

JHARKHAND UNIVERSITY OF TECHNOLOGY, RANCHI

**MINING ENGINEERING
B. Tech, Semester III (Second year]
Course Structure**

3rd Semester Course Structure

Sl. No.	Course Code	Course Title	Hours per week			Credits
			L	T	P	
THEORY						
1.		Mathematics-III	3	1	0	4
2.		Mining Geology	3	1	0	3
3.		MaterialsEngineering	3	1	0	3
4.		Surveying and Geomatics - I	3	1	0	3
5.	MN301	Introduction to Mining Technology	3	1	0	3
6.		Environmental Science	2	0	0	0
PRACTICAL						
7.		MiningGeology Lab	0	0	3	1
8.		Field Surveying Lab	0	0	3	1
9.		Communication Skill Lab	0	0	2	1
10.	MN301P	Introduction to Mining Technology - Lab	0	0	3	1
11.		Extra-Curricular Activity – III (NSO/NSS/NCC/YOGA/CREATIVE ARTS / Mini Project etc.)	0	0	2	1
		Total	17	5	13	21

MN301	INTRODUCTION TO MINING TECHNOLOGY	3L:1T:0P	3 Credits
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Course Objective

When the students enter the college to pursue a degree in Mining Engineering and as well pursue a career in Mining Engineering after graduation, they need to understand the breadth and depth available in this field for possible engagement. When many alternative disciplines of engineering appear to offer apparently more glamorous avenues for advancement, the Mining Engineering student should realize the potentials available in this engineering discipline. The students should understand the enormous possibilities available for creative and innovative works in this all-pervasive field of engineering.

This course is designed to address the following:

- to give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Mining Engineering
- to motivate the student to pursue a career in one of the many areas of Mining Engineering with deep interest and keenness.
- To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.

Proposed Syllabus

Definition and scope of mining: Mining as a basic industry, definition of mining terms. Economic importance of mining, Social and environmental impact of mining.

Principle of boring and purpose of boreholes; methods of boring; rotary and percussive boring methods borehole deflection and deviation.

Explosives and Blasting: Definition, Classification, Basic ideas about coal and rock drilling, basic ideas about the use of explosives in rock breaking concerning shaft sinking, drifting and drivages of adit.

Opening of mineral deposits: Types of mine opening, selection, location, shape and size of different types of opening, drivage methods for adits and incline drifts and cycle of operation, support of incline drift and their mouth.

Shaft sinking: Conventional methods of shaft sinking, shaft lining (temporary and permanent), surface arrangements, ventilation, pumping and illumination arrangement during shaft sinking, shaft fittings. Pit top and Pit bottom layouts Opening and development of mineral deposits, method of working, ventilation, transportation, hoisting and dispatch.

Introduction to common extraction method of underground mineral deposit: Coal: Bord and Pillar method, Longwall method Metal: Various stoping methods like open stoping, cut and fill stoping, shrinkage stoping, sub level stoping, block caving etc.

Overview of Surface Mining: Types of surface mine, unit operation, basic bench geometry, applicability and limitation, advantages and disadvantages.

Modules

Module 1: Definition and scope of mining:

Mining as a basic industry, definition of mining terms. Economic importance of mining, Social and environmental impact of mining.

Module 2: Boring:

Principle of boring and purpose of boreholes; methods of boring; rotary and percussive boring methods borehole deflection and deviation.

Module 3: Explosives and Blasting:

Definition, Classification, Basic ideas about coal and rock drilling, basic ideas about the use of explosives in rock breaking concerning shaft sinking, drifting and drivages of adit.

Module 4: Opening of mineral deposits:

Types of mine opening, selection, location, shape and size of different types of opening, drilage methods for adits and incline drifts and cycle of operation, support of incline drift and their mouth.

Module 5: Shaft sinking: Conventional methods of shaft sinking, shaft lining (temporary and permanent), surface arrangements, ventilation, pumping and illumination arrangement during shaft sinking, shaft fittings. Pit top and Pit bottom layouts Opening and development of mineral deposits, method of working, ventilation, transportation, hoisting and dispatch.

Module 6: Overview of Underground Mining:

Coal: Bord and Pillar method, Longwall method

Metal: Various stoping methods like open stoping, cut and fill stoping, shrinkage stoping, sub level stoping, block caving etc.

Module 7: Overview of Surface Mining:

Types of surface mine, unit operation, basic bench geometry, applicability and limitation, advantages and disadvantages.

Text/Reference Books:

1. Introductory mining engineering-, Howard L.Hartman, Jan M.Mutmansky/ Wiley India (P) Ltd
2. Elements of mining technology Vol.-I - D.J. Deshmukh /Denett& Company
3. Roy Pijush Pal, Blasting in ground excavations and mines, Oxford and IBH, 1st Ed. 1993
4. C.P. Chugh, Drilling technology handbook, Oxford and IBH, 1sted, 1977.

Goals & Outcomes:

- Introduction to what constitutes Mining Engineering
- Identifying the various areas available to pursue and specialize within the overall field of Mining Engineering
- Exploration of the various possibilities of a career in this field
- Providing inspiration for doing creative and innovative work
- Highlighting possibilities for taking up entrepreneurial activities in this field
- Providing a foundation for the student to launch off upon an inspired academic pursuit into this branch of engineering

GE 302	MINING GEOLOGY	3L:1T:0P	3 Credits
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Proposed Syllabus:

Module 1: Physical Geology:

Geology in mining engineering, scope and application, earth structure and composition, weathering processes and grade, physiographical division of India, geological work of river, wind and glacier.

Module 2: Stratigraphy:

Principle of stratigraphy, geological time scale, mineral resource distributions and economic importance of Archean, Cuddapah, Vindhyan, Gondwana, Tertiary deposit of India.

Module 3: Minerology:

Classification of minerals, physical properties of minerals, properties of silica, feldspar, pyroxene, amphibole, mica, olivine, group of minerals and calcite.

Module 4: Petrology:

Classification of rocks,

igneous rock: composition and diversification of magma, texture and structure of igneous rock, tabular classification of igneous rocks, study of importance igneous rock,

sedimentary rock: lithification and diagenesis, texture and structure of sedimentary rock, study of important sedimentary rock,

metamorphic rock: metamorphism, agents and types, study of important metamorphic rocks,

Module 5: Structural Geology:

Introduction to geological structure, faults, folds, joints and unconformities classification, criteria for recognition in the field and significance in mineral exploration, determination of strata thickness, dip and strike calculation,

Module 6: Economic Geology

Ore, Gauge, tenors of ore, grade, assay value cut – off grade, processes of formation of mineral deposit, magmatic concentration, hydrothermal processes, placer deposit and supergene sulphide enrichment deposit, iron, copper, Manganese, lead & zinc, mica etc.

Coal Geology: Introduction, Coal petrography, origin, classification, structural features of coal seam

Oil & Natural Gas: Introduction, origin, classification, accumulation, migration, cap rocks, traps.

Module 7: Mineral Exploration

Geological, Geophysical and Geochemical prospecting- principle and methodology

Module 8: Hydrogeology

Introduction, Hydrological cycle, vertical distribution of groundwater, aquifers, Darcy's law, hydrological properties of rocks and groundwater quality

GE 302P	MINING GEOLOGY LAB	0L:0T:3P	1 Credits
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SL. NO	NAME OF EXPERIMENT/EXERCISE	
A. Study of Mineral samples (Identification of minerals on the basis of colour, streak, luster, hardness, cleavage, fracture)		
1.	Rock Forming minerals	Quartz, Orthoclase, Biotite, Muscovite, Calcite, Plagioclase,
2.	Economic minerals	Galena, pyrolusite, Hematite, Magnetite, Bauxite, Chromite, Chalcopyrite, Pyrite
B. Megascopic study of hand specimens (Identification of rock on the basis of colour, mineral composition, texture, structure)		
3.	Igneous rocks	Granite, Basalt, Rhyolite, Obsidian, Dolerite, Syenite,
4.	Sedimentary rocks	Sandstone. Shale, Limestone, Conglomerate, Breccia
5.	Metamorphic rocks	Gneiss, Schist, Quartzite, Marble, Slate,
C. Study of external morphology of crystal models (Determination of axial relationship, symmetry elements and forms present in model)		
6.	Isometric System& Tetragonal System	
7.	Orthorhombic System& Hexagonal System	
8.	Monoclinic System& Triclinic System	
D.Numerical Problems related to Structural Geology		
9.	Three-point problems and its application	
10.	Borehole problems and its analysis	
11.	Structural analysis using stereonet	
12.	Lithologinterpretation and correlation	

MN301P	INTRODUCTION TO MINING TECHNOLOGY - LAB	0L:0T:3P	1 Credits
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SL. NO	NAME OF EXPERIMENT
13.	Study and sketch of Boring and various methods of Boring.
14.	Study and sketch of Explosive and its types.
15.	Study and sketch of Blasting Accessories.
16.	Study and sketch of Priming, Charging, Stemming and Shot – firing.
17.	Solid Blasting Practices in Undergroundmines.
18.	Study of Blasting Pattern in underground and surface mines.
19.	Study and sketch of incline mouth support.
20.	Study and sketch of Temporary lining of shaft during sinking.
21.	Study and sketch of Concrete lining of Shaft.
22.	Study and sketch of special methods of shaft sinking by cementation process.

JHARKHAND UNIVERSITY OF TECHNOLOGY, RANCHI

**MINING ENGINEERING
B. Tech, Semester IV (Second year)
Course Structure**

4th Semester Course Structure

Sl No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
THEORY						
1.		Electronics and Instrumentation Engg.	3	1	0	3
2.	MN401	Underground Coal Mining Methods	3	1	0	3
3.	MN402	Surface Mining Methods	3	1	0	3
4.	MN403	Drilling and Blasting	3	1	0	3
5.	MN404	Mine Surveying	3	1	0	3
6.		Engineering Economics/ Cyber Security	2	0	0	0
PRACTICAL						
7.	MN401P	Mine Design - I Lab	0	0	3	1
8.	MN402P	Drilling and Blasting - Lab	0	0	3	1
9.	MN403P	Mine Surveying Lab	0	0	3	1
10.		Internship/ Tour and Training/ Industrial Training	0	0	0	2
11.		Extra-Curricular Activity – IV (NSO/NSS/NCC/YOGA/CA/ Mini Project etc.)	0	0	2	1
Total			17	5	11	21

MN401	UNDERGROUND COAL MINING METHODS	3L:1T:0P	3 CREDITS
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Course Objectives:

This course is designed to address the following:

- to give an understanding to the students for opening the underground coal deposit, different mode of opening and their suitability including advantages and disadvantages.
- to give an understanding to the student of various methods of working in underground coal mining and their application.

Proposed Syllabus

Opening of Deposits: Developments of mine for in-seam mining and horizon mining (including shaft pillar), their comparison, advantages and disadvantages, division into levels and districts.

General principle of Bord& Pillar Development, their choice, suitability, advantages and disadvantages.

Open and Panel Systems, Layout of Bord& Pillar panel, size of panel and statutory provisions, Concurrent development activities like support, track laying, lighting, transportation of materials and minerals in and out of the mine etc.

Preparatory arrangement for depillaring operation, statutory provision for depillaring, principle and designing of pillar extraction, size of a district, factors affecting choice of pillar extraction, depillaring with caving, stowing, mechanized depillaring operation, organization and safety.

Longwall methods of working, their choice, suitability, advantages and disadvantages. Shape & size of development roadways and gate roads and their maintenance, support systems of longwall face and gate roads.

Layout of the workings for the required output, length and orientation of longwall faces. Advancing and retreating longwall faces, longwall face and gate road machineries, mechanized longwall faces with shearers, AFC, power support and gate road machineries.

Modules:

Module 1: Opening of Deposits: Developments of mine for in-seam mining and horizon mining (including shaft pillar), their comparison, advantages and disadvantages, division into levels and districts.

Module 2: Bord and Pillar Development: General principle of Bord& Pillar Development, their choice, suitability, advantages and disadvantages,

Module 3: Bord and Pillar Panels: Open and Panel Systems, Layout of Bord& Pillar panel, size of panel and statutory provisions, Concurrent development activities like support, track laying, lighting, transportation of materials and minerals in and out of the mine etc.

Module 4: Pillar Extraction:

Preparatory arrangement for depillaring operation, statutory provision for depillaring, principle and designing of pillar extraction, size of a district, factors affecting choice of pillar extraction, depillaring with caving, stowing, mechanized depillaring operation, organization and safety.

Module 5: Longwall Panel Development:

Longwall methods of working, their choice, suitability, advantages and disadvantages. Shape & size of development roadways and gate roads and their maintenance, support systems of longwall face and gate roads.

Module 6: Longwall Panel Extraction:

Layout of the workings for the required output, length and orientation of longwall faces. Advancing and retreating longwall faces, longwall face and gate road machineries, mechanized longwall faces with shearers, AFC, power support and gate road machineries.

Text/Reference Books:

1. Wining and working – R. T. Deshmukh & D. J. Deshmukh
2. Elements of Mining Technology Vol. I, III – D. J. Deshmukh
3. Principle and Practices of Modern Coal Mining – R. D. Singh
4. Modern Coal Mining – S. K. Das
5. Introductory mining engineering-, Howard L.Hartman, Jan M.Mutmansky/ Wiley India (P) Ltd
6. SME Mining Engineers Handbook 3rd Edition - Peter Darling

Goals and Outcomes:

This course qualifies participants to apply basic concepts of Mining in

1. Explain different mining methods and their selection.
2. Describe details working of bord and pillar method and its development & depillaring.
3. Explain longwall working.

Knowledge:

1. Analyse and evaluate the development of surface mines, with stripping ratio.
2. Analyse the operation and application of the equipment used in surface mining and advanced appreciation of the systems engineering involved with interacting machines.

Skills:

1. Review, analyze, consolidate and synthesizes knowledge to identify and provide to selection of Mining method.
2. Assess and evaluate complex ideas in surface mining and selection of the number required and the size of appropriate equipment

MN402	SURFACE MINING METHODS	3L:1T:0P	3 CREDITS
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Course Objectives:

This course is designed to address the following:

- to give an understanding to the students for basic concept of surface mining including selection between surface mining versus underground mining for a particular project.
- to give an understanding to the student of various cycle of operation of extraction of deposit including opening of deposit, production of different benches, drilling and blasting, excavation and transportation etc.

Proposed Syllabus:

Status of surface mining in India. Selection between surface mining and underground mining. Preliminary evaluation of surface mining prospects; different stripping ratios -- concepts and significance.

Box Cut: Selection of site and machineries, Calculation of rock movement in box cutting for given geometry.

Geometrical parameters of the benches, bench height, bench slope, bench width etc. with regard to the geometry of the deposits and overlying rocks. Formation parameters and factors affecting their selection.

Working principles of Excavation machineries, deployment of drills, dozer, shovel - dumper, dragline, hydraulic shovels, Ripper and Scraper, surface miners etc. their cycle of operation, application and limitation.

Drilling principles, types of blast hole drills, estimation of number of drill for a given mine production, blast design, determination of charge weight, factors affecting blast design, calculation of charge required per hole, problems associated with drilling and blasting, secondary blasting.

Cyclic methods-- shovel-dumper, pay-loader, dragline and their annual capacity calculation.

Modules:

Module 1: Basic Concept of Surface Mining:

Status of surface mining in India. Selection between surface mining and underground mining. Preliminary evaluation of surface mining prospects; different stripping ratios -- concepts and significance.

Module 2: Opening up of Deposits:

Box Cut: Selection of site and machineries, Calculation of rock movement in box cutting for given geometry.

Module 3: Production benches

Geometrical parameters of the benches, bench height, bench slope, bench width etc. with regard to the geometry of the deposits and overlying rocks. Formation parameters and factors affecting their selection.

Module 4: Preparation for Excavation:

Working principles of Excavation machineries, deployment of drills, dozer, shovel - dumper, dragline, hydraulic shovels, Ripper and Scraper, surface miners etc. their cycle of operation, application and limitation.

Module 5: Drilling and blasting:

Drilling principles, types of blast hole drills, estimation of number of drill for a given mine production, blast design, determination of charge weight, factors affecting blast design, calculation of charge required per hole, problems associated with drilling and blasting, secondary blasting.

Module 6: Excavation and Transportation:

Cyclic methods-- shovel-dumper, pay-loader, dragline and their annual capacity calculation.

Text/Reference Books:

1. Surface Mining- Misra, G.B.,
2. Surface Mining -B.A. Kennedy
3. Surface Mining Operations -S.K. Das,
4. SME Mining Engineers Handbook 3rd Edition - Peter Darling
5. Surface Mining Technology - T.N. Singh
6. Surface Mine Blast Evaluation, AMIE Publication

Course Learning Outcomes:

1. Provide a detailed description of the proposed surface mining method and related equipment and support infrastructure (including illustrations, sketches, plans, etc.);
2. Design and evaluate materials handling and transport options;
3. Conduct productivity analysis for the selected mining system;
4. Identify and evaluate core risks in each mining method;
5. Appraise mining systems with respect to safe, efficient, economic and environmentally and socially responsible operations; and
6. Demonstrate awareness of major technological trends.

MN403	DRILLING AND BLASTING	3L:1T:0P	3 CREDITS
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Course Objectives:

This course is designed to address the following:

- to give an understanding to the students for basic concept of drilling and blasting in both surface mining and underground mining.
- to give an understanding to the student of various cycle of operation of drilling and blasting including exploratory drilling, production drilling in both metal as well as coal mines.

Proposed Syllabus:

Exploration Drilling Boring for exploration; Various types of exploratory drills and their applicability – Auger, Cable-tool, Odex, Core Drills; Core recovery: single and double tube core barrels, wire line core barrel; Storage of cores; Interpretation of borehole data. Explosives and Initiating Systems Types of explosives, their composition and properties, classification; Selection of explosives; Manufacture, transport, storage and handling of explosives; Testing of explosives; Types of initiating systems – Electrical Detonators, Detonating Fuse, Detonating Relays, NONEL, Electronic Detonators, Blasting accessories, exploders. Drilling & Blasting in Surface Mines Drilling: Blasthole drills – types, classification, applicability and limitations; Mechanics of drilling, performance parameters, drilling cost, compressed air requirement for hole cleaning; Selection of drilling systems, drilling errors, organization of drilling. Blasting: Mechanics of rock fragmentation; Livingstone theory of crater formation; Factors affecting blasting, Blast design - estimation of burden and spacing, estimation of charge requirement; Initiation patterns; Secondary blasting – pop and plaster shooting; Problems associated with blasting, Ground vibration and air over pressure, Blast instrumentation Drilling & Blasting in Underground Mines Coal mines: Drilling systems and their applicability, blasting-off-solid, different blasting cuts, ring hole blasting, calculation of specific charge, specific drilling and detonator factor, initiation patterns. Metal mines: Drilling systems and their applicability, blast design for horizontal drivages, different blasting cuts, longhole blasting, vertical crater retreat blasting.

Modules:

Module 1: Exploration Drilling:

Boring for exploration; Various types of exploratory drills and their applicability – Auger, Cable-tool, Odex, Core Drills; Core recovery: single and double tube core barrels, wire line core barrel; Storage of cores; Interpretation of borehole data

Module 2: Explosives and Initiating Systems:

Types of explosives, their composition and properties, classification; Selection of explosives; Manufacture, transport, storage and handling of explosives; Testing of explosives; Types of initiating systems – Electrical Detonators, Detonating Fuse, Detonating Relays, NONEL, Electronic Detonators, Blasting accessories, exploders.

Module 3: Drilling in Surface Mines

Drilling: Blasthole drills – types, classification, applicability and limitations; Mechanics of drilling, performance parameters, drilling cost, compressed air requirement for hole cleaning; Selection of drillingsystems, drilling errors, organization of drilling.

Module 4: Blasting in Surface Mines

Mechanics of rock fragmentation; Livingstone theory of crater formation; Factors affecting blasting, Blast design - estimation of burden and spacing, estimation of charge requirement; Initiation patterns; Secondary blasting – pop and plaster shooting; Problems associated with blasting, Ground vibration and air over pressure, Blast instrumentation

Module 5: Drilling & Blasting in Underground Coal Mines:

Drilling systems and their applicability, blasting-off-solid, different blasting cuts, ring hole blasting, calculation of specific charge, specific drilling and detonator factor, initiation patterns.

Module 6: Drilling & Blasting in Underground Metal Mines:

Drilling systems and their applicability, blast design for horizontal drivages, different blasting cuts, longhole blasting, vertical crater retreat blasting.

Text/Reference Books:

1. Rock blasting effects and operations, Lovely Prakashan: P. Pal Roy.
2. Blasting Practices in Surface Mines: S K Das.
3. Explosives and Blasting Technology: G.K.Pradhan.
4. Rock Blasting: Sushil Bhandari.
5. Drilling and Blasting: chapters in SME Mining Engineers Handbook: P Darling.
6. Drilling and blasting of rock, CRC publications:Jimino.
7. Surface and Underground Excavations: R RTatiya.
8. Blasting principles for open pit mining, SME vol. I &II: W Hustrulid.
9. Surface Blast Design: C.J.Konya.
10. Indian Explosive Act 1884.
11. Legislation in Indian Mines – A Critical Appraisal: Rakesh and Prasad.

Course Learning Outcomes:

After completion of the subject the students will be able to:

1. Identifying and relating various drilling procedures to various rock characteristics.
2. Outline and define various blasting practices, accessories, explosives & their suitability in Indianmines both underground and opencast.
3. Analyse and optimize blast performance and productivity improvements.
4. Formulate and list the documentation for safe blasting practices.
5. To understand and appreciate environmental and social implications of rock/coal blasting.

MN404	MINE SURVEYING	3L:1T:P	3 Credits
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Course Objectives:

The course is designed where, students can apply knowledge of mathematics in surveying to calculate and analyse different parameters of survey. Students can get the ability to identify, formulate and solve problems in the field of advanced surveying using advanced surveying instruments. Ability to analyze survey data and design mining engineering projects.

This course is designed to address the following:

- To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Mine Surveying.
- To motivate the student to pursue a career in one of the many areas of Mine Surveying with deep interest and keenness.
- To expose the students to the various avenues and Instruments available for doing creative and innovative work in this field by showcasing the applications in many monuments and inspiring projects of public utility.
- To introduce the students to advanced and astronomical surveying.

Proposed Syllabus:

Surveying Instruments: Mining theodolite, miner's dial, loose and fast needle traversing with miner's dial, EDM & Total Station -- their applications. Introduction to Gyro-theodolite & GPS.

Triangulation Survey: Classification; Reconnaissance; Procedures for angles and base-line measurement; Comparison with precise EDM traversing

Correlation Survey: Correlation of underground and surface surveys and different methods of correlation- connection through adit, incline and shafts, method of connection through single or double vertical shafts. Corrections by means of magnetic needle.

In-pit Survey: Setting out a point of known rectangular co-ordinate. Control of directions and gradients for inclined shafts, slopes, levels and tunnels. Maintaining alignments, simple curve laying underground, laying out and fixing of mine boundaries claims, subsidence surveys on surface and underground. Volume calculations.

Stope Surveying: Stope surveying with Hanging Compass and Alignometer, tape triangulation, radiation and other methods.

Mine Plans and Sections: Legal requirements as to mine plans and sections in India, preparation and preservation of plans and sections, representation of geological and other surface and underground features on mine plans and sections.

Astronomy: Astronomical terms and definitions, Introduction to field astronomy, determination of true meridian, latitude, longitude and time including hour angle.

Modules

Module 1: Surveying Instruments:

Mining theodolite, miner's dial, loose and fast needle traversing with miner's dial, EDM & Total Station- their applications. Introduction to Gyro-theodolite & GPS.

Module 2: Triangulation Survey:

Classification; Reconnaissance; Procedures for angles and base-line measurement; Comparison with precise EDM traversing.

Module 3: Correlation Survey:

Correlation of underground and surface surveys and different methods of correlation- connection through adit, incline and shafts. Method of connection through single or double vertical shafts. Corrections by means of magnetic needle

Module 4: In-pit Survey:

Setting out a point of known rectangular co-ordinate. Control of directions and gradients for inclined shafts, slopes, levels and tunnels. Use of Top telescope and side telescope. Maintaining alignments, simple curve laying underground, laying out and fixing of mine boundaries claims, subsidence surveys on surface and underground. Volume calculations.

Module 5: Stope Surveying:

Stope surveying with Hanging Compass and Alignometer, tape triangulation, radiation and other methods.

Module 6: Mine Plans and Sections:

Legal requirements as to mine plans and sections in India, preparation and preservation of plans and sections, representation of geological and other surface and underground features on mine plans and sections.

Module 7: Photogrammetric:

Introduction to photogrammetric, Scale of a vertical photograph, photographs verses maps, application of photogrammetric in mining

Module 8: Astronomy:

Astronomical terms and definitions, Introduction to field astronomy, determination of true meridian, latitude, longitude and time including hour angle.

Application of Computer in surveying and computation.

Text/Reference Books:

1. Surveying (Vol – 1,2 & 3), by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) Ltd., New Delhi.
2. Surveying (Vol 1, 2& 3), Duggal S.K. Tata Mc.Graw Hill Publishing Co.Ltd. New Delhi, 2004
3. Text book of surveying by C. Venkataramaiah, Universities Press.
4. Engineering surveying by Schofield, Wilfred, and Mark Breach.. CRC Press, 2007
5. Surveying (Vol 1, 2&3), Arora K R, standard Book House, Delhi, 2004.
6. Plane Surveying, Chandra A M. New age International Pvt. Ltd. Publisher, New Delhi, 2002

7. Higher Surveying, Chandra A M., New Age International Pvt. Ltd. Publisher, New Delhi, 2002
8. Surveying and leveling by R. Subramanian, Oxford University Press, New Delhi.

Goals & Outcomes:

Upon successful completion of this course, the student will be able to:

(Knowledge based)

- Know the various surveying instruments and their purpose;
- Have complete understanding of the significant role of surveying play in mining.
- Understanding the setting out concepts and different kind of techniques.
- Understanding the Legal requirements of mine plans and sections in India
- Understand and remember different Astronomical terms, definition and their significance.
- Can remember different kind of representations of geological, surface and underground features on mine plans and sections

(Skills)

Use operations of Mine Surveying to:

- Identify and analyze the applications of Surveying Instruments in different kind of Mining scenario.
- Apply and evaluate the techniques used in correlation for correlation survey depending on the type of mine.
- Apply and analyse different setting out procedure in direction and gradient control in Mining Scenario.
- Apply the different techniques of stope surveying in different kind of mining methods.
- Apply different techniques to analyse the volume of mined-out area, heap and etc.
- Identify and evaluate different kind of representations of geological, surface and underground features on mine plans and sections.

MN401P	MINE DESIGN - I	0L:0T:3P	1 CREDITS
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SL. NO	NAME OF EXPERIMENT
1.	Determination of annual production capacity of a rope shovel with given bucket capacity, dumper capacity and numbers and distance of dumping yard.
2.	Determination of annual excavation capacity of a dragline of given specification including bucket capacity.
3.	Determination of total drilling requirement for an opencast overburden/ coal bench with given geometry and excavation volume/ production requirement per round of blasting.
4.	Determination of matching number of dumpers per shovel for a target output when the shovel and dumper capacities are given.
5.	Determination of volume of rock excavation in box cutting for a given geometry of the entry and depth of first bench.
6.	Determination of haul road dimensions for a given condition.
7.	Study and sketch of an inclined drivage showing support requirements, transport mode, safety features, illumination etc.
8.	Study and sketch of a conventional/ mechanized Bord and Pillar panel being developed.
9.	Study and sketch of a Bord and Pillar panel being depillared with hydraulic sand stowing showing systematic support.
10.	Study and sketch of a Bord and Pillar panel being depillared with caving showing systematic support.
11.	Study and sketch of longwall main gate and tail gate roads with respective gate machineries.
12.	Study and sketch of a mechanized longwall face in a coal seam with given specifications.

MN402P	DRILLING & BLASTING LAB	0L:0T:3P	1 CREDITS
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SL. NO	NAME OF EXPERIMENT/ EXERCISE
1.	Study & sketch of Hand held Coal drill, drill rods and drag bits.
2.	Study & sketch of air leg mounted compressed air drill, drill rod with bit.
3.	Study and sketch of rotary drill with Diamond coring bit.
4.	Study and sketch of Churn/percussive drilling component including water flushing system.
5.	Study and sketch of Down the Hole (DTH) drill for O/C Mines.
6.	Study and sketch of P ₃ and P ₅ explosives with priming and initiation (direct and reverse) methods.
7.	Study and sketch of copper and aluminium tube delay Detonators with sectional views.
8.	Study and sketch of non – electric delays, detonation chord with sectional views.
9.	Study and sketch of multi shot exploders with internal views.
10.	Exercise for deciding drilling pattern, number of holes, amount and type of explosive, stemming material in respect of a given coal face with desired yield.
11.	Exercise for deciding drilling pattern, number of holes, amount and type of explosive, stemming material in respect of a given stone drift.
12.	Exercise for deciding drilling pattern, number of holes, amount and type of explosive, stemming material in respect of a given coal/ overburden bench.

MN403P	MINE SURVEYING LAB	0L:0T:3P	1 CREDITS
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SL. NO	NAME OF EXPERIMENT/ EXERCISE
1.	Study of EDM and total station.
2.	Study of gyro theodolite.
3.	GPS and its applications.
4.	GNSS and its characteristics.
5.	Correlation survey by alignment/ co-planning method.
6.	Correlation survey by weisbach triangle method.
7.	Correlation survey by weiss-quadrilateral method.
8.	Setting out of simple curves.
9.	To determine the most probable value of the included angles of given triangle by method of least squares.
10.	Subsidence monitoring using precise instruments.
11.	Study of photo theodolite.
12.	Measurement of muck pile volume.