

Advanced Mine Survey

[7th Semester, Fourth Year]



Course Description

Offered by Department
Mining Engineering

Credits
3-o-2, (4)

Status
PC

Code
MI107101MI

[Pre-requisites: Basic Mine Surveying]

Course Objectives

The objective of the course is to introduce different types of modern survey equipment and methods for precision survey.

Course Content

UNIT 1: Remote sensing

Remote sensing, Photogrammetry, satellite imaging, GIS application to mining, Computer aided drawings of plans and section.

UNIT 2: Advances in Surveying Instrumentation

GPS & DGPS, Principle, operation, application to mine survey and face monitoring. Laser profilers, EDM, Total Station, principle, techniques and application in mines.

UNIT 3: Underground Surveying

Methods of correlation - direct traversing in inclined shaft, correlation in vertical, single and two shafts. Gyro-theodolite & its application.

Stopes Surveying: Purpose, methods of survey in moderately and steeply inclined ore bodies, flat and vertical ore bodies/seams.

Relevant provisions and requirements as per the Regulations.

Subsidence survey

UNIT 4: Open cast surveying

Slope monitoring Survey, Bench & Ramp Layout survey, Joint boundary survey, Problems based on Dip-Strike, boreholes, faults, Area and Volume calculations.

Relevant provisions and requirements as per the Regulations.

UNIT 5: National Grid:

Map Projections; Cassini, Lambert's Polyconic, UTM, transformation of coordinates.

Geodesy: Geoid, spheroid and ellipsoid, geocentric, geodetic and astronomical coordinates, orthometric and dynamic heights.

Course Materials

Required Text: Text books

1. Ghatak, S., Mine Surveying and Levelling – Vol I, II & III, Coal Field Publishers, Asansol, 2005
2. Punmia, B. C., Surveying Vol- I & II, Laxmi Publishers, New Delhi, 2008.
3. Kanetkar, T.P., Surveying, Vol- I & II, Tata McGraw Hill, New Delhi, 2007

Optional Materials: Reference Books

1. Fundamentals of Remote Sensing, by George Joseph & C. Jeganathan, 3rd Edition
2. Advanced Surveying: Total Station, GPS, GIS & Remote Sensing by Pearson, by Gopi Satheesh, R. Sathikumar, N. Madhu, 2nd Edition

Mining Legislation & Safety-II

[7th Semester, Fourth Year]



Course Description

Offered by Department

Mining Engineering

Credits

3-o-o, (3)

Status

PE

Code

MI107201MI

[Pre-requisites: Underground Coal Mining Method, Underground Metal Mining, Surface Mining.]

Course Objectives

The objective of the course is to help the student in understanding the different statutory provisions of Mines and Minerals (Regulation and Development) Act, Coal Mines Conservation & Development Act, Mineral Concession Rules, Indian Electricity Rules, Industrial Disputes Act, Mine Rescue Rules and Safety management systems for mining industries for maintaining law and order as well as safe working environment in mines.

Course Content

Salient provisions of Mines and Minerals (Regulation and Development) Act and rules and regulations made there under.

Coal Mines Conservation & Development Act.

Indian Electricity Act and Rules made there under applicable to mining

Introduction to risk based safety and health management system; Methods of Risk assessment; Safety education and training. Safety management systems in Indian mining industry; Need for Mine safety; Principal Hazard Management Plan (PHMP), Measures for improving overall safety in mines. Safety management plan, Emergency plan.

Course Materials

Required Text: Text books

1. Legislation in Indian Mines: A critical Appraisal, Vol. I & II by S. D. Prasad & Rakesh (1992).
2. Safety in Mines by Kejriwal, B. K. (2002)
3. Coal Mines Conservation & Development Act Mines 1974& Minerals (Development and Regulation) Act and rules1957.
4. Indian Electricity Act 2003 and Rules 2005.
5. Industrial & Occupational Safety, Health & Hygiene by A. Hommadi.
6. Occupational Health: A Practical Guide for Managers by Ann Fingret&Akin Smith. 1st Edition

Optional Materials: Reference Books

1. Occupational Health and Safety Management: A Practical Approach, 3rd Edition, by Charles D. Reese

Mine Closure Planning

[7th Semester, Fourth Year]

Course Description

Offered by Department
Mining Engineering

Credits
3-o-o, (3)

Status
PE

Code
MI107202MI



[Pre-requisites:No]

Course Objectives

The objective of the course is to help the student in understanding the principles, processes and methodologies associated with mine closure planning and workout and develop mine closure plan.

Course Content

UNIT 1: Introduction: Mine Closure Planning and its components, need of Closure Planning in mining ventures; technical information for Closure Planning.

UNIT 2: Issues in mine closure planning. Different mine closure operations. Role of regulatory authorities and mine operator in mine closure. Post-mining site rehabilitation programme.

UNIT 3: Principles, planning, financial provisions, implementation, standards for closure criteria, systems approach for mine closure and development of closure plan.

UNIT 4: Factors to be considered, Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) preparation, Mine Closure Planning.

UNIT 5: Legal provisions for environmental protection – various acts, rules and regulations and various legal aspects of mine closure planning. Its advantages and amendments. Guidelines from Ministry of Environment, Forest and Climate change. Preparation of a Mine Closure Plan.

Course Materials

Required Text: Text books

1. Mineral Deposit Evaluation: A practical approach by Alwyn E. Annels 1991
2. Guidelines for preparation of Mine Closure Plan issued by Indian Bureau of Mines
3. SME Mining Engineering Handbook 2nd Edition Howard L. Hartman

Mine Economics

[7th Semester, Fourth Year]

Course Description

Offered by Department

Mining Engineering

Credits

3-0-0, (3)

Status

PE

Code

MI107251MI



[Pre-requisites: No]

Course Objectives

The course is designed for the student to make students conversant with importance of mineral economics and make aware about the various financial aspects of mineral industry.

Course Content

UNIT 1:

Introduction: Importance of Mineral resource in Economy; Mineral Resources & Reserves -concept, methods of classification, UNF Codification. Sampling- Methods of sampling, Sample preparation, Errors in sampling, analysis of samples. Salting, precautions against salting, Estimation of grade and Ore reserves.

UNIT 2:

Elements of Economics, Factors of Production, Functions and Forms of Capital, Market Systems, Trade Cycle.

Mine Valuation – Purpose & range of economic studies, Preliminary & Intermediate studies of valuation, Valuation Methods, Depreciation, Amortization and Redemption of capital, life and present value of a mine.

UNIT 3:

Cost of mining: Elements of Costs, Direct & Indirect Costs, Components of Costs, Capital and operating costs; factors affecting operating cost; standard cost estimation and forecasting; budget and budgetary control.

Financial Management - Methods of financing industrial enterprises, Memorandum and articles of association. Sources of funding Enterprises, shares, debentures, dividends and interest. Break even chart and inventory control computations.

UNIT 4:

Investment Decisions - discounted cash flow methods, non-discounted cash flow methods, advantages and disadvantages of them, Internal Rate of Return & Return on Investment, Net Present Value.

Book keeping, balance sheet, profit and loss statement.

UNIT 5:

Pre-feasibility, feasibility, and detailed project reports.

Course Materials

Required Text: Text books

1. Mineral and mine economics, 1986, by Ramrao T Deshmukh
2. Engineering Economics, Second Edition by R. Panneerselvam

Optional Materials: Reference Books

1. Mineral Economics, 4th Edition 2019by SINHA R K
2. Financial Management, 11th Edition 2016 – I. M. Pandey

Mine Systems Engineering

[7th Semester, Fourth Year]



Course Description

Offered by Department
Mining Engineering

Credits
3-o-o, (3)

Status
PE

Code
MI107252MI

[Pre-requisites: No]

Course Objectives

The objective of the course is to introduce different operational research models for planning, scheduling, controlling and optimization of the system.

Course Content

UNIT 1: Introduction to systems engineering

Concept of system, sub-system and system environment, Classification of systems; Systems analysis.

Linear Programming: Linear Programming models; Assumption of linear programming, Graphical and Simple method of solving Linear Programming Problems, Application of Linear Programming for solution of mining related problems of production planning, scheduling and blending.

UNIT 2: Transportation and Assignment Problem

Transportation models, Variations on Classical Transportation models, Solution; Algorithm for Transportation problem. Assignment model, Variations on Assignment model. Solution algorithm for Assignment problems. Application to mining problems.

UNIT 3: PERT & CPM

Assumption of PERT and CPM; Methods of drawing network; Redundancy; Critical path calculation; Statistics related to PERT; Case studies.

UNIT 4: Simulation

Introduction and concept; Scope and limitation; System type versus simulation technique; Generating input data; Monte-Carlo simulation; Simulation of equipment maintenance and inventory systems in mines.

UNIT 5: Queuing Theory & Probability

Introduction and concept; Review of probability, random variables, distributions, generating functions, Characteristics of queuing systems, Markovian and non-Markovian queueing system, Scope, applications and limitation

Course Materials

Required Text: Text books

1. Linear Programming by G. Hadley, Narosa, Reprint, 2002
2. Linear Algebra by G. Hadley, Narosa, Reprint, 2002.
3. Operations Research-An Introduction, Prentice Hall, 9th Edition, 2010.

Optional Materials: Reference Books

1. Operations Research- Principles and Practice by A. Ravindran, D. T. Phillips and James J. Solberg, John Wiley & Sons, 2005.
2. Introduction to Operations Research- Concepts and Cases by F.S. Hillier, G.J. Lieberman, 9th Edition, Tata Mc-Graw Hill, 2010.

Advanced Mine Survey Lab

[7th Semester, Fourth Year]

Course Description

Offered by Department

Mining Engineering

Credits

0-0-2, (1)

Status

PC

Code

MI107401MI



[Pre-requisites: Basic Mine Surveying]

Course Objectives

The objective of the course is to introduce different types of modern survey equipment and methods for precision survey.

Course Content

List of experiments:

1. Detailed surveying and contouring with Total Station.
2. Volume and stock measurement.
3. Plotting of sections using AUTOCAD.
4. Study of Gyro-theodolite.
5. Study of GPS & DGPS and data collection.
6. Weisbach Triangle method of Correlation survey .
7. Subsidence monitoring using 1" –Micro-optic Theodolite & Precise Level.
8. Digitization of Mine Plans.
9. Creation of 3D mine model using GPS data.
10. Satellite Image analysis using ArcGIS.

Course Materials

Required Text: Text books

1. Ghatak, S., Mine Surveying and Levelling – Vol I, II & III, Coal Field Publishers, Asansol, 2005
2. Punmia, B. C., Surveying Vol- I & II, Laxmi Publishers, New Delhi, 2008.
3. Survey Laboratory Manual