

Shri Rawatpura Sarkar University, Raipur



Examination Scheme & Syllabus for Diploma in Mining Engineering Semester-IV

(Effective from the session: 2022-23)



Faculty of Engineering, Shri Rawatpura Sarkar University, Raipur

Three Years Diploma Programme

Scheme of Teaching and Examination

Diploma Fourth 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		Continuou s Evaluation	Sem End Exam	Total	
1	DENMN401 T	Drilling & Blasting Technology	3	1	-	4	70	30	100	3
2	DENMN402 T	Applied Geology	3	-	-	3	70	30	100	3
3	DENMN403 T	Mine Safety and Legislation	3	1	-	4	70	30	100	3
4	DENMN404 T	Coal Mining Methods	3	1	-	4	70	30	100	3
5	DENMN405 T	Mine Surveying-I	3	-	-	3	70	30	100	3
6	DENMN401P	Drilling & Blasting Lab	-	-	4	1	-	-	50	-
7	DENMN402P	Applied Geology Lab	-	-	4	1	-	-	50	-
8	DENMN405P	Mine Surveying-I Lab	-	-	4	1	-	-	50	-
9	DENMN406P	Industrial Training/Vocational Training	-	-	-	1	-	-	50	-
Total Contact hr per week: 30			Total Credit: 22			Grand Total Marks:			700	

L: Lecture T: Tutorial P: Practical



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Course Title	DRILLING & BLASTING TECHNOLOGY				
Course Code	DENMN401				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	Chemistry				
Course objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Choose proper explosives to different rock beds. • Design and analyze basic element of blast holes in open cast mine and underground mine. • Learn various blasting accessories. • Learn various blasting nuisances. 				
Course Contents	<p>UNIT I COMMERCIAL EXPLOSIVES Commercial Explosives and their properties, Bulk Explosive Systems, Selection of explosive, Transportation and Handling of explosives & Related regulations.</p> <p>UNIT II INITIATION SYSTEM & BLASTING ACCESSORIES Detonators of various types, Detonating cord, Safety fuse, Detonating relays, Non electric initiation and Blasting accessories.</p> <p>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.</p> <p>UNIT IV UNDERGROUND BLAST DESIGN Various cut patterns, U/G blast design, Series & Parallel connection of detonators, Precautions during blasting</p> <p>UNIT V ROCK BREAKAGE MECHANISM Breakage mechanism, rock fragmentation, Factors affecting rock fragmentation, Back break, Over break, Fly rock, Ground Vibration, Noise, Control Blasting Techniques.</p>				
Course Outcome	<p>At the end of the course student will be able to:-</p> <ol style="list-style-type: none"> 1. Apply knowledge of blasting engineering for understanding, formulating and solving blast hole design problems. 2. Acquire knowledge and hands-on competence in applying the concepts in the design and development of blast hole. 				



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	3. 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. Rock Blasting: Sushil Bhandari 2. Indian Explosive Act 1884 3. Legislation in Indian Mines – A Critical Appraisal: Rakesh and Prasad



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Course Title	APPLIED GEOLOGY				
Course Code	DENMN402				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	Geography				
Course objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Mining Engineering is the application of the knowledge of science and other branches of engineering for the extraction of minerals and ores from the surface of the earth or from the underground. • Geology becomes the first step of mining education. • It is essential to know and identify mineral and ore, their modes of occurrences in the earth crust and the formation and deposition of various rocks. 				
Course Contents	<p>UNIT-I PHYSICAL GEOLOGY Solar system, Origin of the earth, Various hypotheses related to origin of earth, Age of the earth, Various methods of age determination, Radioactive methods and their advantages, Interior of the earth – Crust, Mantle and Core, Weathering - Physical weathering and Chemical weathering, Exfoliation and Spheroidal weathering, Work of wind – Erosion, Transport and Deposition vent facts, Pedestal rocks, Sand dunes and Loess, Work of Rivers: Erosion Transport and Deposition, Water falls, Menders, Oxbow lakes, Alluvial, Fans, Flood plains, Delta.</p> <p>UNIT-II MINERALOGY Definition, Physical properties of minerals – Color, Streak, Luster, hardness, Habit, Cleavage, Fracture. Identification of common minerals- Orthoclase, Plagioclase, Augite, Hornblende, Biotite, Muscovite, Olivine, Quartz, Asbestos, Calcite, Dolomite, Corundum, Gypsum, Talc.</p> <p>UNIT-III PETROLOGY Classification of Rocks- Igneous, Sedimentary and Metamorphic. Igneous rocks – Acid and basic rocks, Textures of Igneous rocks- Glassy, Vesicular, Prophyritic, Coarse grained, Medium grained, Fine grained and Cryptocrystalline, Classification – Plutonic, Hypabyssal and volcanic rocks. Tabular Classification Igneous bodies- Batholithic, Laccolith, sill and Dyke,</p>				



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	<p>Lava flows, Common Igneous rocks – Granite, Syenite, Gabbro, Basalt, Trachyte and Rhyolite.</p> <p>Sedimentary rocks - Definition, Classification, Mechanically formed, Organically formed and Chemically formed rocks, Sedimentary structures, Stratification, Lamination, Graded bedding, Current bedding and Ripple marks, Common Sedimentary rocks- Conglomerate, Sandstone, Shale, Mine stone and Breaccia.</p> <p>Metamorphic rock – Definition, Agents of metamorphism- Heat, Uniform pressure, Directed Pressure, Chemically active fluids and gases, Structures and textures of Metamorphic rocks – Slaty, Schistose, Gneissose and Granulose, Common Metamorphic rocks – Slate, Schist, Gneiss, Quartzite and Marble.</p> <p>UNIT-IV STRUCTURAL GEOLOGY</p> <p>Dip and Strike, Apparent dip and True dip. Folds- Elements of folds, Anticline and Syncline, Limbs, Axial of folds, Types of folds- Symmetrical, Asymmetrical, Overturned, Recumbent, Isoclinal, Plunging folds, Anticlinorium, Synclinorium , Open fold, Close fold ,Dome and Basin. Faults – Fault Terminology, Fault- Plan, Hade, Dip and strike, Throw, Heave, Slip, Hanging wall and foot wall. Classification of faults- Normal and reverse faults, Dip fault, strike fault and Oblique faults, High and low angle faults , Parallel faults, Steps- faults, Graben, Horst, Radial faults, Peripheral faults. Unconformities- definition, Types – Angular unconformity, Disconformity, Nonconformity.</p> <p>UNIT-V EARTH QUAKE & VOLCANO</p> <p>Earth quakes: Seismograph, earthquake waves, classification of earthquakes, elastic rebound theory, Richter scale of earthquake intensity, Distribution of earthquakes Volcano: Types of volcanoes, Volcanic products, Volcanic cones, distributionof volcanoes, Joints- Classification- Strike joints, Dip joints, Oblique joints, Bedding joints, Master Joints, Sheet Joints and columnar joints.</p>
<p>Course Outcome</p>	<p>At the end of the course student will be able to:-</p> <ol style="list-style-type: none"> 1. Enhance the technical knowledge on shape, size, mass & density of earth, age of earth, structure of the earth. 2. Identify, formulate, and solve engineering problems in properties of minerals, structural geology, types of rocks and geological maps. 3. 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.
<p>Text Books</p>	<ol style="list-style-type: none"> 1. K.M. Banger Engineering and General Geology



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	<ol style="list-style-type: none">2. Prabin Singh Laboratory Manual of Geology3. Ajay Kumar Sen. Sedimentary rocks4. A.K. Dutta Structural Geology
Reference Books	<ol style="list-style-type: none">1. Pettijohn Elements of Mineralogy2. Rutley's Introduction to Physical Geology3. P. Billings The Principal of Petrology Tyrrel4. P.K. MukharjeeA Text book of Mineralogy



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Course Title	MINE SAFETY AND LEGISLATION				
Course Code	DENMN403				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites					
Course objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Know the various rules & regulations applicable in different conditions to the mine workers, managers and mine owner. • Know the responsibility and duties of the various employee of the mine and owner of the mine accidents. 				
Course Contents	<p>UNIT-I RELEVANT PROVISIONS OF MINES ACT, 1952 Preliminary Definitions, Mining Boards and Committees, Provisions as to health and safety, Hours and limitations of employment, Provisions regarding leaves & wages, Regulations, Rules & by laws.</p> <p>UNIT-II RELEVANT PROVISIONS OF MINES RULES, 1955 Preliminary Definitions, Committees, Provisions regarding health and sanitation, Medical examination of persons employed, Workman inspector and Committees, Provisions regarding first aid and Medical appliance, Employment of persons, Provisions as to leave with wages, Welfare committees, Provisions regarding accident, Classification as per annexure I and II, Equipment's of first aid room and first aid station as per II and III schedule, Abstract of the mines Act & Rule from (1) to (42) as per V schedule.</p> <p>CHAPTER –III RELEVANT PROVISIONS OF COAL MINES REGULATIONS, 2017 Definitions, Duties and responsibilities of persons employed in mines, Provisions regarding plans and sections, Provisions as to mines working, Provisions regarding precautions against danger from fire, Dust, Gas and Water, Ventilation, Provisions as to explosives and shot firing, Miscellaneous provisions as to symbols for mine plan and section, Systematic support rules as per II and III schedule.</p> <p>CHAPTER- IV GENERAL SAFETY IN MINES Knowledge of vocational training of persons employed in a mine, Refresher course for mining persons, Pit safety committee, Formation, Function and Organizations.</p>				



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	<p>UNIT-V THE METALLIFEROUS MINES REGULATIONS, 1961</p> <p>Duties and responsibilities of persons employed in mines, Provisions regarding plans and sections, Provisions as to mines working, Provisions regarding precautions against danger from fire, Dust, gas and water, Ventilation, Provisions as to explosives and shot firing 7 Miscellaneous provisions as to symbols for mine plan and section, systematic support rules as per II and III schedule.</p>
Course Outcome	<p>At the end of the course student will be able to:-</p> <ol style="list-style-type: none">1. Apply knowledge of legislation in mines for the implementation of rules and regulations during their job.2. Work effectively with other engineering and science teams for suggesting any measures against any mine.
Text Books	<ol style="list-style-type: none">1. CMR-20172. MMR-1961 L. C. Kaku.3. Mines Act-19524. Mines Rules-1955 L. C. Kaku.
Reference Books	<ol style="list-style-type: none">1. Legislation in Indian Mines (A critical Appraisal) Vol. II & I By- S. D. Prasad & Prof. Rakesh



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Course Title	COAL MINING METHODS				
Course Code	DENMN404				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	Elements of mining technology				
Course objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Discuss the theories of coal, classification of coal, choice of coal mining method and distribution of coal in India. • Explain the board and pillar mining, depillaring by stowing method, and caving method. • Discuss the longwall mining of extraction of coal underground mines. • Explain thick seam mining and room & pillar mining. 				
Course Contents	<p>UNIT I INTRODUCTION Origin of Coal, Theories of Coal Formation, Classification of Coal, Coaking Coal, Coal Seam and its Classification, Coal Seam Structures and Abnormalities like Faults, Joints, Cleats, Folds etc., Coal Measuring Rocks and Their Characteristics, Distribution of Coal in India, Indian Coal Mining Industry; Choice of Coal Mining Methods.</p> <p>UNIT II BOARD AND PILLAR METHOD Important Terminology, Development Size and Shape of The Pillar, Galleries, Panel System and Without Panel System of Development, Size of Panel, Cycle of Operation, Depillaring, Problems in Depillaring, Preparatory Arrangements, Depillaring by Stowing, Depillaring by Caving Methods, Pillar Extraction Techniques, Dangers Associated With Depillaring.</p> <p>UNIT III LONGWALL MINING Important Terminology, Types of Longwall Faces and Their Choice, Merits and Demerits of Longwall Mining, Development of Longwall Panels and Faces, Longwall Advancing Method, Longwall Retreating Method, Length of Longwall Faces, Rate of Face Advance, Double Unit Longwall Faces, Face organization and material supply.</p> <p>UNIT IV THICK SEAM MINING Problem in Mining of Thick Seams, Choice of Thick Seam Mining Methods, Inclined Slicing, Horizontal Slicing, Diagonal Slicing, Transverse Slicing, Sublevel Caving, Blasting Gallery Method, Cable-Bolting Method of Thick</p>				



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	Seam Extraction. UNIT V ROOM AND PILLAR MINING Vermelles Method, Slant Method, Sublevel Method, Coal Saw Method, Mining of Contiguous Seams, Mining of Steeply Inclined Seam, Mining Under Water, Mining of Seams Prone to Spontaneous Heating, Bumps, Air blast etc.
Course Outcome	At the end of the course student will be able to:- 1. Enhance the technical knowledge on extraction of coal by board & pillar mining and longwall mining. 2. Formulate and solve the problems of extraction of coal from the underground mines. 3. Use the techniques, skills, and modern engineering tools necessary for thick seam mining and room & pillar mining. 4. Work effectively as an individual and as a member of a multidisciplinary team.
Text Books	1. Principle and practices of modern Coal Mining – R.D. Singh 2. Coal Mining in India – S.P. Mathur
Reference Books	1. Mining & working coal – R.T. Deshmukh 2. U/G winning of Coal – T.N. Singh



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Course Title	MINE SURVEYING-I				
Course Code	DENMN405				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	Knowledge about various survey needed for any type of construction.				
Course objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • 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	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>				



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	<p>UNIT V PLANE TABLE SURVEYING</p> <p>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.</p>
Course Outcome	<p>At the end of the course student will be able to:-</p> <ol style="list-style-type: none">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	<ol style="list-style-type: none">1. Surveying Vol. I by B.C. Punmia& Ashok Jain2. Suveying Vol. II by B.C.Punmia& Ashok Jain3. Surveying Vol. I by S.K.Duggal4. Surveying Vol II by S.K.Duggal5. Mine Surveying Vol I by Ghatak6. Mine Surveying Vol II by Ghatak
Reference Books	<ol style="list-style-type: none">1. Metalliferous Mine Surveying : Frederick Winniberg2. Surveying and levelling :Kanetkar and Deshpande



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Course Title	DRILLING & BLASTING LAB				
Course Code	DENMN401P				
Course Credits	L	T	P	TC	
	-	-	4	2	
Prerequisites	Chemistry				
Course objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Apply knowledge of blasting engineering for understanding, formulating and solving blast hole design problems. • Acquire knowledge and hands-on competence in applying the concepts in the design and development of blast hole. • Work effectively with other engineering and science teams as well as with multidisciplinary designs. 				
Course Contents	<p>LIST OF EXPERIMENTS</p> <ol style="list-style-type: none"> 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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Course Title	APPLIED GEOLOGY LAB				
Course Code	DENMN402P				
Course Credits	L	T	P	TC	
	-	-	4	2	
Prerequisites	Geography				
Course objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • 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	<p>LIST OF EXPERIMENTS</p> <p>1. Identification of Minerals in hand specimen -Asbestos, Augite, Biotite, Calcite, Corundum, Dolomite, Gypsum, Hornblende, Muscovite , Kaolinite Orthoclase, Plagioclase, Quartz, Talc.</p> <p>2. Identification of Rocks –</p> <p>(i) Granite, Rhyolite, Syenite, Gabbro, Basalt, Trachyte.</p> <p>(ii) Conglomerate, Sandstone, Shale, Limestone.</p> <p>(iii) Slate, Schist, Gneiss, Quartzite, Marble.</p> <p>3. Geological map reading and drawing simple Geological section -</p> <p>(i) Geological maps of inclined beds.</p> <p>(ii) Geological maps of Unconformity</p> <p>(iii) Geological maps of Folds.</p>				



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Course Title	MINE SURVEYING-I LAB				
Course Code	DENMN405P				
Course Credits	L	T	P	TC	
	-	-	4	2	
Prerequisites	Knowledge about various survey needed for any type of construction.				
Course objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • 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	<p>LIST OF EXPERIMENT</p> <ol style="list-style-type: none"> 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. 				



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Course Title	INDUSTRIAL TRAINING/VOCATIONAL TRAINING				
Course Code	DENMN406P				
Course Credits	L	T	P	TC	
	-	-	-	2	
Prerequisites	Industrial Training/ Mine Visiting				
Course objectives	<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Industrial Training is one of the most essential components for a diploma graduate in Mining. • The sole purpose of industrial training is to expose the students to “real life” situations. Different aspect of mining such as geology, exploration, selection of method of working. • Students will cover different coal and metal mines both underground and opencast in such a way that at the end of the completion of diploma programme, they are conversant with different mining conditions. • Industrial training also opens avenues of new learning to the students and apply them during their project and industrial training presentations. 				
Course Contents	<p>The students should follow the following procedures:-</p> <ol style="list-style-type: none"> 1. Before going for training, the students will prepare various formats for data collection based on the topic of training assigned to them. 2. The students will be given specific assignments for the period of training. 3. During the course of training students will complete weekly report, assignments and keep weekly attendance updated. 4. On completion of training each student will submit a report of training and make a presentation before the group of students. Teacher assessment will be done during the training, on presentation of training and at the end of semester examination. 5. A seminar will be organized on specific topics identified by the teacher and the students will present their experiences earned during the training on the specific tasks. 6. Prepare the one training project file. 				