

# Mine Management

[8<sup>th</sup> Semester, Fourth Year]



## Course Description

### Offered by Department

Mining Engineering

### Credits

3-o-o, (3)

### Status

PE

### Code

MI108201MI

[Pre-requisites: No]

## Course Objectives

The students are made conversant with management, organization, structures, personnel management and managerial behaviors. This would be very much essential for their duties as of manager which they have to perform in future.

## Course Content

### UNIT 1: Evolution of Management Theory

Principle of Scientific & Administrative management, Behavioral Management, Management functions, Planning, Organizing and Control, Levels of Management. Structure of organization for Enterprises, Roles & Skills of Managers.

### UNIT 2: Personnel Management

Selection, training and executive development program of human resources, Essence of Manpower planning, Job evaluation, Performance Appraisal, Job analysis, Incentive, human needs and various need hierarchy theories, X theory & Y theory and Herzberg's motivational theories; Leadership – role of leader & types of leadership. Effective Communication and Counseling skills in mining industry. Absenteeism – causes and remedy - in mining industry.

### UNIT 3: Production Management

Determination of norms and standards of operations by work study, work measurements, Production planning, Scheduling and control, Queuing theory, short and long term planning, Productivity - its concept and measurement, Quality control. Introduction to ISO 9001-2 & 14001, Quality Circle, TQM & TPM. Industry 4.0, Material Management – Models, Stores, Warehouse & Logistic management.

Introduction, components and nature of inventory problems, Classical EOQ model; EOQ model with quantity discount; Static and dynamic inventory problems.

### UNIT 4: Industrial Psychology

Definition & Applications, Personality Traits & Theories, Studies of physical factors and their effect on man, Psychological tests and Uses. Industrial relations, Human relations, Industrial Disputes – Causes, Analysis of industrial disputes, Prevention and settlement of industrial disputes, Trade union movements in India.

### UNIT 5: Industrial Act and Laws

Industrial Dispute Act, Industrial Trade Union Act, Payment of wages Act, Workmen's Compensation Act, Contract Labor Laws.

## Course Materials

### Required Text: Text books

1. Mine Management, V.N. Singh, Lovely Prakashan, 2003.
2. Industrial Engineering and Management (17<sup>th</sup> Edition) by O.P. Khanna
3. Personnel Management and Industrial Relations by Dr. Satish Mamoria & Dr. Mohan Lal Dashora Dr. Chaturbhuj Mamoria
4. Industrial-Engineering-Production-Management M. Mahajan, Dhanpat Rai & Co. (P) Limited

### Optional Materials: Reference Books

1. DGMS Circulars pertaining to Labour Welfare & Rehabilitation.

# Computer Applications in Mining

[8<sup>th</sup> Semester, Fourth Year]



## Course Description

Offered by Department

Mining Engineering

Credits

3-o-o, (3)

Status

PE

Code

MI108202MI

[Pre-requisites: Surface Mining, Mine Environment II, Rock Mechanics]

## Course Objectives

1. To make students conversant with importance of computers in mining engineering
2. To make aware about the various software and its application to mine planning and design
3. To demonstrate and impart initial training to use the software

## Course Content

### UNIT 1:

Overview of software for Mine Planning and Design such as Minex, SURPAC. Applications for preparation of mine plans and sections. Statistical and geostatistical techniques used in mining calculations, ore reserve and ore grade estimation.

### UNIT 2:

Analogue and digital simulations, deterministic and stochastic computer simulation models of mining operations. Computer simulation of mine ventilation systems, Coal and mineral handling systems.

### UNIT 3:

Mine design computer applications based on rock mechanics and ground control like slope stability, pillar design, mine opening design, blast design, fragmentation analysis,etc. using FLAC3D,Oasys,FLACslope, WIPFRAG, UDEC, JKSIMblast, etc.

### UNIT 4:

Introduction to the application of robotics in mines, remote controlled and manless mining.

Expert systems: concept and applications in mining. Application of Artificial Intelligence in Mining

Mine automation, application of IOT in mining, smart sensors, Automated Mining Equipment for Improved Safety Standards.

## Course Materials

### Required Text: Text books

1. Open Pit Mine Planning and Design, Second Edition by William A. Hustrulid , Mark Kuchta
2. Operation Research Application by Kulkarni
3. Surface blast design, Calvin J Konya; Edward J Walter; 1990
4. Introduction to Rock Mechanics: Goodman, Richard E Second Edition
5. Coal mines ground control by S. Peng, 2008
6. Mine Environment And Ventilation, by Misra G.B., 1998

### Optional Materials: Reference Books

1. Surpac / Minex / Flac / Udec / Wipfrag / Blastware Software Manuals

# Advanced Surface Mining

[8<sup>th</sup> Semester, Fourth Year]



## Course Description

### Offered by Department

Mining Engineering

### Credits

3-0-0, (3)

### Status

PE

### Code

MI108251MI

[Pre-requisites:Surface Mining]

## Course Objectives

The objective of the course is to develop an understanding of various casting layouts used by the Draglines, continuous mining systems by BWE and continuous surface miners, mine pit design and design of pit and dump slopes.

## Course Content

### UNIT 1:

Methods of side casting by Dragline, Range/Balancing Diagram, calculation of operating radius, Tandem operation of Draglines, Horizontal and Vertical Tandem. Layouts of waste dumps. Design of Haul roads.

### UNIT 2:

Introduction to continuous surface mining equipment, Bucket wheel excavators, constructional features, basic machine operation, cutting methods and productivity calculations, Continuous surface miner, their construction, basic operation and productivity. Cutting methods, Face Layouts.

### UNIT 3:

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

### UNIT 4:

Introduction to rock slope engineering, Slopes in surface mines and their formation, Pit slopes and their influence on mine economics, Slope/Dump stability, Factors influencing slope/dump stability, various types of slope failure and their geometrical conditions. Determination of factor of safety of a slope under plane and circular failure using LEM and Finite/Discrete Element Methods.

### UNIT 5:

Planning of slope stability investigations, Stabilization and protection methods for stability of slopes. Methods of Slope monitoring using surveying instruments, slope stability radar, etc. Trigger action response plan for warning of slope failure.

## Course Materials

### Required Text: Text books

1. Surface Mining, Misra, G.B., Dhanbad Publishers, Dhanbad, 1994
2. Surface Mining Equipment (1982). by James W. Martin
3. Rock Slope Engineering: Third Edition: Hoek, Evert, Bray, Jonathan D.
4. Open Pit Mine Planning and Design, 2013 by William A. Hustrulid, Mark Kuchta, Randall K. Martin

### Optional Materials: Reference Books

1. Surface Mining. E. P. Pfleider, American Institute of mining, metallurgical, and petroleum engineers, 1972
2. SME Mining Engineering Handbook, 2<sup>nd</sup> Edition by Howard L. Hartman

# Numerical Methods in Mining Engineering

[8<sup>th</sup> Semester, Fourth Year]



## Course Description

Offered by Department  
Mining Engineering

Credits  
3-o-o, (3)

Status  
PE

Code  
MI108252MI

[Pre-requisites: No]

## Course Objectives

1. To study the finite element methods, finite difference methods and boundary element methods
2. To understand the practical applications of numerical methods in mining field

## Course Content

### UNIT 1: Introduction To Elastic And Plastic Models

Fundamentals, elastic, plastic, homogeneous and isotropic, non-linear elastic and elastoplastic models.

### UNIT 2: Finite Difference Methods

Concept, formation of mesh element, finite difference patterns, solutions, application to mining.

### UNIT 3: Finite Element Methods

Concept, discretization, element configuration, element stiffness, assemblage and solutions,two and three dimensional solutions, linear and non-linear analysis, applications in geo-mechanics.

### UNIT 4: Boundary Element Method

Concept, discretization, different methods of solution for isotropic and infinite media.

### UNIT 5: Practical Applications in Mining

Practical Applications in stress analysis, slope stability, subsidence prediction, pillar design, rock burst, etc.

## Course Materials

### Required Text: Text books

1. Introduction to the finite Element Method by Desai, C.S. and Abel, J.F., Van Nostrand Riehokl Co., New York, 1983.
2. The Finite Element Method in Engineering Science by Zienkiewicz, O.C., Tata McGraw Hill 1972.
3. Applied Finite Element Analysis by Segerlind, L.J., John Wiley and Sons, New York, 1987.
4. Matrix Finite Element – Computer and Structural Analysis by Mukhopadhyay, M., Oxford and IBH Publishing Co., 1984
5. Analytical and Computational Methods in Engineering and Rock Mechanics by Brown, E.T., (Ed) Allen and Unwin, London, 1987.

### Optional Materials: Reference Books

1. Flac / Udec Software Manuals

# Occupational Health and Safety

[8<sup>th</sup> Semester, Fourth Year]



## Course Description

Offered by Department  
Mining Engineering

Credits  
3-o-o, (3)

Status  
OE

Code  
MI108301MI

[Pre-requisites: No]

## Course Objectives

The objectives of the course is to help the students in developing a solid understanding of the Occupational Health and Safety (OH&S) legislation, processes, procedures, and techniques involved in workplace safety hazard recognition, assessment and its control, Impact of Ergonomics on Occupational Health & Safety, various Occupational Hazards and its prevention, importance of and process of Accident / Incident Investigation system and Safety Audits.

## Course Content

### **Unit-1:**

#### **Occupational Health and Hazards:**

Introduction to workplace hazards, types of workplace hazards, health risks associated with workplace hazards, Managing occupational health, assessment and evaluation of hazardous substances at work, Control of hazardous substances, Biological agents, Noise, Vibration, Radiation, Thermal stress index, Musculoskeletal disorders and controls, Work environment risks and controls, Relevant statutes.

### **Unit-2:**

#### **Impact of Ergonomics on Occupational Health and Safety:**

Introduction and Overview of Ergonomics, Ergonomics and human factors at work, Definition, Aim and focus of Ergonomics, Physiological work load classification, Total Calories and concept on Energy expenditure, Application of ergonomics for safety & health, Ergonomic Improvements and Controls, Overview of Ergonomic guidelines for work station design, Case study.

### **Unit-3:**

#### **Risk Assessment and Safety Management System**

Introduction to Occupational and Non-occupational Risks & it's detection techniques / models / methodologies / tools like Preliminary hazard analysis (PHA) & hazard analysis (HAZAN), failure mode effect analysis (FMEA), Hazard and operability (HAZOP) study, Hazard ranking, Fault tree analysis, Event tree analysis, Job Safety Analysis (JSA), etc. Assessment and evaluation of risk, Short and Long term Risk control measures, Salient features of Principal Hazard Management Plan (PHMP), Safety Management Plan (SMP) and Emergency Response and Evacuation Plan (EREP), Case study.

### **Unit-4:**

#### **Workplace Accident Investigation and Safety Audits:**

Accidents and their classification; Basic causes of accident occurrence at workplace, Potential factors for accident, Cost of accidents, Objective of Accident Investigation, Process of Accident Investigation, Accident reporting, Preparation of Accident investigation report, Calculation on accident statistics (IFR) and finding confidence interval, Case study.

Overview and objective of Safety Audit, Types of Safety Audit, Benefits of Safety Audit, Procedures of Safety Audit, and Safety profile rating system (SPRS), Case study.

**Personal Protective Equipment:** Introduction to PPE, Need of PPE, Indian standards, factors of selection of PPE, non-respiratory equipment, respiratory equipment's etc.

## Course Materials

Required Text: Text books

1. Occupational Safety and Health: Fundamental Principles and Philosophies by Charles D. Reese
2. Safety at Work Hardcover –1994by John R. Ridley
3. Fundamentals of Industrial Safety and Health: Vol. - 2 by K. U. Mistry. Siddharth Prakashan, Publisher: Ahmedabad, 2012, Edition: 3<sup>rd</sup>
4. Industrial & Occupational Safety, Health & Hygiene by A. Hommadi.
5. Occupational Health: A Practical Guide for Managers by Ann Fingret&Akin Smith. 1<sup>st</sup> Edition

**Optional Materials: Reference Books**

1. Occupational Health and Safety Management: A Practical Approach, 3rd Edition, by Charles D. Reese
2. Environment and Health Hardcover –1980by Norman M. Trieff Ann Arbor Science Publishers
3. Environmental Health & Technology by Y P Kudesia & Ritu Kudesia.
4. Occupational Ergonomics: Principles of Work Design (Principles and Applications in Engineering) by Waldemar Karwowski, William S. Marras
5. Introduction to Ergonomics by R. S. Bridger, 3<sup>rd</sup> Edition