

School of Engineering & I.T.

MATS University

Raipur



Syllabus Scheme

(VIth Semester)

For

Bachelor of Technology

Mining Engineering

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

VIth Semester (Mining)

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

Professional Elective-I

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



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Scheme of Teaching & Examination

VI - Semester

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

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

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

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Semester: B.Tech. VIth Sem.

Subject: - Mineral Dressing

Total Lecture Periods/Week : 4

Total marks in end semester Exam: 100

Minimum Number of Class test to be conducted: 02

Branch: - Mining Engineering

Code : - BT 660

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

Course Objective

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

Course outcomes:

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

UNIT I: CRUSHING & GRINDING

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

UNIT II: SIZING

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

UNIT III: GRAVITY CONCENTRATION

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

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

Text Books

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

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Semester: B.Tech. Vth Sem.

Subject: - Underground Metal Mining

Total Lecture Periods/Week : 4

Total marks in end semester Exam: 100

Minimum Number of Class test to be conducted: 02

Branch: - Mining Engineering

Code : - BT 561

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

Course Objective

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

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

UNIT I: General

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

UNIT II: Development

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

UNIT III: Stopping Methods-I

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

UNIT IV: Stopping 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.

Text Books

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

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Semester: B.Tech. VIth Sem.

Subject: - Blasting Technology

Total Lecture Periods/Week : 4

Total marks in end semester Exam: 100

Minimum Number of Class test to be conducted: 02

Branch: - Mining Engineering

Code : - BT 662

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

Course Objective

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

Course outcomes:

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

UNIT I: COMMERCIAL EXPLOSIVES

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

UNIT II: INITIATION SYSTEM & BLASTING ACCESSORIES

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

UNIT III: SURFACE BLAST DESIGN

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

UNIT IV: UNDERGROUND BLAST DESIGN

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

UNIT V: ROCK BREAKAGE MECHANISM

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

References:

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

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Semester: B.Tech. VIth Sem.

Subject: - Mine Legislation II

Total Lecture Periods/Week : **3**

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

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

Branch: - Mining Engineering

Code : - BT 663

Total Tutorial Periods/Week: **00**

Total Practical Periods/Week: **00**

Course Objective

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

Course outcomes:

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

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

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

References: -

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

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Semester: B.Tech. VIth Sem.

Subject: - Mine Machinery II

Total Lecture Periods/Week : 4

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

Branch: - Mining Engineering

Code : - BT664

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 02

Course Objective

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

Course outcomes:

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

UNIT I: Skip & Koepe Winding

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

UNIT II: HYDRULIC TRANSMISSIONS

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

UNIT III: FACE MACHINERY

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

UNIT IV: LOADER AND TRANSPORTING MACHINE

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

UNIT V: USE OF ELECTRICITY & COMPRESSED AIR IN MINES

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

Text Books

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

3. Coal Mining Practice By Stathum

Reference books:

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

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Semester: B.Tech. VIth Sem.

Subject: - Small Scale Dimension Stone Mining

Total Lecture Periods/Week : 3

Total marks in end semester Exam: 100

Minimum Number of Class test to be conducted: 02

Branch: - Mining Engineering

Code : - BT 6652

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

Course Objective

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

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

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

UNIT V:

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

Reference Books :

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

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Semester: B.Tech. VIIIth Sem.

Subject: - Surface Mining II

Total Lecture Periods/Week : 3

Total marks in end semester Exam:100

Minimum Number of Class test to be conducted: 02

Branch: - Mining Engineering

Code : - BT6653

Total Tutorial Periods/Week: 00

Total Practical Periods/Week: 00

Course Objective

To learn various layout of opencast mine and waste dump.

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

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

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

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

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

UNIT V:

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

References:

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

Department of Mining Engineering

List of Experiment

Subject: Minor Project (150 Marks)
Code: BT-666
Maximum Marks: 50

Allocation of project:

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

Monitoring of project:

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

Internal Evaluation & Submission of project:

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

External Evaluation:

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

Department of Mining Engineering

List of Experiment

Subject: Blasting Engineering Lab

Code: BT-668

Maximum Marks: 50

List of Experiments to be performed:

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

Department of Mining Engineering

List of Experiment

Subject: Mining Machinery II Lab

Code: BT-667

Maximum Marks: 50

List of Experiments to be performed :10

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

Department of Mining Engineering List of Experiment

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

List of Experiments to be performed :

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