

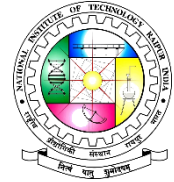
National Institute of Technology Raipur

| Course of Study and Scheme of Examination | | | | | | | B. Tech. 4th Semester | | | | Branch: Mining Engineering | |
|---|--------------|------------------------------------|------------------|---|---|--------|-----------------------|--------|----------|----|----------------------------|---------|
| S. No. | Subject Code | Subject Name | Periods per Week | | | TA | Examination Scheme | | | | Total Marks | Credits |
| | | | L | T | P | | MSE/MTR | | ESE/ESVE | | | |
| | | | | | | Theory | Prac. | Theory | Prac. | | | |
| 1 | MI10411MI | Mining Environment-II | 3 | 1 | 0 | 20 | 30 | | 50 | | 100 | 4 |
| 2 | MI10412MI | Basic Mine Surveying | 3 | 1 | 0 | 20 | 30 | | 50 | | 100 | 4 |
| 3 | MI10413AG | Geology-II | 3 | 0 | 2 | 20 | 30 | | 50 | | 100 | 4 |
| 4 | MI10414MI | Underground Coal Mining | 3 | 1 | 0 | 20 | 30 | | 50 | | 100 | 4 |
| 5 | MI10415MI | Surface Mining | 3 | 1 | 0 | 20 | 30 | | 50 | | 100 | 4 |
| 6 | MI10406MA | Mathematics IV [Numerical Methods] | 3 | 1 | 0 | 20 | 30 | | 50 | | 100 | 4 |
| 7 | MI10447MI | Basic Mine Surveying Lab | 0 | 0 | 2 | 40 | | 20 | | 40 | 100 | 1 |
| 8 | MI10448MI | Mining Environment-II Lab | 0 | 0 | 2 | 40 | | 20 | | 40 | 100 | 1 |
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Mining Environment-II

[4th Semester, Second Year]



Course Description

Offered by Department

Mining Engineering

[Pre-requisites: Mining Environment-I]

Credits

3-1-0, (4)

Status

Core

Code

MI10411MI

Course Objectives

The course is designed for the student to enable the knowledge of ventilation planning and application of mine fans along with the ventilation survey of the underground mine. The course is also designed to impart knowledge on the surface mining environment and its impacts.

Course Content

Unit-1 Ventilation Systems and Planning

Calculation of Pressure and Quantity Requirements, Network Problems, Hardy-Cross method, Ventilation Planning and Economic Analysis, various types of Ventilation Schemes.

Unit-2 Mechanical Ventilation

Mine Fans, Auxiliary and Booster Fans, Forcing and Exhaust Ventilation, Fan Reversal.

Unit-3 Ventilation Survey

Methods and Instruments for the Measurement of Pressure, Velocity and Quantity of Air.

Unit-4 Surface Mining Environment - I

Air, Water, Noise pollution in Mines - Causes, Consequences, Preventive Measures
Land degradation and reclamation.

Unit-5 Surface Mining Environment - II

Environmental Impact of Surface Mining, Environmental Management Plan, Environmental Audit.
Environmental problems in deep Surface Mines, Waste dumps.

Course Materials

Required Text: Text books

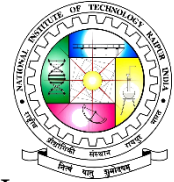
1. Elements of Mining Technology, D.J. Deshmukh, Vol. II
2. Mine Environment & Ventilation, G.B. Misra
3. Subsurface Mine Ventilation, M. J. McPherson
4. Air & Water Acts
5. Forest Conservation acts
6. Legislation in Indian Mines - A Critical appraisal by Rakesh and Prasad

Optional Materials: Reference Books

1. Environmental Impact of Mining By Down and Stokes
2. Subsurface Mine Ventilation, H.L. Hartman

Basic Mine Surveying

[4th Semester, Second Year]



Course Description
Offered by Department
Mining Engineering
[Pre-requisites: No]

Credits
3-1-0, (4)

Status
Core

Code
MI10412MI

Course Objectives

The objective of this course is to give an overview of basic surveying, use of rudimentary tools, fundamental techniques of linear and angular measurements along with its application in mines.

Course Content

Unit-1 Surveying

Definition, objective, classification and principles of surveying. Linear and Angular Measurement – Instruments for measuring distances and angles such as EDM, Total Station, Miner's Dial. Prismatic compass: principle and construction and measurement techniques.

Unit-2 Theodolite

Essentials of the transit and modern micro-optic theodolite; measurement of horizontal and vertical angles; theodolite traversing, traverse calculations, adjustment of the traverse; computation of co-ordinates; temporary and permanent adjustments.

Tacheometry: Principle and classification of tachometry; stadia tachometry; distance and elevation formulae.

Unit-3 Leveling

Definition of leveling terms; leveling instruments; different types of leveling; booking and reduction methods; differential, profile, cross-sectional and reciprocal leveling; underground leveling; shaft depth measurement. Contouring: Characteristics, methods of contouring and uses of contours; problem solving.

Unit-4 Triangulation

Classification, reconnaissance, measurement, procedures for angles and base-line
Theory of errors: Calculation of most probable values, adjustment of observations.

Unit-5 Curve setting

Elements, laying of simple circular curves on surface and belowground. Transition curve and super elevation.

Development surveys: Setting a point of known coordinate, control of direction and gradient in drifts, tunnels, raises and winzes; application of lasers; Problems of underground traversing.

Course Materials

Required Text: Text books

1. Mine surveying by S. Ghatak
2. Surveying & Levelling by B. C. Punamia

Optional Materials: Reference Books

1. Surveying & Levelling by Kanetkar & Kulkarni

Geology-II

[4thSemester, Second Year]



Course Description

Offered by Department

Applied Geology

[Pre-requisites: Geology-I]

Credits

3-1-0, (4)

Status

Core

Code

MI10413AG

Course Objectives

The objective of the course is to provide basic understanding of Stratigraphy & Paleontology and its importance in minerals exploration, determining location on a base map; making and recording field observations and measurements, identification ore minerals; concept of minerals investigation and its mining operation and educating geological concepts to the mining engineering students for economic, environmental, safe and sustainable mining operation.

Course Content

Unit-1 Principles of Stratigraphy & Paleontology

Stratigraphy: Definitions and Basic Principles of Stratigraphy; Stratigraphic Units; Criteria for Stratigraphic Classification and Correlation; Standard Geological Time Scale.

Paleontology: Fossils; Elementary idea about conditions, modes of preservation and uses of fossils. A preliminary idea on broad groups of animals and plants fossils; Brief Palaeontological study of Gondwana Fields.

Unit-2 Indian Geology

Introduction: Major Geomorphic Divisions of India; General Review of Indian Stratigraphy.

Indian Rock Systems: Classification, geographic distribution and descriptions of important Geological formations and Economic significance- Archean, Proterozoic, Palaeozoic, Mesozoic, Gondwana, Deccan Traps and Cenozoic.

Unit-3 Economic Geology-I

Introduction: Definition and Scope of the subject; Fundamental terms and their definitions.

Processes and forms: Brief review of the processes of Mineral formation and the Genetic Classification of Mineral Deposits. Distribution and Morphology of Minerals Deposits.

Unit-4 Economic Geology-II

Metallic Minerals: Mode of Occurrence, Origin, Distribution, Association and Industrial uses of important Metallic (Au, Al, Cu, Fe, Mn, Sn, Pb and Zn) Minerals.

Non-Metallic Minerals: Mode of Occurrence, Origin, Distribution, Association and Industrial Uses of important Non-Metallic (Diamond, Mica, Radioactive Minerals, Gypsum, Dolomites, Fire-Clay, Magnesite, Talc, Asbestos, Graphite, Kyanite, Sillimanite, Corundum, Fluorite, Phosphorite, Precious and Semi-Precious Stones) Minerals and Petroleum deposits of India.

Unit-5 Prospecting and Exploration

Introduction: Prospecting and Exploration -their definitions and classification of methods

Methods and Guides: Elementary methods of Geological, Geophysical, Geochemical prospecting; Guides to Ore-Ringed Targets, Intersection Loci, Physiographical, Mineralogical, Stratigraphical and Structural Guides to Ores.

Course Materials

Required Text: Text books

1. G.B. Mahapatra, Text book of physical geology, CBS Publishers and distributors Pvt. Ltd. 1st Edition, 1994.
2. Kevin Hefferan & John O'Brien, Earth material, Wiley-Blackwell, 1st publication, 2010.

Optional Materials: Reference Books

1. Mead L. Jensen & Alan M. Bateman, Economic Mineral Deposit, John Wiley and Sons, Third Edition 1981.
2. Umeswar Prasad, Economic Geology, CBS Publication, 2nd Edition, 2000.
3. Sam Boggs Jr., Petrology of sedimentary rocks, Pearson Publication, 5th Edition, 2016.
4. P.C. Jain & M.S. Anantharaman, Palaeontological evolution and animal distribution, 9th Edition, 2015.
5. M. Ramakrishnan & R. Vaidyanadhan, Geology of India (Vol. I & II), Geological society of India, 2008.
6. R. N. P. Arogyaswamy, Courses in Mining Geology, Oxford & IBH, 4th edition, 1995.

Geology-II Lab

[3rd Semester, Second Year]



Course Description
Offered by Department
Applied Geology
[Pre-requisites: Geology-II]

Credits
0-0-2

Status
Core

Code
MI10413AG

Course Objectives

The objective of this course is to provide a basic idea about Identification, Practiced to and description of ore forming and industrial minerals; inferring origin of ore forming and industrial minerals, Identification and description of important plant Fossils, through specimens, Drawing and interpreting advanced geological maps and sections, through specimens and maps and applying geological concepts in the mining engineering for economic, environmental, safe and sustainable mining operation.

Course Content

List of Experiments

1. Megascopic identification, description and distribution of Ore Forming Minerals and Industrial Minerals.
2. Study of important plant Fossils with respect Gondwana records.
3. Study of Advance Geological Maps, preparation and description of Geological Cross Sections.
4. Plotting of important Mineral deposits / mine-locations on map of India.



Underground Coal Mining

[4th Semester, Second Year]

Course Description

Offered by Department

Mining Engineering

[Pre-requisites: Basics of Mining Engineering]

Credits

3-1-0, (4)

Status

Core

Code

MI10414MI

Course Objectives

The basic objective of the course is to provide knowledge of different theories of coal formation, coal classification, methods of coal mining. The course will also deal with Bord& Pillar and Longwall method of extraction, Thick seam mining and various specialized coal mining methods namely, Room & pillar mining, Shortwall mining, Hydraulic mining and underground gasification of coal.

Course Content

Unit-1 Introduction

Theories of Coal Formation, Classification of Coal, Coal Seam and its Classification, Coal Seam Structures and abnormalities, Coal Measuring Rocks and their Characteristics, Distribution of Coal in India, Indian Coal Mining Industry.

Unit-2 Bord and Pillar Method

Development by Bord& Pillar system, Panel & without Panel system, Size and Shape of the Pillar, Galleries, Cycle of Operations, Depillaring, Problems in Depillaring, Preparatory arrangements, Pillar Extraction techniques, Depillaring with Stowing and Caving Methods, Dangers associated with Depillaring.

Unit-3 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, Variants of Longwall Mining.

Unit-4 Overview of 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 Seam extraction.

Unit-5 Overview of Special Methods of Mining

Short wall Mining, Room & Pillar mining, Hydraulic Mining, Underground gasification of Coal, Introduction to CBM recovery.

Course Materials

Required Text: Text books

1. Principle and practices of modern Coal Mining by R.D. Singh
2. Coal Mining in India by S.P. Mathur
3. Mining & working coal by R.T. Deshmukh

Optional Materials: Reference Books

1. Underground winning of Coal by T.N. Singh
2. Longwall Mining by S. Peng



Surface Mining

[4th Semester, Second Year]

Course Description

Offered by Department

Mining Engineering

[Pre-requisites: Basics of Mining Engineering]

Credits

3-1-0, (4)

Status

Core

Code

MI10415MI

Course Objectives

The objective of the course is to develop basic understanding of various surface mining methods, layouts of surface mines and machineries used for drilling, excavation, transportation and land reclamation.

Course Content

Unit-1 Open Pit Design and Layouts

Classification of surface mining methods, mineral deposits suitable for open pit mining, important parameters of open pit design; design of benches, ultimate pit, stripping ratio, break even 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 open cast mining.

Unit-2 Rock Drilling

Theory of rock drilling, different types of drill machines used in open pits; rotary, percussive and rotary percussive drilling, selection of drill machines on the basis of drillability; computation of productivity of drill machines; inclined drilling; their advantages and disadvantages.

Unit-3 Pit Preparation

Development of an open pit mine and its various activities, introduction to site preparation equipments such as dozers, scrapers, front-end loaders, grader, back hoe, etc.; their construction, machine operation, suitability and applicability; calculation of their productivity.

Unit-4 Loading and Excavation

Different types of excavators used in open pits; shovel, dragline, hydraulic excavators, multi bucket excavators, surface miners, their construction, specifications, machine operation, suitability and applicability; calculation of their productivity.

Unit-5 Transport in Open Pits

Automobile transport such as dumpers, its various types, applicability and limitations, computation of their productivity; synchronization of shovel dumper combination, automation in open pit transport such as truck dispatch system, rail transport and conveyors; their suitability, in-pit crushing & conveying, high angle conveying, specialized conveying.

Course Materials

Required Text: Text books

1. Surface Mining by G.B. Mishra
2. Surface Mining Technology by S. K. Das
3. Surface mining equipment by Martin
4. Surface Mine Planning & Design by Hustrulid & Kuchha

Optional Materials: Reference Books

1. SME handbook by Hartman
2. Surface Mining by Eugene P. Pfeleider



Mathematics-IV (Numerical Methods)

[4th Semester, Second Year]

Course Description

| Offered by Department | Credits | Status | Code |
|-----------------------|------------|--------|-----------|
| Mathematics | 3-1-0, (4) | Core | MI10406MA |

[Pre-requisites: Mathematics-I, Mathematics-II]

Course Objectives

To enable the students to apply the knowledge of Mathematics in various fields:

1. To solve the algebraic, transcendental and simultaneous linear equations and its application.
2. To solve the problems related to data appear equal or unequal intervals and to obtain a functional relationship between the observed values.
3. To calculate the derivative of the function and evaluate the definite Integral from set of numerical values.
4. To solve the ordinary differential equations using different numerical techniques.

Course Content

Unit-1 Numerical Solutions of Algebraic, Transcendental and Simultaneous Linear Equations

Errors in numerical computation, Error type, Bisection Method, Regula-Falsi Method, Secant Method, Newton-Raphson Method, Direct Methods: Gauss Elimination, Gauss-Jordan & Crout's Triangularisation Method, Iterative Methods: Jacobi, Gauss-Seidel & Relaxation Methods.

Unit-2 Interpolation and Curve Fitting

Finite differences, Forward, Backward & Central Difference Interpolation, Lagrange's method and Newton's Divided Difference method, Principle of Least Squares, Fitting a Straight Line, Fitting a Parabola, Exponential Function, Method of Group Averages.

Unit-3 Numerical Differentiation and Integration

Derivatives using Forward, Backward and Central Difference methods, Derivatives using unequally spaced values, Newton-Cote's Quadrature method, Trapezoidal rule, Simpson's $1/3$ rule, Simpson's $3/8$ rule, Weddle's rule.

Unit-4 Numerical Solutions of Ordinary Differential Equations

Numerical solutions of ODE by Picard's Method, Taylor's Series Method, Euler's Modified Method, Runge-Kutta Method of Fourth Order, Milne's Method, Adams-Bashforth Method to solve ODE.

Course Materials

Required Text: Text books

1. M. K. Jain, S. R. K. Iyengar & R. K. Jain Numerical Methods for Scientific and Engineering Computation, New Age International (P) Limited, Publisher.
2. B. S. Grewal, Numerical Method in Engineering and Science, Khanna Publisher.
3. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, Inc. Publisher.

Optional Materials: Reference Books

1. P. Kandasamy, K. Thilagavathy, & K. Gunavathi, Numerical Methods, S. Chand Publisher.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons Inc. Publisher.
3. S. S. Sastry, Introductory methods of numerical analysis, PHI, Publisher.



Basic Mine Surveying Lab

[4thSemester, Second Year]

Course Description

Offered by Department

Mining Engineering

[Pre-requisites:Basic Mine Surveying]

Credits

0-0-2

Status

Core

Code

MI10447MI

Course Objectives

The objective of the course is to give an overview of basic mine surveying, use of surveying instruments and fundamental techniques of linear measurements, angular measurements and coordinate surveying.

Course Content

List of Experiments

1. Linear measurement by different methods
 - Ranging and Chaining of line of 50 meter.
 - Measurements of area by cross staff.
 - Measurement of width of an obstacle which can be seen across but can't be chained.
2. Angular measurement by different methods using Prismatic compass, surveyor compass and miners dial.
 - Measurement of included angle by Prismatic compass.
 - Plotting a closed traverse and elimination of errors.
 - Measurement of angle by Miners Dial.
3. Different methods of Levelling.
 - Measurement of difference in elevation and gradient between two stations using dumpy level & auto level.
4. Horizontal and Vertical angle by different Theodolite
 - Horizontal angle measurement by Repetition and Reiteration method.
 - Measurement of base height (for accessible and inaccessible base) by trigonometric surveying.
5. Different methods of Tacheometry survey
 - Measurement of stadia constant.
 - Measurement of distance and elevation by Stadia method.
 - Study of Auto Reduction Tacheometer.
6. Setting out of circular curve by Chord and Offset method, Rankine's method & Cord and Offset method.
7. Study of total station and their working in underground and opencast mines.
8. Study of triangulation method and base line measurement.
9. Underground correlation survey by Weisbach triangle method.
10. Study of DGPS and their use in mine survey.
11. Study of Ediograph, Pentagraph and Planimeter& their use in maps and plan.



Mining Environment-II Lab

[4th Semester, Second Year]

Course Description

Offered by Department

Mining Engineering

[Pre-requisites: Mining Environment-II]

Credits

0-0-2

Status

Core

Code

MI10448MI

Course Objectives

The student shall be enabled with the practical knowledge of ventilation planning, mechanical ventilators, selection of mine fan, ventilation survey of the underground mine, dust sampling instruments.

Course Content

List of Experiments

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 static tube.
8. Study of central and boundary ventilation system.
9. Study of gravimetric Dust sampler.
10. Study of thermal precipitator Dust sampler.