Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

for

B.Tech in Mining Engineering

Semester-V

(Effective from the session: 2019-20)

Faculty of Engineering,
Shri Rawatpura Sarkar University, Raipur

B.Tech in Mining Engineering

Semester-V

Examination Scheme

(Effective from the session: 2019-20)

S.N	Course Code	Th /Pr	Subject	Type of Course	Teaching hours per week			TC	Examination Scheme				Total Marks
					L	T	P		Theory		Practical		
									EX	IN	EX	IN	
1	BENMN501	Th	Mine Machinery – I	Core	3	1	-	4	70	30	-	-	100
2	BENMN502	Th	Surface Mining - I	Core	3	1	-	4	70	30	-	-	100
3	BENMN503	Th	Mine Legislation – I	Core	3	1	-	4	70	30	-	-	100
4	BENMN504	Th	Mine Ventilation	Core	3	1	-	4	70	30	-	-	100
5	BENMN505	Th	Underground Metal Mining	Core	3	1	-	4	70	30	-	-	100
6	BENMN506	Th	Element of Management	Core	3	1	-	4	70	30	-	-	100
7	BENMN501P	Pr	Mine Machinery – I Lab	Core	-	-	4	2	-	-	35	15	50
8	BENMN502P	Pr	Surface Mining - I Lab	Core	-	-	4	2	-	-	35	15	50
9	BENMN504P	Pr	Mine Ventilation Lab	Core	-	-	4	2	-	-	35	15	50
10	BENMN507P	Pr	Vocational & Industrial Training Evaluation and presentation	Core	-	-	4	2			35	15	50
	Total Contact hr per week: 40			**Total Credit: 32**					**Grand Total Marks:**				**800**

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Course Title	**MINE MACHINERY – I**				
Course Code	**BENMN501**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites					
Course objectives	**This course will enable students to:** • 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.				
Course Contents	**UNIT I** Wire Rope Wire ropes used in Mines, Application of wire ropes in Mines, Testing of wire ropes, Factor of safety,Examination of Wire ropes, Care of wire ropes. Ropes splicing: Rope capples and changing theropes. **UNIT 2** **HAULAGE** Different systems of rope haulage, rope haulage calculations, safety devices, tubs, haulage road andmanholes, locomotive haulage and calculations based on it, track laying, mine cars. **UNIT 3** **WINDING** Head gear arrangement, shaft fittings, safety devices, cages & skips, their suspension arrangements, Multi level winding; automatic winding, Calculation for winding,Location of winding engine. **UNIT 4** **WINDING & SPEED CONTROL** Electric winders, winding drums, types of construction, duty cycle, mechanical & electrical breaking,safety devices on winders, Electrical & Electronic methods of speed control, Torque- time & power- time diagram;Pit top and pit bottomarrangements. **UNIT 5** **PUMPING** Sources of mine water, types of pumps, design calculations, characteristics, operation, maintenance and selection, pump fittings, special types of pumps used in mines.				

Course Outcome	**At the end of the course student will be able to:-** 1. Enhance the technical knowledge on classification of engineering materials, structure of metals and alloys and iron-carbon phase diagram. 2. Possess ability to identify, formulate and solve treatment of iron & steel problem. 3. To use the techniques, skills, and modern engineering tools necessary for engineering materials. 4. Work effectively as an individual and as a member of a multidisciplinary team.
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.

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Course Title	**SURFACE MINING - I**				
Course Code	**BENMN502**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	Winning and working				
Course objectives	**This course will enable students to:** • 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. • Atmosphere becomes the first step of mining education. • Explain the origin, occurrence, effects, and detection of various mine gases. • Discuss the air conditioning of surface mines and underground mines.				
Course Contents	**UNIT I** **Open Pit Design and Layouts** Important parameters of Open pit design; Design of Benches, Ultimate pit design, Stripping ratio, Breakeven stripping ratio, Different methods of opening up the deposits; Box cuts, internal and external box cut, Methods of driving Box cuts; Layout of open pits; Layout of waste dumps, unit operations in opencast mining. UNIT II: Rock Breakage Theory of Rock Drilling, Different Types of Drill Machines Used in Open Pits; Rotary, Percussive and Rotary Percussive Drilling, Selection of Drill Machines; Computation of Productivity of Drill Machines; Inclined Drilling; Their Advantages and Disadvantages. Introduction to Different Types of Explosives Used in Open Cast Mining. UNIT III: Site preparation Dozers, Scrapers, Front-End Loaders etc.; Their Construction, Operation, Suitability and Applicability; Calculation of Their Productivity; UNIT IV: Loading and Excavation Different Types of Excavators used in Open Pits; Shovel, Dragline, Hydraulic Excavators, Multi Bucket Excavators, Their Construction, Operation, Suitability and Applicability; Calculation of Their Productivity. UNIT V: Transport in open pits Automobile Transport, Rail Transport and Conveyors; Their Suitability; Computation of Their Productivity; Land Reclamation and its Methods. Application of Computers in Open Pit Mining.				
Course Outcome	**At the end of the course student will be able to:-** 1. The students are expected to enhance the technical knowledge on origin,				

	occurrence, effects, and detection of various mine gases, air conditioning of surface and underground mining. 2. To enhance the technical knowledge on health & safety. 3. Work effectively as an individual and as a member of 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, VidyasewaPrakashan, Nagpur. 3. A.Skochinsky and Komorov V., Mine Ventilation, MIR Pub., Moscow 4. B.B.Dhar and A.K.Ghose, Mining Challenges for 21st Century, Ashish Publications New Delhi. 5. D. Pennman, J.S. Penman, The principles and practice of Mine Ventilation, Charles Griffin 6. H. Rabia, Mine Environmental Engineering, Entrac Software Pub.

Course Title	**MINE LEGISLATION I**				
Course Code	**BENMN503**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites					
Course objectives	**This course will enable students to:** • 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	**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. **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. **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. **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.				

	UNIT–V **THE METALLIFEROUS MINES REGULATIONS, 1961** 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.
Course Outcome	**At the end of the course student will be able to:-** 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	1. CMR-2017 2. MMR-1961 L. C. Kaku. 3. Mines Act-1952 4. Mines Rules-1955 L. C. Kaku.
Reference Books	1. Legislation in Indian Mines (A critical Appraisal) Vol. II & I By- S. D. Prasad & Prof. Rakesh

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Course Title	**MINE VENTILATION**				
Course Code	**BENMN504**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	Applied geology				
Course objectives	• Determine the quantity of air flow in mine roadways and mine ducts. • Discuss the mine doors, regulators, stopping's, 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.				
Course Contents	**UNIT-I** **THEORY OF VENTILATION** Objects and standard of ventilation , Flow of air in ducts and mine roadways, Resistance of air ways, Laws of ventilation, Chezy's and Atkinson's euations, Equivalent resistance and equivalent orifice of mine, Regulations related with above topics **UNIT II** **NATURAL VENTILATION** Definition, Natural Ventilation and its Measurements, Thermodynamics of Natural Ventilation, Distribution and Control of air Current, Doors, Regulators, Stopping's and Their Types, air Crossings, Airlocks. **UNIT III** **MECHANICAL VENTILATION** Theory of mine fans, Types of mine fans, their characteristics &suitability, Selection of fans. Auxiliary and booster fans, series and parallel operation of fans, mine characteristic and selection of mine fans, fan drift and ease, forcing and exhaust ventilation, reversal of ventilation, ventilating of headings. **UNIT IV** **VENTILATION SURVEY** Objects of ventilation survey, Instruments for the measurement of pressure, velocity and quantity of air. **UNIT V** **VENTILATION SYSTEMS & PLANNING** Calculation of pressure and quantity requirements, network problems, Hardy-cross				

	method, Ventilation planning and economic analysis, central and boundary ventilation, accessional and declensional ventilation, antitropal , homotropal ventilation
Course Outcome	**At the end of the course student will be able to:-** 1. Enhance the technical knowledge on stratigraphy of India and important geological formation of India. 2. Identify, formulate and solve the problems of economic minerals 3. Use the techniques, skills, and modern engineering tools necessary for geophysical and geochemical prospecting. 4. Work effectively as an individual and as a member of a multidisciplinary team.
Text Books	1. Fundamentals of Historical Geology and Stratigraphy of India:Ravindra 2. Geology of India and Burma:M.S. Krishnan 3. Economic Mineral Deposits:M.L. Jensen&A.Batman 4. India's Mineral Resources :S. Krishnaswamy
Reference Books	1. Geophysical Prospecting:MDorbin& B. Miller 2. Courses in Mining Geology:Arogya swamy 3. Applied Geology: S. Banger

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Course Title	**UNDERGROUND METAL MINING**				
Course Code	**BENMN505**				
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:** • Choose proper extraction methods to different mineral deposits depending on their geo-mining conditions. • Learn how to develop a metal mine. • Choose proper support system for the metal mines. • Learn the various metal mining methods.				
Course Contents	**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 stopping methods; Open stoping; 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 stopping, Sub level caving, Block caving, Top slicing. **UNIT V** **SUPPORT SYSTEMS** Pillars; Back fill, Cable bolting, Steel Rock bolts, Grouting, Shotcreting etc.,code of timbering rules.				
Course Outcome	**At the end of the course student will be able to:-** 1. Apply knowledge of metal mining for understanding metal mining problems. 2. Acquire knowledge and hands-on competence in applying the concepts in the				

	design and development of metal mine. 3. Apply knowledge of metal mining for designing a metal mines
Text Books	1. Elements of Mining Tech. Vol II by D. J. Deshmukh 2. S M E Handbook, Vol. I & II, Pub:A.I.M.M. New-York.
Reference Books	1. Howard, L.Hartman. Introductory Mining Engineering, Pub: John Willey & Sons. 2. Ramlu et al, Computer in mineral industry. Pub: Oxford & IBH, New-Delhi. 3. W.A. Hustrulid. Underground mining methods handbook, Pub: Society of mining engineers of the American Institute of Mining Metallurgical and Petroleum Engineers, Inc. New-York.

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<table>
<tr><td>Course Title</td><td colspan="5">ELEMENT OF MANAGEMENT</td></tr>
<tr><td>Course Code</td><td colspan="5">BENMN506</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Management</td></tr>
<tr><td>Course objectives</td><td colspan="5">• To choose proper method of sampling for different ore bodies and mineral heaps.
• To know the responsibility and duties of the various employee of the mine and owner of the mine
• To perform various management aspects related with the mine</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT-I
Management
Principles of Scientific Management; Organization, Planning and control. Forms of Business Organization: Private and public enterprises with special reference to mining of minerals. Basic Principles of Trade unionism, Trade union activities vis-a-vis. mining in India, Major trade union bodies Disputes: Types of disputes between contractors and owners, between workers and owners; Methods of avoiding and resolving disputes.

UNIT-II
Network Analysis
CPM, PERT and Work scheduling. Work Study: Time and motion study; Methods of improving productivity; Improving productivity; Improving working environment, welfare measures, incentives and penalties.
UNIT-III
Inventory
Systems of inventory control; Methods of minimizing inventory.
Purchasing and Tendering: Purchase procedures in public sector; Preparation of tender documents; Tender completion formalities; Consideration of bids and finalization of purchase order.

UNIT-IV
Introduction to system concept
System design; System analysis; Planning sub systems; Production sub-systems; Decision making process; Mining system and sub system; Perspective planning for a mineral community; Salvaging and transfer of equipment; Reallocation of manpower.

UNIT-V
Project Monitoring: Monitoring techniques; Management Information Systems (MIS).</td></tr>
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Course Outcome	**At the end of the course student will be able to:-** 5. Enhance the technical knowledge on stratigraphy of India and important geological formation of India. 6. Identify, formulate and solve the problems of economic minerals 7. Use the techniques, skills, and modern engineering tools necessary for geophysical and geochemical prospecting. 1. Work effectively as an individual and as a member of a multidisciplinary team.
Text Books	5. Banga & Sharma: Engineering Economics and Industrial Organisation. Pub: Khana Publishers, New-Delhi 6. V.L. Mote, Samuel Paul and G.S. Gupta. Managerial Economics, Concepts and Cases,
Reference Books	4. Khana, O.P., A text book of Work Study. Pub: M/S Dhanpatrai & Sons, Delhi. 5. Jain, S.P. Industrial & Labour laws. Pub: M/S M/S Dhanpatrai & Sons, Delhi

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Course Title	**MINE MACHINERY – I LAB**				
Course Code	**BENMN501P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	
Prerequisites	Chemistry				
Course objectives	**This course will enable students to:** • 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	**LIST OF EXPERIMENTS** 1.Study of Different types of Rope Capels. 2. Study of Rope Splicing. 3. Study of Clifton pulley. 4. Study of various safety devices on rope haulages 5. Study of Exhaust Conditioner on a diesel locomotive 6. Study of Cage Suspension Gear 7. Study of Detaching safety Hook 8. Study of Lilly Controller 9. Study of Turbine Pump 10. Study of a Balancing Disc.				

<table>
<tr><td>Course Title</td><td colspan="5">SURFACE MINING - I LAB</td></tr>
<tr><td>Course Code</td><td colspan="5">BENMN502P</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>-</td><td>-</td><td>4</td><td>2</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Winning and working</td></tr>
<tr><td>Course objectives</td><td colspan="5">This course will enable students to:
To choose proper surface mining methods to different mineral deposits depending on their geomining 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.</td></tr>
<tr><td>Course Contents</td><td colspan="5">LIST OF EXPERIMENTS
1. Study of Drivage of Internal and External Box Cut
2. Determination of Ultimate Pit Slope, Overall Ramp slope and Inter ramp slope and Design of Ultimate pit by manual methods.
3. Study of Constructional features of Scrapers and the machine operation.
4. Study of Constructional features of Electric Rope Shovel and the machine operation.
5. Study of Constructional features of Dragline and the machine operation.
6. Determination of Productivity of shovel dumper combination and synchronization of 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.</td></tr>
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Course Title	**MINE VENTILATION LAB**				
Course Code	**BENMN504P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	
Prerequisites	Mine Geology				
Course objectives	**This course will enable students to:** • Determine the quantity of air flow in mine roadways and mine ducts. • Discuss the mine doors, regulators, stopping's, 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.				
Course Contents	**LIST OF EXPERIMENT** 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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<table>
<tr><td>Course Title</td><td colspan="5">INDUSTRIAL TRAINING/VOCATIONAL TRAINING</td></tr>
<tr><td>Course Code</td><td colspan="5">BENMN506P</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>2</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Industrial Training/ Mine Visiting</td></tr>
<tr><td>Course objectives</td><td colspan="5">This course will enable students to:
• Industrial Training is one of the most essential components for a B.Tech 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 B.Tech 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.</td></tr>
<tr><td>Course Contents</td><td colspan="5">The students should follow the following procedures:-
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.</td></tr>
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