEXT BOOKS:

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

REFERNCE BOOKS:

1. U/G Mine Env. by Mcpherson
2. Mine fires by Dr. Ramlu

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

Semester	:	VII B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Economics & System Engineering
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT-762

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 SAMPLIMG

Sampling-Methods of sampling, Errors in sampling, analysis of samples, Estimation grade and reserves, salting and precautions against salting, Different types of reserves. Division of mine area into units and sub units, Area, Reserve, Life and Capacity of mine, Panel size, Design of long wall face.

UNIT- II MINE VALUATINON

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

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

UNIT -IV LINEAR PROGRAMMING MODELS

Assumption of linear programming, graphical and simple method of solving linear programming Problems; Basic and Basic feasible solution, optimal solution, interpretation of SIMPLEX table. Primal and dual Problem, Sensitivity analysis.

UNIT-V TRANSPORTATION AND ASSIGNMENT PROBLEM

Transportation problem. Assignment model, Variations on Classical Assignment model; solution algorithm for Assignment problems. Application to mining problems. Project Management with PERT & CPM: Assumption of PERT and CPM; Methods of drawing network; Redundancy and identification of redundant jobs; Critical path calculation, Criticality index; Statistics related to PERT; Probability of completing a project by a due date, Lowest cost schedule: Case studies

COURSE OUTCOMES:

- Apply knowledge of mine economics for understanding, formulating and solving problemsrelated 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.

TEXT BOOK:

1. Mineral Economics by R.T. Deshmukh

REFERENCE BOOKS:-

1. SME Handbook Vol. I
2. Mineral Economics by Sinha and Sharma

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

Semester	:	VII B.Tech.
Branch	:	Mining Engineering.
Subject	:	Mine Environment- II Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT-763

LIST OF EXPERIMENTS

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 Aer- 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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Semester	:	VII B.Tech.
Branch	:	Mining Engineering.
Subject	:	Rock Mechanics Laboratory
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT-763

LIST OF EXPERIMENTS

1. Determination of moisture content of rock sample by ISRM standard method.
2. Determination of density and porosity of rock samples using saturation andcaliper 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-dyakonov 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 Brazalian 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.

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Scheme & Syllabus

(VIII-Semester)

Bachelor of Technology

Mining Engineering

MATS School of Engineering &I.T.

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Scheme of Teaching & Examination

Semester-VIII

S.N.	code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BTP6XX	Professional Elective-V	3	0	-	70	30	3
2.	BTOXX	Open Elective- I V	3	0	-	70	30	3
3.	BT800	Internship/ Training-3	-	-	-	50	20	6
4.	BT860	Project-3	-	-	-	120	80	6
		Total	**6**	**0**	**0**	**310**	**160**	**18**

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

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

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

Semester	:	VIII B.Tech.
Branch	:	Mining Engineering.
Subject	:	Project-3
Total Theory Periods	:	00
Total Tutorial Periods	:	00
Total Credits	:	06
Code	:	BT-860

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.
   - Broad area: Subject or expertise/application area.
   - Required skills: Knowledge of subject(s), software, tools & other characteristics.
   - Type of project: Hardware, software, design, survey, study based etc.
   - Guide available: Name of Guide (S) from Department & Institute.
   - 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 betweenstudents 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 ofsemester.

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 thedepartment 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:

4. Evaluation of project would be as per the examination scheme of the University, which isbased on internal as well as external evaluation.
5. Internal assessment requires submission of project report for getting approved by the concernauthority. However printing and binding would be as per the conventional format.
6. Evaluation will be based on Live demonstration / presentation and Viva.
7. 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, andmust be executed as per the norms of practical exams.

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

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Department of Mining Engineering List of Professional Elective

Code	Subject
BTP601	Disaster Management
BTP602	Engineering Materials
BTP603	Engineering Risk-Benefit Analysis
BTP604	Mine Management
BTP605	Energy Management
BTP606	Small Scale and Dimensional Mining
BTP607	Surface Mining-II
BTP608	Computer Application in Mining
BTP609	Geostatistics
BTP610	Advance Surface Mining
BTP611	Advance Mining Geology
BTP612	Advance Mine Machinery
BTP613	Strata Control
BTP614	Pollution Control in Mining
BTP615	Application of computer, GIS & RS in Mining
BTP616	Underground Metal Mining

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Disaster Management
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-601

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 damageof structures

UNIT-V

Short-term and long-term relief measures.

COURSE OUTCOMES:

- Learners get knowledge about disasters

TEXT BOOKS

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

REFERENCE BOOKS

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

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

Branch	:	Mining Engineering.
Subject	:	Engineering Materials
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-602

COURSE OBJECTIVES:

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

UNIT-IV CONSTRUCTION MATERIALS
Cements–Classification & Properties, Quick Setting Cement, R.C.C., Shot creting, Brick & Stone Masonries, and Application of Fly Ash In Mining.

UNIT-V ENGINEERING BEHAVIOUR OF SOME MATERIALS
Stress- Strain curves of Typical Engineering. Materials, Elastic And Plastic Deformation, Fracture, Fatigue And Creep.

COURSE OUTCOMES:

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

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.

MATS UNIVERSITY

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

Branch	:	Mining Engineering.
Subject	:	Engineering Risk – Benefit
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-603

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, Trade off 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

COURSE OUTCOMES:

- Learners get all knowledge about risk benefit analysis.

TEXT BOOK:

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.

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Mine Management
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-604

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 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 miningenterprises.

UNIT-II 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

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UNIT-III 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-IV 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-V 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.

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.

TEXT BOOK:

1. Mine Management: V. N. Singh , Print Press Dhanbad.

REFERENCE BOOKS:

1. Management & Administration: S.K.Gupta.
2. Introduction to management: O.P. Khanna , Dhanpat Rai Publication.

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Energy Management
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-605

COURSE OBJECTIVE:

- To improve knowledge about energy performance, optimizing input energy requirements.

UNIT -I 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, Fueland Energy substitution.

UNIT -II 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 -III 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 -IV 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 Modelingand Optimization.

UNIT -V ENERGY AUDIT INSTRUMENTS

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

COURSE OUTCOMES:

- Learners know about energy management.

TEXT BOOKS:

1. Industrial Energy Conservation : D.A. Reay (Pergammon Press)
2. Energy Management Handbook – W.C. Turner (John Wiley and Sons, A Wiley IntersciencePublication)

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 (Wieley Eastern)

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Small scale Dimension stone
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-606

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 depositdepending 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 o 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. Environmental Protection measures.

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.

REFERENCE BOOKS:

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

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Surface Mining-II
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-607

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.

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

TEXT BOOKS:

1. Rock slope Engg. : Hoek& Bray
2. SME handbook : Hartman

REFERENCE BOOKS:

3. Surface Mining : G.B. Misra
4. Surface mining equipment : Martin

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Computer Application in Mining
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-608

COURSE OBJECTIVE

- To learn various software packages applicable in Mining.
- To learn about algorithms used in pit design.

UNIT –I Introduction to Software Packages Applicable to Mining

UNIT –II Development of Algorithms Slope stability.

UNIT-III Pillar design. Open pit configuration. Design of mine ventilation system. Optimisation of cycle of operations.

UNIT-IV Blast design. Simplex technique for mining. Rock reinforcement design

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

COURSE OUTCOMES:

- Apply knowledge of surface, Minex mining software for understanding, formulating and solving slope stabilityproblem in any opencast mine & underground mine.
- Identify, analyze and solve design of working operation

TEXT BOOK:

1. Underground Coal Mine Design : RD Singh

REFERENCE BOOKS:

1. Surface Mining Design : S.K. Das
2. Blast Design : GK Pradhan

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Geostatistics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-609

COURSE OBJECTIVE

- To learn various Geostastistics Factors.
- To learn the calculation of Reserve Estimation technique and Kriging.

UNIT-I Introduction to Classical statistics, Histrograms, mean, median, mode, skewness, Kurtosis, standard deviation, variance, confidence interval, normal and lognormal distribution.

UNIT-II Different types of mineral reserves, estimation of grade and reserves, Different techniques of grade estimation, rule of nearest point , constant distance weighting technique and inverse distance weighting technique, method of triangles and polygonal method, bench compositing.

UNIT-III Introduction to Geostastistics, theory of reigonalised variable, application of Geostastistics in mining, Covariogram and semivariogram, definitions and their estimation, Parameters of semivariogram, sill variance, nugget effect, range of influence, zonal and directional anisotropy.

UNIT-IV Mathematical representation of semivariogram and covariogram, Semivariogram models and their characterics, calculation, plotting and fitting of experimental semivariogram.

UNIT-V Volume-Variance relationship, Extension variance and estimation variance, optimal valuation and kriging, Kriging estimator and kriging error, Kriging of a square block valued by two samples, Grade tonnage relationship.

COURSE OUTCOMES:

- Apply knowledge of Geostastistics for understanding, formulating and solving problems related with the Geostastistics.
- Identify analyze and learn various Geostastistics model.

REFERENCE BOOKS:

1. Geostatistics: Runge
2. Basic Geostatistics: Liu

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Advance Surface Mining
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-610

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 CLASSIFICATION AND BASIC PARAMETERS

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

UNIT-II OPENING OF DEPOSITS

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

UNIT-III OVERBURDEN REMOVAL

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

UNIT-IV BASIC LAYOUTS

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

UNIT-V SPECIAL MINING SITUATIONS

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

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.

TEXT BOOKS:

1. Surface Mining: Pfleider
2. SME handbook: Hartman

REFERENCE BOOKS:

1. Surface Mining: G.B. Misra
2. Surface mining equipment: Martin

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Advance Mining Geology
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-611

COURSE OBJECTIVES:

- Discuss the principles of stratigraphy, units of stratigraphy, classification and correlation ofstratigraphy.
- Discuss the important geological formations: Dharwar, Cuddapah, Vindhyan, Gondwana andTertiaries.
- Discuss the mode of occurrence, origin, distribution and industrial use of important metallic and non-metallic minerals
- Explain the Fuel Geology and Geo-Hydrology

UNIT-I 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. Significanceof texture and structure of rocks on geo-mechanical properties of rock mass.

UNIT-II 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-III 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-IV GEO-HYDROLOGY
Sources of water in mines. Classification of rocks based on porosity and permeability. Water table andtypes of ground water. Geological controls on ground water movement in mines.

UNIT-V ENVIRONMENTAL GEOLOGY
Geological hazards and their management. Weathering of ore and overburden – environmentalcomplications.

COURSE OUTCOMES:

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

TEXT BOOKS:

1. India's Mineral Resources :S. Krishnaswamy
2. Geophysical Prospecting :M.Dorbin & B. Miller.

REFERENCE BOOKS:

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

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Advance Mine Machinery
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-612

COURSE OBJECTIVE

- To learn the various layout of mine
- To calculate and analyze basic element of trackless haulage system and aerial ropeway.
- To learn the construction and working of winding system
- To learn the construction and working of man riding system.

UNIT-I 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-II 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-III TRACKLESS HAULAGE

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

UNIT -IV AERIEL ROPEWAYS

Aerial Ropeways Types, construction and installation. Loading, unloading and angle stations.

UNIT-V MAN-RIDING SYSTEM

Man-riding Systems, Statutory Provisions

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.

TEXT BOOKS

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

REFERENCE BOOKS:

1. Handbook of Metalliferous Mining Methods by Y.P. Chacharkar, Lovely Prakashan, Dhanbad
2. Mine Transport by Kerlin

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Strata Control
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-613

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 undergrounds 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, Front abutment and back abutment, Failure of roof and floor, measurement of strata movement, rock burst, bumps. gasoutbursts, 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.

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 ofstrata control.

TEXT BOOK:

1. Strata control in mines by R.D. Singh

REFERENCE BOOKS:

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

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Pollution Control in Mining
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-614

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 ofthe 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 equipment's.

UNIT-III WATER POLLUTION

Water pollution, its causes and preventive measures, acid-mine drainage, water pollution in mines andmineral 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 andsafety, measurement of noise levels.

COURSE OUTCOMES:

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

TEXT BOOKS:

1. Legislation in Indian Mines – A Critical appraisal by Rakesh and Prasad
2. Environmental Impact of Mining By Down and Stokes

REFERENCE BOOKS:

1. Air & Water Acts
2. Forest Conservation acts

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SCHOOL OF ENGINEERING & I.T.

Branch	:	Mining Engineering.
Subject	:	Application of Computer, GIS & RS in Mining
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-615

COURSE OBJECTIVE:

- To improve knowledge about remote sensing, Hardware's and Software's related to Remote Sensing, Raster based GIS ,Vector based GIS, Data Capture and Basic Operations of SpatialAnalysis

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, RemoteSensing Data Product, Procedure For Obtaining Satellite Data. Hardware's and Software's 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, Contract Enhancement, Spatial Filtering, Band Rationing Image Classification,Supervised And Unsupervised Classification. Remote Sensing Applications in Forestry, Geology,Hydrogeology, Land use and Land Cover Mapping.

UNIT-III

Fundamentals of GIS: Basic Concepts including Definition and History of GIS, Essential Elements ofGIS, Uses and Users of GIS, General GIS Applications, Advantages of GIS. Geodesy, Grids, Datum'sand Projection Systems, GIS Data Formats, GIS Layers and Digitization. Overview of GPS and its Applications. Hardware's and Software's 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 Conceptof 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

COURSE OUTCOMES:

- learners know about , Electromagnetic Radiation, Remote ,Sensing Data Product, Spatial Filtering ,Band Rationings Image Classification GIS-Project Planning, Management andImplementation

TEXT BOOKS:

1. Remote Sensing of The Environment - J.R. Jensen Pearson EducationDictionary of Remote Sensing - S. M. Rashid
2. Introduction to GIS - I. Heywood, S. Cornelius & S. Carver Pearson Edu. AsiaIntroduction to GIS – Demerits

REFERENCE BOOKS:

1. Digital Image Processing - R.C. Gonzalez & R.E. Woods Pearson Edu. Asia
2. Principles of Geographical Information Systems- P.A. Burrough& R.A. McDonnell OxfordText Book of Remote Sensing - C.S.Agawal & P.K.Garg Wheeler

MATS UNIVERSITY

Aarang, Raipur (C.G.)

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

Branch	:	Mining Engineering.
Subject	:	Underground Metal Mining
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP-616

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

UNIT-IV STOPING METHODS-II
Shrinkage stoping, Cut and fill stoping, Introduction to Square set stoping, 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.

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

REFERENCE BOOKS:

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