Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

for

B.Tech in Mining Engineering

Semester-III

(Effective from the session: 2022-23)

Four Years B.Tech.Programme

Scheme of Teaching and Examination

B.Tech. Third Semester Mining Engineering

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2022-2023)

S.No	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			Sem End Exam Duration (Hrs)
			L	T	P		Continuous Evaluation	Sem End Exam	Total	
1	BENMN301	Mathematics-III	3	1	-	4	70	30	100	3
2	BENMN302	Engineering Materials	3	1	-	4	70	30	100	3
3	BENMN303	Basics of Mining Engineering	3	1	-	4	70	30	100	3
4	BENMN304	Geology-I	3	1	-	4	70	30	100	3
5	BENMN305	Mining Environment-I	3	1	-	4	70	30	100	3
6	BENMN306	Underground Mining Machinery-I	3	1	-	4	70	30	100	3
7	BENMN304P	Geology-I Lab	-	-	4	1	-	-	50	-
8	BENMN306P	Underground Mining Machinery-I Lab	-	-	4	1	-	-	50	-
	Total Contact hr. per week: 32		**Total Credit: 26**				**Grand Total Marks:**		700	

L: Lecture   T: Tutorial   P: Practical

Course Title	**MATHEMATICS – III**				
Course Code	**BENMN301**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	Mathematics – II				

Course objectives	**This course will enable students to:** • To make the students understand that Fourier series analysis is powerful methods where the formulas are integrals and to have knowledge of expanding periodic functions that explore variety of applications of Fourier series. • To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differentials equations. • To have a thorough knowledge of PDE which arise in mathematical descriptions of situations in Engineering. • To provide a sound background of complex analysis to perform a thorough investigation of major theorems of complex analysis and to apply these ideas to a wide range of problems that includes the evaluation of both complex line integrals and real integrals. • To study about a quantity that may take any of a given range of values that can't be predicted exactly but can be described in terms of their probability.
Course Contents	**UNIT I** **Fourier series and Fourier Transform** Expansion of function as Fourier series, Functions having points of discontinuity, Change of interval, Even & Odd functions, Half-range series, Harmonic analysis, Fourier Transformation, Inverse transformation, Finite cosine and sine transforms. **UNIT II** **Laplace Transform** Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives and integrals, Multiplication by tn, Division by t, Evaluation of Integrals, Periodic functions, Inverse Laplace transform, Convolution theorem, Application of Laplace transform to find solutions of ordinary differential equations. **UNIT III** **Partial Differential Equations** Formation, Solutions by direct integration method, Linear equations of first order, Homogeneous linear equations with constant coefficients, Non-homogeneous linear equations, Method of separation of variables with application in solution of wave, heat and Laplace equations. **UNIT IV** **COMPLEX VARIABLE**

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

UNIT V
Introduction to Probability and Statistics

Definitions of Probability, Conditional Probability, Random Variables, Discrete and continuous probability distributions, Expectation, Mean & Standard deviation, Moment Generating Function, Binomial, Poisson and Normal distributions, Descriptive Statistics: Collection and classification of data, Measure of Central Tendency, Measure of Dispersion, Correlation, Line of Regression.

Course Outcome	**At the end of the course student will be able to:-** 1. Define Fourier series including half range series, Harmonic analysis and variety of its applications. 2. Define (mathematically) Unit step, Unit impulse, Laplace transforms, its properties, Inverse and applications to solve ordinary differential equations. 3. Form and solve by direct integration method Linear equation of first order including Homogeneous and Non-homogeneous Linear equations and also method of separation of variables. 4. Solve difficult problems using theorems of complex analysis and apply Residue theorem to evaluate real integrals. 5. Understand discrete and continuous probability distribution and be able to find mean and standard deviation and use the uniform distribution.
Text Books	1. Higher Engg. Mathematics by Dr. B.S. Grewal– Khanna Publishers. 2. Advanced Engg. Mathematics by Erwin Kreyszig – John Wiley & Sons. 3. Advanced Engg. Mathematics by R.K. Jain and S.R.K. Iyengar – Narosa Publishing House.
Reference Books	1. Applied Mathematics by P.N.Wartikar& J.N. Wartikar. Vol- II– Pune Vidyarthi NGriha Prakashan,Pune 2. Applied Mathematics for Engineers & Physicists by Louis A. Pipes- TMH. 3. Higher Engineering Mathematics by B.V.Ramana , Tata McGraw Hill

Course Title	**ENGINEERINGMATERIALS**				
Course Code	**BENMN302**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	Basics of Computer				
Course objectives	**This course will enable students to:** • Discuss the history and development of C compiler, data types, functions, operators, debugging. • Explain if-else statements, conditional operator, loop control, arrays and pointer. • Explain declaring and defining functions, library function, recursion. • Discuss the reading and writing strings & declaring and using structures. • Discuss the reading and writing the text files through C programs.				
Course Contents	**UNIT-I** **GENERAL** Introduction, Classification of Engineering Materials, Structure of Metals and Alloys, Iron-carbon phase diagram. **UNIT-II** **CONTROL STATEMENTS** If-else, For loop, Do-while loop, While loop, Nested if-else, Arrays: Syntax and definition, One, Two dimensional and multi-dimensional arrays, reading and writing an array, Pointers and arrays, array of pointers. **UNIT-III** **FUNCTIONS** Declaring and defining functions, Storage classes, Function calling, Call by value, Call by reference, Using library functions in programs. **UNIT-IV** **STRINGS** Reading and writing strings, Passing a string into a function, Using library functions to manipulate strings. Structures: Declaring and using structures, Array of structures, Passing structures into function, Unions. **UNIT-V** **FILE HANDLING** Reading and writing text files though C programs, Working with Binary files, Fread and fwrite, Command line arguments, Bitwise operators in C.				
Course Outcome	**At the end of the course student will be able to:-** 1. The students are expected to enhance the technical knowledge on C language 2. The students are expected to possess ability to identify, formulate, and solve				

	engineering problems in data types, functions, operator, arrays, pointer, functions, debugging, structures. 3. The students are expected to possess ability to use the techniques, skills and modern engineering tools necessary for C Programming 4. Work effectively as an individual and as a member of multidisciplinary team.
Text Books	1. Let us C – Yashwant Kanetkar BPB Publication 2. Programming in ANSI C – E. Balaguruswamy Tata Mc-Gcraw Hill
Reference Books	1. Sukumar Bandopadhyay; "Application of the Computers and OperationResearch in the Mineral Industry" Proceedings of the 30th internationalSymposium SME Publication 2002 2. Manuals of different softwares

Course Title	**MECHANICS OF SOLIDS & FLUID MECHANICS**
Course Code	**BENMN303**

Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	Basic Mechanical Engineering				
Course objectives	**This course will enable students to:** • 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 conjugate beam methods. • Study the physical properties of the fluid, compressibility & incompressibility of fluid, Newtonian and Non-Newtonian fluids. • Study the fluid in static and kinematics				
Course Contents	**UNIT–I** **CONCEPT OF STRESS AND STRAIN** Stress and strain at a point; Axial and shear stresses, Ultimate an working stresses; Relation between stress and strain, Poisson's Ratio, Two dimensional state of strain, Principle stresses and Principle planes, Mohr's Circle, Two state of strain, Principle strains and principle axis of strain, Determination of Principle strain from strain measurements, Calculation of Principle stresses from, Principle strains, Composite bars in tension and Compassion, Thermal stresses in composite bars. **UNIT-II** **BENDING STRESSES IN BEAMS AND PLATES** Pure bending, Bending Stresses, Section Modulus of rolled and built up sections, Composite beams, Distribution of normal and shear stresses across the section of a simple beam with vertical section of symmetry, Theory of plates. **UNIT –III** **DEFLECTION OF BEAMS** Slope and deflection of beams by deflection methods, Area moment and conjugate beam methods, Propped cantilever and Fixed beams. **UNIT-IV** **INTRODUCTION TO FLUID MECHANICS & FLUID STATICS** Physical properties of fluids; Compressible and Incompressible fluids; Newtonian and Non- Newtonian fluids. Pressure, density and height relationships; manometer pressure on curved and plane surfaces; Centre of Pressure; Buoyancy; Stability of Immersed and Floating bodies; Fluids in relative equilibrium. **UNIT-V**				

	FLUID KINEMATICS Classification of flow: Uniform and Non-Uniform, Steady and Non- Steady, Laminar andTurbulent, 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	**At the end of the course student will be able to:-** 1. The students are expected to enhance the technical knowledge on relation between stress & strain, Mohr's circle, principal stress & principal strain. 2. The students are expected to possess ability to identify, formulate, and solve engineering problems in bending stresses in beams and plates, deflection of beams and knowledge in fluid statics & fluid dynamics. 3. The students are expected to possess ability to use the techniques, skills and modern engineering tools necessary for mechanics of solid & fluid mechanics. 4. Work effectively as an individual and as a member of multidisciplinary team.
Text Books	1. Strength of Materials – R.K. Rajput (S. Chand & Co.) 2. Mechanics of Materials – B.C. Punmia (Laxmi Publication)
Reference Books	1. A text book of fluid mechanics by R. K. Bansal (Luxmi publication) 2. A text book of fluid mechanics and Hydraulic mechanics in SI Units by R.K. Rajput(S. Chand and company)

Course Title	**MINING GEOLOGY-I**

Course Code	BENMN304				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	Geography				

Course objectives	**This course will enable students to:** • Discuss the size, shape, mass & density of earth, age of earth, internal structure of earth, earthquake and volcanism. • Explain physical properties of the mineral. • Brief discussion of igneous rock, sedimentary rock and metamorphic rock. • Discuss the folds, faults, joints, geological maps.

Course Contents	**UNIT I** **THE EARTH IN SPACE AND TIME** Solar System; Size, Shape, Mass and Density of Earth; A Brief idea of the origin and the age of the Earth; Interior of the Earth- seismic data, Density and Pressure within the Earth; The internal structure and composition of Earth;; Elementary knowledge of Diastrophism, earthquakes and volcanism, Volcanic and earthquake belts, and their relationship with plate tectonics. **UNIT II** **MINERALOGY** Physical Properties of Minerals; Classification of various Rock forming Minerals; Introduction and preliminary study of principle Rock forming Mineral groups - Garnet, Pyroxene, Amphibole, Mica, Feldspar and Felspethoid, Megascopic properties of Economically important non Silicate minerals. **UNIT III** **IGNEOUS AND METAMORPHIC PETROLOGY** Elementary knowledge of Magma and its Crystallization; Classification of Igneous Rocks; Textures and Structures of Igneous Rocks; Petrographic Description of Common Igneous Rocks; Agents and Types of Metamorphism; Depth zones, Facies and Grades of Metamorphism and Petrography Description of Common Metamorphic Rocks. **UNIT IV** **SEDIMENTARY PETROLOGY** Textures and Structures of Sedimentary Rocks; Sedimentary Processes- Weathering, Transportation and Deposition; Classification and Petrographic Description of Common Sedimentary Rocks. **UNIT V**

	STRUCTURAL GEOLOGY Concept of Deformation; Primary and Secondary Planer and Linear structure of Rocks; Topography and its representations; Altitude of strata- Dip and strike; Outcrop patterns; Width of Outcrop and thickness of beds; Structural Contours; Geological Maps; Study of Unconformity; Folds, Joints, Faults and their influence in Mining Operations.
Course Outcome	**At the end of the course student will be able to:-** 1. The students are expected to enhance the technical knowledge on shape, size, mass & density of earth, age of earth, structure of the earth. 2. The students are expected to possess ability to identify, formulate, and solve engineering problems in properties of minerals, structural geology, types of rocks and geological maps 3. The students are expected to possess ability to use the techniques, skills and modern engineering tools necessary for Engineering Geology. 4. Work effectively as an individual and as a member of multidisciplinary team.
Text Books	1. Engineering And General Geology :Parbin Singh 2. Physical And Engineering Geology : S.K. Garg 3. Rutley's Elements of Mineralogy :H.H.Read 4. Principles Of Petrology :G.W.Tyrell
Reference Books	1. Structural Geology :M.P.Billings 2. Geological Maps :G.W.Chiplonkar

Course Title	**MINE SURVEYING-I**

Course Code	BENMN305				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	Knowledge about various survey needed for any type of construction.				
Course objectives	This course will enable students to: • Discuss the chain survey for linear measurements • Explain the compass survey • Discuss the plane table surveying and Miner's Dial • Brief discussion on types of leveling instruments, temporary and temporary adjustment of leveling instruments, trigonometric leveling, reciprocal leveling.				
Course Contents	**UNIT I** **CHAIN SURVEY** Linear Measurements, Types of chains, Tapes, Errors in chaining and corrections in linear measurements, Direct and indirect Ranging, Principles of chain surveying offsets, Limiting length of offsets, Booking field notes, Obstacles in chaining, Instruments for setting out right angles. **UNIT II** **COMPASS SURVEY** Theory of Magnetism, Dip of Magnetic needle, Prismatic Compass, Surveyor's Compass, Bearings, Designation of Bearings, Calculation of Included Angles, Local Attraction, Magnetic Declination, Errors in compass survey. **UNIT III** **LEVELING** Definitions of important terms used in leveling, Development in leveling Instruments, Types and Constructional details, Temporary and Permanent Adjustments, Methods of leveling, Straight edge leveling, Fly leveling, Check leveling, Reciprocal leveling, Longitudinal Sections, Cross-Sectioning, Trigonometric leveling, Methods of booking and reduction of levels. **UNIT IV** **THEODOLITE SURVEYING** Types of Theodolites, Description of various parts of a Vanier Theodolite, Requirements of Mining type Theodolites, Measurements of height and distances of accessible and inaccessible points, Traversing with Theodolite on surface and underground, Checks on Closed and Open traverses, Balancing of traverses, Temporary & Permanent adjustments of Theodolites, Sources of errors and their prevention. **UNIT V** **PLANE TABLE SURVEYING**				

Board of Studies

	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.
Course Outcome	**At the end of the course student will be able to:-** 1. Enhance the technical knowledge on linear measurements by chain surveying & tape surveying, compass surveying and plane table surveying. 2. Identify, formulate, and solve engineering problems in leveling. 3. Use the techniques, skills and modern engineering tools necessary for mine surveying. 4. Work effectively as an individual and as a member of multidisciplinary team
Text Books	1. Surveying Vol. I by B.C. Punmia& Ashok Jain 2. Suverying Vol. II by B.C.Punmia& Ashok Jain 3. Surveying Vol. I by S.K.Duggal 4. Surveying Vol II by S.K.Duggal 5. Mine Surveying Vol I by Ghatak 6. Mine Surveying Vol II by Ghatak
Reference Books	1. Metalliferous Mine Surveying : Frederick Winniberg 2. Surveying and levelling :Kanetkar and Deshpande

Course Title	**Introduction to Mining Engineering**

Course Code	BENMN306				
Course Credits	**L**	**T**	**P**	**TC**	
	3	1	-	4	
Prerequisites	General Science				
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. - Discuss the various types of machinery used in the underground mining and surface mining.				
Course Contents	**UNIT I** **EXPLORATORY DRILLING** Drilling machines used for exploratory drilling viz. Rotary & Percussive, their attachments; Core Barrels; Conditions of applicability of drilling methods; Borehole Survey, Directional drilling, Underground methods of exploratory drilling. **UNIT II** **DRIVAGE OF INCLINES/DRIFTS/ADITS** Types of Openings; Choice of Openings; Location of Openings; Drilling, blasting, Loading and transportation of muck during drivage of inclines/adits/drifts, Ventilation, Lighting and drainage, Extension of center line; Organization and cycle of operations; Mechanized methods of drivages of inclines/adits/drifts. **UNIT III** **SHAFT SINKING** Drilling, blasting, loading and transportation of muck, Ventilation, lighting and drainage, Extension of center line; Shaft lining and its design; Special methods of shaft sinking; Shaft boring; Deepening and widening of shafts, Upward drivage, Organization and cycle of operations. **UNIT IV** **INTRODUCTION TO UNDERGROUND MINING** Definition of important terms, Mine development, Activities involved in development of a mine, Stages in the life of a mine, Introduction to unit operations in underground mining. Choice of method of mining, Introduction to various Underground Mining methods Introduction to various types of machineries used in				

	Underground mining. **UNIT V** **INTRODUCTION TO SURFACE MINING** Definition of important terms, Advantages and disadvantages of surface mining, mineral deposits amenable to surface mining, Various surface mining methods, Introduction to unit operations in surface mining. Introduction to various types of machineries used in surface mining.
Course Outcome	**At the end of the course student will be able to:-** 1. The students are expected to enhance the technical knowledge on exploratory drilling, drivage of inclines, adits and shaft sinking 2. The students are expected to possess ability to identify, formulate and solve engineering problems in drilling and shaft sinking. 3. The students are expected to possess ability to use the techniques, skills, and modern engineering tools necessary for mine development practice. 4. Work effectively as an individual and as a member of a multidisciplinary team.
Text 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
Reference Books	1. Mining of Mineral Deposits :Shevyakov 2. Modern Coal Mining : Samir Das 3. Coal Mining :R.D.Singh 4. Mining :Boki 5. Introduction to mining

Course Title	**Computer ProgrammingLAB**

Course Code	**BENMN302P**			
Course Credits	**L**	**T**	**P**	**TC**
	-	**-**	**4**	**2**
Prerequisites	Basics of Computer			

Course objectives	**This course will enable students to:** • Discuss the history and development of C compiler, data types, functions, operators, debugging. • Explain if-else statements, conditional operator, loop control, arrays and pointer. • Explain declaring and defining functions, library functionand recursion. • Discuss the reading and writing strings & declaring and using structures. • Discuss the reading and writing the text files through C programs.
Course Contents	**LIST OF EXPERIMENTS** 1. Write a program to add 2 numbers. 2. Write a program to print digit in reverse order 3. Write a program to find if a number is even or odd 4. Write a program to find greatest number using if statement 5. Write a program to find greatest number using nested if else 6. Write a program to find if number is perfect number or not 7. Write a program to find prime number 8. Write a program for Lucas series 9. Write a program for Fabonary series 10. Write a program to print Armstrong number

Course Title	**MECHANICS OF SOLIDS & FLUID MECHANICS LAB**

Course Code	BENMN303P				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	
Prerequisites	Basic Mechanical Engineering				

Course objectives	**This course will enable students to:** • 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 conjugate beam methods. • Study the physical properties of the fluid, compressibility & incompressibility of fluid, Newtonian and Non-Newtonian fluids. • Study the fluid in static and kinematics
Course Contents	**LIST OF EXPERIMENTS** 1. Determination of compressive strength of cement cube. 2. Determination of tensile strength of cement cube. 3. Determination of fineness of cement by sieving method. 4. Determination of fineness of cement by Blain Apparatus. 5. To determine Uni-axial tensile test of mild steel. 6. To determine Izod Charpy Value of given mild steel. 7. To determine the Rockwell Hardness of given material. 8. To determine Compressive strength of wood: (a.) Along the fiber and (b.) Across the fiber. 9. To study the cupping test machine and determination of Ericheser value of mild steel sheet. 10. To determine the meta-centric height of a ship model. 11. To calibrate an orifice-meter. 12. To determine the head loss in various pipe fittings. 13. To determine the coefficient of discharge of a mouthpiece. 14. To study the variation of friction factor for pipe flow. 15. To verify the bernoulli's theorem. 16. Angle measurement by repetition method.

	17. Angle measurement by reiteration method.

Course Title	**MINING GEOLOGY I LAB**
Course Code	**BENMN304P**

Course Credits	L	T	P	TC	
	-	-	4	2	
Prerequisites	Geography				
Course objectives	**This course will enable students to:** • Discuss the size, shape, mass & density of earth, age of earth, internal structure of earth, earthquake and volcanism. • Explain physical properties of the mineral. • Brief discussion of igneous rock, sedimentary rock and metamorphic rock. • Discuss the folds, faults, joints, geological maps.				
Course Contents	**LIST OF EXPERIMENT** 1. Identification of Minerals in hand specimen -Asbestos, Augite, Biotite, Calcite, Corundum, Dolomite, Gypsum, Hornblende, Muscovite , Kaolinite Orthoclase, Plagioclase, Quartz, Talc. 2. Identification of Rocks – (i) Granite, Rhyolite, Syenite, Gabbro, Basalt, Trachyte. (ii) Conglomerate, Sandstone, Shale, Limestone. (iii) Slate, Schist, Gneiss, Quartzite, Marble. 3. Geological map reading and drawing simple Geological section - (i) Geological maps of inclined beds. (ii) Geological maps of Unconformity (iii) Geological maps of Folds.				

Course Title	**MINE SURVEYING-I LAB**

Course Code	BENMN305P				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	
Prerequisites	Knowledge about various survey needed for any type of construction.				

Course objectives	**This course will enable students to:**
	• Discuss the chain survey for linear measurements
	• Explain the compass survey
	• Discuss the plane table surveying and Miner's Dial
	• Brief discussion on types of leveling instruments, temporary and temporary adjustment of leveling instruments, trigonometric leveling, reciprocal leveling.

Course Contents	**LIST OF EXPERIMENT**
	1. To take the bearing of given lines and measure the included angles by the verniers of the dial.
	2. To traverse the area by loose needle method with miner's dial.
	3. To traverse a given area by fast needle method with miner's dial.
	4. To sketch and describe a dumpy level.
	5. Use and application of a micro optic level.
	6. Find out the reduced level of different points with a given datum.
	7. To carry out differential levelling and check the work by the levelling.
	8. To draw a longitudinal profile along with a chain line.
	9. To draw a cross section across given chain line.
	10. To draw a contour of given area by direct and indirect methods.
	11. To conduct a complete subsidence survey in a given area.
	12. To calculate the contours of required reduced level and to plot the subsidence work with a suitable scale.
	13. To sketch and describe a transit vernier theodolite.
	14. To measure the horizontal angle by repetition method with a theodolite.