ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS

R - 2008

B.E. MINING ENGINEERING

III TO VIII SEMESTERS CURRICULUM and SYLLABI

SEMESTER – III

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MA9211	Mathematics - III	3	1	0	4
AG9213	Geology - I	3	0	0	3
CE9213	Strength of Materials	3	0	0	3
ME9213	Basic Mechanical Engineering for Mining	4	0	0	4
EE9211	Electrical Drives and Control	3	0	0	3
EC9161	Electronics Engineering	3	0	0	3
PRACTICAL					
AG9214	Geology Laboratory - I	0	0	2	1
CE9214	Strength of Materials Laboratory	0	0	3	2
EE9220	Electrical Machines & Measurement Laboratory	0	0	3	2
EC9162	Electronics Laboratory	0	0	2	1
	TOTAL	**19**	**1**	**10**	**26**

SEMESTER – IV

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MA9268	Statistics and Numerical Methods	3	1	0	4
AG9261	Geology - II	3	0	0	3
CE9211	Fluid Mechanics and Machinery	3	1	0	4
CE9261	Surveying - I	3	1	0	4
MI9251	Mining Machinery- I	3	0	0	3
MI9252	Mine Environmental Engineering - I	3	0	0	3
PRACTICAL					
AG9262	Geology Laboratory – II & Field Work	0	0	3	2
CE9212	Fluid Mechanics and Machinery Laboratory	0	0	3	2
ME9257	Basic Mechanical Engineering Lab for Mining	0	0	4	2
MI9253	Mining Machinery Laboratory - I	0	0	2	1
	TOTAL	**18**	**3**	**12**	**28**

SEMESTER – V

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MI9301	Mine Environmental Engineering - II	3	0	0	3
MI9302	Rock Mechanics and Ground Control - I	3	0	0	3
MI9303	Surveying - II	3	1	0	4
MI9304	Surface Mining	3	0	0	3
MI9305	Underground Mining Methods of Mining (Coal)	3	0	0	3
EE9361	Instrumentation Engineering	3	0	0	3
PRACTICAL					
CE9312	Survey Laboratory - I	0	0	4	2
MI9307	Mine Environmental Engineering Lab-I	0	0	2	1
MI9308	Practical Training - I	0	0	0	1
MI9309	Technical Seminar - I	0	0	2	1
EE9362	Instrumentation Engineering Lab	0	0	2	1
	TOTAL	**18**	**1**	**10**	**25**

SEMESTER – VI

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
ME9362	Industrial Management	3	0	0	3
MI9351	Mining Machinery - II	3	0	0	3
MI9352	Underground Mining Methods (Metal)	3	0	0	3
MI9353	Rock Mechanics and Ground Control - II	3	0	0	3
MI9354	Mineral Processing	3	0	0	3
MI9355	Mine Environmental Management	3	0	0	3
	Elective - I	3	0	0	3
PRACTICAL					
CE9361	Survey Laboratory - II	0	0	4	2
GE9371	Communication Skills and Soft Skills laboratory	0	0	2	1
MI9356	Mine Machinery Laboratory - II	0	0	2	1
MI9357	Rock Mechanics and Ground Control Laboratory - I	0	0	2	1
MI9358	Mineral Processing Laboratory	0	0	3	2
MI9359	Survey Camp	0	0	0	1
	TOTAL	**21**	**0**	**13**	**29**

SEMESTER – VII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MI9401	Mine Planning and Design	3	0	0	3
MI9402	Mine Economics and Investment	3	0	0	3
MI9403	Computer Application in Mining	3	0	0	3
MI9404	Mine Legislation and Safety	4	0	0	4
MI9405	Mine Environmental Engineering	3	0	0	3
	Elective - II	3	0	0	3
PRACTICAL					
MI9406	Mine Environmental Engineering Laboratory - II	0	0	2	1
MI9407	Computer Application in Mining Laboratory	0	0	3	2
MI9408	Rock Mechanics and Ground Control Laboratory - II	0	0	2	1
MI9409	Comprehension	0	0	2	1
MI9410	Practical Training - II	0	0	0	1
	TOTAL	**19**	**0**	**9**	**25**

SEMESTER – VIII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
	Elective - III	3	0	0	3
	Elective - IV	3	0	0	3
PRACTICAL					
MI9451	Project Work	0	0	12	6
	TOTAL	**6**	**0**	**12**	**12**

TOTAL CREDIT: 201

LIST OF ELECTIVES FOR B.E. MINING ENGINEERING

ELECTIVES – I

CODE NO.	COURSE TITLE	L	T	P	C
MI9021	Advanced Coal Mining and Mechanization	3	0	0	3
MI9022	Advanced Metal Mining and Mechanization	3	0	0	3
MI9023	Rock Excavation Engineering	3	0	0	3
MI9024	Numerical Methods in Mining Engineering	3	0	0	3
MI9025	Advanced Surface Mining	3	0	0	3
MI9026	Longwall Mining	3	0	0	3
MI9027	System Engineering in Mining	3	0	0	3
MI9028	Material Handling	3	0	0	3
AG9071	Mineral Exploration	3	0	0	3
MI9029	Subsidence Engineering	3	0	0	3
MI9030	Small Scale and Marine Mining	3	0	0	3
MI9031	Drilling and Blasting	3	0	0	3
MI9032	Rock Reinforcement	3	0	0	3
MI9033	Rock Slope Engineering	3	0	0	3
MI9034	Mine Safety Engineering	3	0	0	3
AG9072	Petroleum Engineering	3	0	0	3
GE9021	Professional Ethics in Engineering	3	0	0	3
GE9022	Total Quality Management	3	0	0	3
GE9023	Fundamentals of Nanoscience	3	0	0	3
CS9079	Object Oriented Programming	3	0	0	3
MI9035	Material Management	3	0	0	3
ME9072	Entrepreneurship Development	3	0	0	3
ME9022	New and Renewable Sources of Energy	3	0	0	3
ME9021	Energy Conservation and Management	3	0	0	3
ME9027	Management Sciences	3	0	0	3
ME9351	Finite Element Analysis	3	0	0	3
MF9022	Non-destructive Testing	3	0	0	3

MA9211 **MATHEMATICS III** **L T P C**
(Common to all branches of BE / B.Tech) **3 1 0 4**

AIM:

To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics

OBJECTIVES:

- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions are not periodic
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in the analysis of continuous time systems

UNIT I FOURIER SERIES **9+3**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORM **9+3**

Fourier integral theorem – Fourier transform pair-sine and cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **9+3**

Formation - Solution of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange's Linear equation – Integral surface passing through a given curve – Solution of linear equations of higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **9+3**

Method of separation of Variables – Solutions of one dimensional wave equation, -One-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATION **9+3**

Z – transform - Elementary properties - Inverse Z-transform – Convolution theorem - Initial and Final value theorems – Formation of difference equation – Solution of difference equation using Z - transform.

TOTAL: 45+15=60

TEXT BOOK

1. Grewal, B.S., Higher Engineering Mathematics, Khanna Publications, Delhi 2007.

REFERENCES

1. Glyn James. Advanced Modern Engineering Mathematics, Pearson Education (2007).
2. Ramana,B.V. Higher Engineering Mathematics, Tata McGraw Hill 2007.
3. Bali, N.P, and Manish Goyal. A Textbook of Engineering, 7th Edition (2007), Lakshmi Publications (P) Limited, New Delhi.

AG9213 **GEOLOGY – I** **L T P C**
3 0 0 3

AIM
To familiarize the students with the fundamental concepts of geology.

OBJECTIVE:
To lay emphasis on the study of minerals, rocks and structures. At the end of the course the students will have an understanding of the sciences of ores and minerals.

UNIT I PHYSICAL GEOLOGY 9
Geology in mining engineering: scope and applications- earth structure and composition - weathering processes and grades – groundwater: origin, occurrence and exploration techniques.

UNIT II MINERALOGY 9
Classification of minerals- Physical properties of minerals- properties of Quartz, Feldspar, Mica, Pyroxene, Olivine and Garnet group of minerals and calcite.

UNIT III PETROLOGY 9
Classification of rocks- Description of igneous, sedimentary and metamorphic rocks – forms and mode of occurrence of rocks- Engineering properties of rocks: field and lab tests.

UNIT IV STRUCTURAL GEOLOGY 9
Introduction to geological structures - folds, faults, joints and unconformities- classification, criteria for recognition in the field and significance in mineral exploration.

UNIT V FIELD GEOLOGY 9
Introduction to Geological time scale - mineral resource distributions and economic importance of Archaen, Paleozoic, Mesozoic and Cenozoic rocks.

TOTAL= 45 PERIODS

REFERENCES:

1. Parbin Singh. Geology for Engineers, IBH publications, N. Delhi. 1991.
2. Arthur Holemess. Principles of Physical Geology, Thomas Nelson and Sons, USA, 1964.
3. Ford, W.E. Dana's Textbook of Mineralogy (4th edition), Wiley Eastern Ltd.,N. Delhi, 1989.
4. Winter J.D. An Introduction to Igneous and Metamorphic Petrology,Prentice Hall, N. Delhi, 2001.
5. Billings, M.P. Structural Geology, Prentice Hall Inc., N. Jersey, USA, 1972.
6. Krishnan M.S. Geology of India and Burma, 3rd Edition, IBH Publishers, N.Delhi, 1984.
7. Blyth F.G.H. and de Freitas M.H. A Geology for Engineers, 7th edition, Elsevier Publications, 2006.
8. Bell F.G. Engineering Geology, Elsevier Publications, 2007.

CE9213 STRENGTH OF MATERIALS L T P C
3 0 0 3

AIM:
To study the fundamental concepts of mechanics of deformable bodies.

OBJECTIVE:
Enable the student to understand the behavior of deformable structural elements, subjected to different types of loading

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 10
Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic Constants – Volumetric strains.

Thin cylinders and shells – Deformation of thin cylinders and shells – Stresses on inclined planes – Principal stresses and principal planes – Mohr's circle of stress.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAMS 13
Beams – types and transverse loading on beams – shear force and bending moment in beams – Cantilevers – Simply supported beams and over-hanging beams.

Theory of simple bending – bending formula-bending stress distribution – Load carrying capacity – Proportioning of sections – leaf springs – Flitched beams – Shear stress distribution.

UNIT III TORSION 6
Stresses and deformation in circular and hollow shafts – Stepped shafts- shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs.

UNIT IV DEFLECTION OF BEAMS 8
Double Integration method – Macaulay's method – Area moment theorems for computation of slopes and deflections in beams – Conjugate beam method.

UNIT V ENERGY PRINCIPLES 8
Strain energy and strain energy density – Strain energy due to axial loads , shear ,flexure and torsion – Castigliano's and Engessor's energy theorems. Principle of virtual work – Application of energy theorems for computing deflection in beams – Maxwell's reciprocal theorems.

TOTAL= 45 PERIODS

TEXT BOOKS:

1. Egor. P.Popov "Engineering Mechanics of Solids" Prentice Hall of India, New Delhi 1997
2. Srinath, L.N., "Advanced Mechanics of Solids", Tata McGraw Hill Publishing Company Ltd. New Delhi 1994
3. Bhavikatti "Strength of Materials, Vikas Publishing House Pvt Ltd. New Delhi 2003.

REFERENCES:

1. Junarkar S.B., Mechanics of Structures, Vol.1.,21st Edition, Charotar Publishing House, Anand, India, 1995
2. Kazimi S.M.A. Solid Mechanics, Tata McGraw Hill Publishing Company, New Delhi 1991

ME9213 BASIC MECHANICAL ENGINEERING FOR MINING L T P C
4 0 0 4

AIM:
To prepare the mining engineering students to learn about Mining Machinery in higher semesters by introducing various aspects Mechanical Engineering.

OBJECTIVES
1. To understand basic concepts of various aspects of Mechanical Engineering, fields of application, their merits, demerits, and limitations.
2. To understand basic concepts and principles of thermodynamics and heat transfer.
3. To understand basic concepts of IC Engines & air-conditioning and their applications.
4. To know about the various methods of power transmission and their applications.
5. To comprehend the application of Kinematics to Mining Machinery.
6. To be aware of some machines used in mines.

UNIT I BASIC CONCEPTS OF THERMODYNAMICS AND HEAT TRANSFER 13

Definitions – Continuum concept – Properties – Point and Path functions – Systems – Processes – Thermodynamic Equilibrium - Laws of Thermodynamics – SFEE - First Law applied to open and closed systems – Steady and Unsteady flow systems - Second Law - Kelvin Planck and Clausius statements – Heat Engines and Heat Pumps – Efficiency and COP – Carnot Cycle.

Heat Transfer – Conduction – Fourier's law – General conduction equation in Cartesian coordinates – Conduction in composite walls. Convection – Newton's law of cooling – Free and Forced convection – Simple empirical correlations. Radiation – Laws – Stefan Boltzmann law, Kirchoff's law and Planck's – Black body and Grey body radiation – Introduction to Radiation Shields and Gas radiation.

UNIT II IC ENGINES AND AIR CONDITIONING 8

IC Engines – Classification - Construction - Two and Four Stroke engines – S I and C.I engines – Carburetion and Fuel Injection Systems – Powdered coal as an alternative to diesel fuel.

Air Conditioning – Air cycles, Vapour compression cycle – Vapour absorption cycle – Psychrometric processes. Air cooling – methods and simple cooling load calculations. Systems applicable to mining environment.

UNIT III POWER TRANSMISSION 15

Friction – Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads, bearings, lubrication and Introduction to mechanical and hydraulic clutches. Rope, Belt and Chain drives - Introduction and simple calculations. Braking – types and applications.Gears – Nomenclature, Laws of gearing, Types of gears including rack and pinion, Interference, gear trains, Calculation of gear ratios. Couplings - Types, features and applications.

Basic concepts in Hydraulic & Pneumatic power and devices and their utilisation – Simple calculations.

UNIT IV KINEMATICS OF MACHINES 12

Mechanisms – Basics – kinematic concepts and definitions – degree of freedom, mechanical advantage – Transmission angle – Description of common mechanisms – Quick return mechanisms, Straight line generators, Dwell mechanisms, Ratchets and Escapements – Universal joints.

Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method – velocity and acceleration polygons. Cams and Followers – Terminology and Definitions, Displacement diagrams – Uniform velocity, parabolic and simple harmonic motions.

UNIT V ROTODYNAMIC AND VIBRATORY MACHINES 12

Fans and Compressors – Types, Construction, working principle, Characteristics and Applications. Single stage and multistage air compressors – Intercooling. Simple calculations for output and efficiency.

Vibration – Free vibration – longitudinal, transverse and torsional vibrations. Importance of Forced vibration. Vibrators and Shakers – Construction, working principle, application and limitations.

TOTAL= 60 PERIODS

HMT Data book to be permitted

TEXT BOOKS

1. Rajput,R.K., Thermal Engineering, 6th Edition, Laxmi Publications, 2007.
2. Ballaney,P.L., Thermal Engineering, Khanna Publishers, 24th Edition, 2003.
3. Ambekar A.G., Mechanism and machine Theory, Printic Hall of India, New Delhi, 2007.
4. Shingly J.E., Pennock G.R. and Uicker J.J., Theory of Machines and Mechanisms, Oxford University Press, 2003.

REFERENCES

1. Domkundwar, Kothandaraman, and Domkundwar, A Course in Thermal Engineering, Dhanpat Raj & Sons, Fifth edition, 2002.
2. Yunus A. Cengel, Heat Transfer - A Practical Approach – Tata Mc Graw Hill 2004.
3. Nag, P.K., Engineering Thermodynamics, 3rd Edition, Tata Mc Graw Hill, 2005
4. Thomas Bevan, Theory of Mechanics, CBS Publishers and Publishers and Distributers, 1984.
5. Ghosh A. and Mallick A.K., Theory of Mechanisms and Machines, Affiliated East-West Pvt. Ltd., New Delhi, 1988

EE9211 ELECTRICAL DRIVES AND CONTROL L T P C
3 0 0 3

AIM

To provide knowledge in the area of electrical dives and their control techniques

OBJECTIVE

To impart knowledge on

I. Basics of electric drives
II. Different speed control methods
III. Various motor starters and controllers
IV. Applications

UNIT I INTRODUCTION 9

Fundamentals of electric drives – advances of electric drive-characteristics of loads – different types of mechanical loads – choice of an electric drive – control circuit components: Fuses, switches, circuit breakers, contactors. Relay – control transformers.

UNIT II SPEED CONTROL OF DC MACHINES 9

DC shunt motors – Speed Torque characteristics - Ward Leonard method, DC series motor – series parallel control – solid state DC drives – Thyristor bridge rectifier circuits-chopper circuits.

UNIT III SPEED CONTROL OF AC MACHINES 9

Induction motor – Speed torque Characteristics – pole changing, stator frequency variation - slip-ring induction motor – stator voltage variation - Rotor resistance variation, slip power recovery – basic inverter circuits- variable voltage frequency control.

UNIT IV MOTOR STARTERS AND CONTROLLERS 9

DC motor starters using voltage sensing relays, current sensing relays and time delay relays - wound rotor induction motor starters – starters using frequency sensing relays - DOL -starter and auto transformers starter.

UNIT V HEATING AND POWER RATING OF DRIVE MOTORS 9

Load diagram, over load capacity, insulating materials, heating and cooling of motors, service condition of electric drive – continuous, intermittent and short time – industrial application.

TOTAL = 45 PERIODS

TEXT BOOKS

1. N.K De and P.K Sen ‘Electric Drives’ Prentice Hall of India Private Ltd, 2002.
2. Vedam Subramaniam ‘Electric Drives’ Tata McGraw Hill ,New Delhi,2007
3. V.K Mehta and Rohit Mehta ‘ Principle of Electrical Engineering’ S Chand & Company,2008

REFERENCES

1. S.K Bhattacharya Brinjinder Singh ‘Control of Electrical Machines’ New Age International Publishers,2002.
2. John Bird ‘Electrical Circuit theory and technology’ Elsevier, First Indian Edition, 2006.

EC9161 **ELECTRONICS ENGINEERING** **L T P C**
3 0 0 3

AIM:
To have a knowledge of basis electronic devices

OBJECTIVES:
To familiarize with the fundamentals of
- Semiconductors and rectifiers
- Transistors and Amplifiers
- Signal generators
- Linear IC's
- Digital Electronics

UNIT I SEMICONDUCTORS AND RECTIFIES 9
Classification of solids based on energy band theory – Intrinsic semiconductors – Extrinsic semiconductors – P – type and N – type – P – N junction – VI Characteristics of PN junction diode - Zener effect – Zener diode – Zener diode characteristics – Zener diode as a regulator – Half and Full wave rectifiers.

UNIT II TRANSISTOR AND AMPLIFIERS 9
Biopolar junction transistors – CB, CE, CC configurations and characteristics – Biasing circuits – Fixed bias, Voltage divider bias – Concept of feedback – Negative feedback – Voltage series feedback amplifier – Current series feedback amplifier – Principles of Tuned amplifiers.

UNIT III POWER AND AMPLIFIERS 9
FET – Configuration and characteristics – FET amplifier – SCR, Diac, Triac, UJT – Characteristics and simple applications.

UNIT IV SIGNAL GENERATORS AND LINEAR ICs 9
Sinusoidal oscillators – Positive feedback – RC phase shift, Hartley, Colpitts, Wein bridge oscillators – Multivibrators – Operational amplifier - Adder, multipliers, integrator and differentiators.

UNIT V DIGITAL ELECTRONICS 9
Boolean algebra – Decoder, Encoder – Multiplexer, Demultiplexer – Half and full adders – Flip flops - Digital to Analog and analog to digital converters.

TOTAL= 45 PERIODS

TEXT BOOK:
1. Malvino, 'Electronic Principles', McGraw Book Co., 1993.

REFERENCES:
1. Grob. B and Schultz. M.E., 'Basic Electronics', Tata Mcgraw Hill, 2003.
2. Thomas L. Floyd, 'Electronic Devices', Pearson Education, 2002.
3. Thomas L. Floyd, 'Digital Fundamentals', Pearson Education, 2003.

AG9214	GEOLOGY LABOROTARY- I	L T P C 0 0 2 1

UNIT I IDENTIFICATION OF MINERALS 6

Identification of physical properties of quartz, feldspar and its varieties, hornblende, augite, mica, diopside, hypersthene, asbestos, barite, calcite, fluorite, topaz, tourmaline, beryl, corundum. Study of Moh's scale of hardness.

UNIT II IDENTIFICATION OF ROCKS 6

Identification and description of igneous rocks- plutonic, hypabyssal and volcanic type of rocks: Sedimentary rocks- rudites, arenites, carbonates and argillites : metamorphic rocks- gneiss, marble, slate, schist, quartzite, etc.

UNIT III STRUCTURAL GEOLOGY 6

Exercises on structural maps of geological site and interpretation of geological conditions; 3 point and 4 point bore hole problems to decipher the subsurface geological conditions for mining of resources. Determination of stratal thickness. Dip and strike calculations.

UNIT IV GEOLOGICAL MAPS 6

Toposheets, Map scale- types, preparation and interpretation of contour maps, drainage maps, outcrop maps, symbols, rock and geological structures, use of clinometers, brunton compass and knowledge on GPS.

UNIT V GEOLOGICAL FIELD WORK 6

Practical field geological mapping and report preparation.

TOTAL= 30 PERIODS

REFERENCES:

1. Ford, W. E., Mineralogy, Wiley Eastern Limited, 1949
2. Parbin Singh. Engineering and General Geology, Katson publications house, Delhi. 2000
3. Gokhale,N. W., Manual of Geological maps CBS publishers, N. Delhi, 1987
4. Lahee, F.H., Field Geology, CBS publishers,N. Delhi 1987.

CE9214 STRENGTH OF MATERIALS LABORATORY L T P C
0 0 3 2

OBJECTIVES:

To study the properties of materials when subjected to different types of Loading.

1. Tension test on mild steel rod
2. Double shear test on metals
3. Torsion test on mild steel rod.
4. Impact test on metal specimen
5. Hardness test on metals
6. Compression test on helical spring
7. Deflection test on carriage spring

TOTAL = 45 PERIODS

EE9220 ELECTRICAL MACHINES & MEASUREMENTS LABORATORY L T P C
0 0 3 2

1. Study of DC Motors Starters
2. Study of AC Motors Starters
3. Power Measurements in Three-Phase Circuits
4. Swinburn's Test
5. Speed Control of DC Motor
6. Load Test on DC Shunt Generator
7. OCC & Load Test on DC Shunt Generator
8. OC and SC Test on Single-Phase Transformer
9. Load Test on Single-Phase Transformer
10. Equivalent Circuit on Three-Phase Induction Motor
11. Load Test on Three-Phase Induction Motor
12. OCC Characteristics of Alternator

TOTAL = 45 PERIODS

EC9162 ELECTRONICS ENGINEERING L T P C
0 0 2 1

1. VI Characteristics of PN Junction Diode
2. Characteristics of CE configuration of Transistor
3. Characteristics of uni-junction transistor
4. Characteristics of Silicon Controlled Rectifier
5. Operational Amplifiers Applications - Adder, Multiplier
6. RC & LC Oscillators
7. A/D & D/A Converters

TOTAL = 30 PERIODS

MA9268 STATISTICS AND NUMERICAL METHODS L T P C
3 1 0 4

AIM:
To provide the required skill to apply the statistical tools in engineering problems and give procedures for solving numerically the different kinds of problems occurring in engineering and technology

OBJECTIVES:
To make the students
Acquire knowledge of the concepts of statistical inference
Get exposure to the basic concepts of numerical methods and their applications

UNIT I TESTING OF HYPOTHESIS 9
Sampling distributions - Tests for single mean, Proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – chi-square test for goodness of fit – Independence of attributes.

UNIT II DESIGN OF EXPERIMENTS 9
Completely randomized design – Randomized block design – Latin square design - 2^2 - factorial design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9
Newton-Raphson method- Gauss Elimination method – Pivoting - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Matrix Inversion by Gauss-Jordan method – Eigen values of a matrix by Power method .

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9
Lagrange's and Newton's divided difference interpolation – Newton's forward and backward difference interpolation - Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal and Simpson's 1/3 rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9

Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first and second order equations - Milne's predictor-corrector methods for solving first order equations - Finite difference methods for solving second order equation.

L = 45 T = 15 TOTAL = 60 PERIODS

TEXT BOOKS

1. R.A. Johnson and C.B. Gupta, "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, 2007 (For units 3, 4 and 5).
2. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, 2004.

REFERENCES:

1. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia , 8th edition, 2007.
2. M.R. Spiegel, J. Schiller and R.A. Srinivasan, "Schaum's Outlines Probability and Statistics", Tata McGraw Hill edition, 2004.
3. Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata McGraw-Hill, New Delhi, 2007.
4. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", 6th Edition, Pearson Education Asia, New Delhi, 2006.

AG9261 GEOLOGY – II L T P C
3 0 0 3

AIM:

To study about the exploration of economic minerals

OBJECTIVE:

To familiarize the students with the economic mineral deposits and the techniques used to explore such deposits

UNIT I ECONOMIC GEOLOGY 9

Ore forming process, mineral deposits formed from magmatic, hydrothermal and volcanic process: mechanical concentration, residual concentration, oxidation and supergene enrichment.

UNIT II ECONOMIC INDIAN MINERAL DEPOSITS 9

Metallic, non-metallic deposits. Study of graphite, copper, zinc, lead, gold, iron, manganese, asbestos, mica, gemstone- origin, mode of occurrence and distribution in India. Origin and occurrence of industrial minerals- ceramic, refractory, abrasive, glass and paint industry.

UNIT III COAL AND PETROLEUM GEOLOGY 9

Origin, physical properties, processes, occurrence of coal and its types, petroleum deposits. Fossil fuel distribution in sedimentary basins of India.

UNIT IV SUBSURFACE EXPLORATION 9

Geophysical prospecting methods - seismic, electrical, magnetic and gravity methods of mineral prospecting. Location of ore body, coal and petroleum reserves, subsurface litho-log and 3-D models.

UNIT V REMOTE SENSING AND GIS 9

Introduction to aerial and satellite photos and satellite imageries, identification of photo recognition elements; applications of remote sensing in geological mapping and mineral exploration, introduction to GIS.

TOTAL = 45 PERIODS

REFERENCES

1. Bateman, A.M., Economic Mineral Deposits, John Wiley and Sons, 1956.
2. Krishnaswamy, S. Indian Mineral Resources, Oxford and IBH Publication Company, New Delhi, 1984.
3. Bales, R.L., Geology of the Industrial Rocks and Minerals, Harper Press (India) Ltd., Faridabad, 1988.
4. Arogyaswamy, R.N.P. Courses in Mining Geology, Oxford and IBH Co., New Delhi, 1988.
5. Umapathy, R.M., Text book of Mining Geology, Daltsons, 2002.

CE9211 FLUID MECHANICS AND MACHINERY L T P C

(Common for Manufacturing, Mechanical, Mining, and Industrial Engineering) **3 1 0 4**

AIM:

To comprehend the principles of fluid mechanics and its application to pipe flow and machines

OBJECTIVES:

- The student is introduced to the mechanics of fluids through a thorough understanding of the properties of the fluids. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of the mass, momentum and energy.
- The application of conservation laws to flow through pipes and hydraulic machines is studied.

UNIT I INTRODUCTION 9

Units and dimensions. Properties of fluids – specific gravity, specific weight, viscosity, compressibility, vapor pressure and gas laws – Capillarity and surface tension, Flow characteristics: Concepts of system and control volume. Application of control volume to continuity equation, energy equation, momentum equation and moment of momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS 9

Laminar flow through circular conduits and circular annuli. Boundary layer concepts. Boundary layer thickness. Hydraulic and energy gradient. Darcy-Weisbach equation. Friction factor and Moody diagram. Commercial pipes. Minor losses. Flow through pipes in series and pipes in parallel.

UNIT III DIMENSIONAL ANALYSIS 7

Dimensions and units: Buckingham's Π theorem. Discussion on dimensionless parameters. Models and similitude. Applications of dimensionless parameters.

UNIT IV ROTODYNAMIC MACHINES 12

Homologous units. Specific speed. Elementary cascade theory. Theory of turbo machines. Euler's equation. Hydraulic efficiency. Velocity components at the entry and exit of the rotor. Velocity triangle for single stage radial flow and axial flow machines. Centrifugal pumps, turbines, performance curves for pumps and turbines.

UNIT V POSITIVE DISPLACEMENT MACHINES 8

Reciprocating pumps, indicator diagram. Work saved by air vessels. Rotary pumps. Classification. Working and performance curves.

TOTAL = 45+15 PERIODS

TEXT BOOKS

1. Streeter, V.L. and Wylie, E.B. Fluid Mechanics, McGraw Hill, 1983.
2. Ramamritham, S. Fluid Mechanics, Hydraulics and Fluid Machines, Dhanpat Rai and Sons, Delhi, 1988.

REFERENCES

1. Kumar, K.L. Engineering Fluid Mechanics (7^{th} Edition) Eurasia Publishing House (P) Ltd., New Delhi, 1995.
2. Bansal, R.K., Fluid Machines and Hydraulic Machines, Laxmi Publications (P) Ltd, New Delhi.

CE 9261	SURVEYING – I	L	T	P	C
		3	1	0	4

AIM:

To comprehend the principles of Surveying for efficient field operations

OBJECTIVES:

- To introduce Surveying and Levelling
- To introduce instruments and methods
- To offer details of Levelling
- To impart knowledge about triangulation and determination of azimuth of a survey line

UNIT I INTRODUCTION 7

Objectives and general principles of mine surveying, definitions of plane and geodetic surveying, broad ideas of the parts and terms common to different survey instruments used such as telescope, line of sight, line of collimation, level tubes, vernier, magnetic needle, chain, steel, linen, metallic tapes, theodolite, striding levels, trough compass, least count, micrometer levels, clinometers, etc. optical aids and illumination aids for surveying.

UNIT II LINEAR MEASUREMENTS 8

Chain surveying, principles, equipment, ranging, setting and chain lines, chaining on sloping ground, errors in chaining, use of steel tape and corrections, catenary taping, corrections to measured lengths, errors in measurement, metallic, steel tapes, miscellaneous field problems relating to sighting, taping and both, field notes, record of data, plotting and computation.

UNIT III ANGULAR MEASUREMENT 8

Construction, testing, correction/adjustments of angle-measuring instruments-theodolite, compass dial, angle measurement procedures, corrections, and computations, plane and rectangular coordinates, relative applications, sources of error and field checks in traversing, relative merits and applications of theodolite, fixed, free needle surveying, etc., limit of precision.

UNIT IV LEVELLING AND PLANE TABLE SURVEYING 10

Construction, testing and adjustment of levelling instruments levelling practice, rise and fall, height of collimation, booking, errors, computations, standards of accuracy.

UNIT V TRIANGULATION AND TRUE NORTH FIXATION 12

Primary, secondary, tertiary, triangulation, frame work of triangles, accuracy required, setting up baseline, extension, main and check base, corrections, angle measurement methods, figure adjustment and correction, triangles, quadrilaterals, braced-quadrilateral, polygon, combined figures, computation of triangulation scheme, transfer coordinates through two, three four point interpolation, reduction to centre(satellite station) methods, broken baseline method, common terms and definitions in astronomical surveys – determination of true north, sun/star observations and connection to triangulation base line.

TOTAL : 45+15 PERIODS

TEXT BOOKS

1. Bannister, A. and Raymond, S. Surveying, ELBS, 6th Edition 1992.
2. Kennetkar, T.P. Surveying and Levelling, Vols. 1 and 2, United Book Corporation, Pune.
3. Punmia, B.C. Surveying, Vols. 1, 2 and 3, Laxmi Publications

REFERENCE BOOKS

1. Schofield, W. Engineering Survey, Butterworth and Heinmann Publishers, 5th edition, 2001.
2. Clark, D. Plane and Geodetic Surveying, Vols.1 and 2. C. B.S. Publishers and Distributors, Delhi, 6th Edition, 1971.
3. Anderson, J.N. and Mikhail, E.M. Introduction to Surveying, McGraw Hill Book Company.

MI9251 **MINING MACHINERY – I** **L T P C**
3 0 0 3

AIM: To impart knowledge on transport and electrical systems in mines

OBJECTIVES:

1. To understand the electrical layouts and power distribution in mine.
2. To study the rope haulage layouts, technical details and applications.
3. To study the various modes of transport means and electrical circuits.
4. To study the types of pumps, installations and design calculations.

UNIT I INTRODUCTION 6

Different types of motive power used in mines – their fields of application, relative merits and demerits; transmission and distribution of compressed air in mines, compressed air drills.

UNIT II ROPE HAULAGE 12

Elements of the transport system, classification and techno-economic indices. Wire ropes – classification, construction, fields of application, rope capping and splicing; deterioration of rope in use and its prevention; testing of ropes, selection and maintenance, rope calculations.

Rail Track – gauge; layout, curves, turnouts and cross-over, track maintenance, main features of rolling stock like tubs, mine cars man riding cars and tipplers; types of rope haulage – merits, demerits and fields of application, constructional features, safety appliances and rope haulage calculations.

UNIT III OTHER TRANSPORT SYSTEMS 10

Locomotives – diesel, trolley-wire, battery locomotives, constructional features and safety devices and comparison of different types; underground and surface battery charging stations and safety measures, locomotive calculations; shuttle cars, underground trucks, load-haul-dumpers, SDL vehicles, aerial rope ways, gravity transport, hydraulic and pneumatic transportation, electric layouts, man-riding systems.

UNIT IV PUMPING 7

Different types of drives, installation and maintenance of pumps and pipes in shafts and roadways, electrical layouts, pumping calculations, various sources of water in mines, design of sumps.

UNIT V MINE ELECTRICAL ENGINEERING 10

Distribution of electric power in mines, types of mine cables and their fields of applications, mining switch gears and their installation in hazardous atmosphere, flame proof enclosures, intrinsically safe circuits, (examples) safety aspects and signalling, Indian electricity rules applicable to mines. Mine telephone system and latest development in mine communications.

TOTAL= 45 PERIODS

REFERENCES
1. Cherkassky, B.M. Pumps, Fans, Compressors, MIR Publishers, 1980.
2. Deshmukh, D.J. Elements of Mining Technology, Vol. I and II EMDEE Publishers, Nagpur,1989.
3. Walker, S.C. Mine Winding and Transport, Elsevier, 1988.
4. Karelin N.T. Mine Transport, Orient Longmans, N. Delhi.
5. Mason, E. Coal Mining Series, Mining Machinery, Virtue and Company Ltd., London.
6. Statham, I.C.F. Coal Mining, Vol. I, II, III and IV, Caxton Eastern Agencies, Calcutta.

MI9252 MINE ENVIRONMENTAL ENGINEERING – I L T P C
3 0 0 3

AIM:
To introduce the various parameters affecting the underground mine environment, impart knowledge on the prevailing ventilation systems

OBJECTIVES:
- Introduce the components of underground mine atmosphere and measurement methods and instrumentation.
- To impart knowledge on various elements affecting mine environment.
- To study the ways in which ventilation occurs in mines and the controls associated
- To deal with principal laws governing mine ventilation and various ventilation systems.

UNIT I MINE GASES 12
Occurrence, properties, physiological effects, detection – types of instruments, construction, principle and limitations, measurement and analysis, methane layering, methane drainage.

UNIT II MINE CLIMATE AND CONTROL 9
Psychrometric properties of air, sources of heat and humidity in mines and their effects, heat stress estimation, cooling power of mine air and methods of improving cooling power including air cooling and air-conditioning.

UNIT III NATURAL VENTILATION AND AIR CURRENT DISTRIBUTION IN MINES 8
Natural ventilation, effect of depth, temperature, pressure, etc. thermodynamic treatment, distribution of air current in mines – splitting, stoppings, regulators, ventilation doors, air crossings, controlled recirculation, etc.

UNIT IV PRINCIPAL LAWS OF AIR MOVEMENT IN UNDERGROUND 11
Fundamentals of fluid flow and its application in mine ventilation with special reference to Bernoulli's Equation, Reynolds number, Poisseuille's equation, Atkinson's equation, Karman-Prandtl equation for rough flows, resistance of mine roadways, friction and shock resistance, etc.

UNIT V MINE VENTILATION SYSTMS 5
Retrograde and boundary, ascensional, decensional, homotropal and antitropal ventilation systems, ventilation in deep and hot mines, remedial measures.

TOTAL = 45 PERIODS

TEXT BOOKS

1. Mishra, G.B. Mine Environment and Ventilation, Oxford University Press, 1992.
2. Hartman, H.L. Mine Ventilation and Air Conditioning, Wiley Interscience publication, 1993.

REFERENCES

1. Hall, C.J., Mine Ventilation Engineering, Society of Mining Engineers, New Engineers, New York, Second Edition, 1992.
2. Vutukuri, V.S., Mine Environment Engineering, Trans Tech Publishers, 1986.
3. McPherson, M.J., Subsurface Ventilation and Environmental Engineering, Chapman and Hall Publication, London, 1993.

AG 9262	GEOLOGY LAB - II & FIELD WORK	L	T	P	C
		0	0	3	2

UNIT I ORE GEOLOGY **9**

Identification of ores of iron, manganese, lead, zinc, copper, chrome, aluminum, graphite, asbestos, ochres, corundum, kyanite, garnet, silimanite, vermiculite, mica, silica.

UNIT II ORE RESERVE **9**

Ore reserve estimation – ore assaying reserve calculation

UNIT III REMOTE SENSING **9**

Study of aerial photographs and satellite imageries. Preparation of geological and structural maps.

UNIT IV GEOPHYSICS AND APPLIED GEOLOGY **9**

Electrical resistivity survey, seismic survey – 2 and 3 layer problems. Preparation of panel diagrams.

Determination of engineering properties of rocks, determination of porosity of rocks. Preparation of weathering profile, RMR, RQD.

UNIT V GEOLOGICAL FIELD WORK **9**

Geological mapping of igneous, sedimentary and metamorphic terrains. Identification of minerals and ores in the field site. Recognisition of geological structures - fault, fold joint etc. in the field.

TOTAL: 45 PERIODS

REFERENCE BOOKS

1. Bateman, A.M. Economic Mineral Deposits, John Wiley and Sons, 1956.
2. Krishnaswamy, S. Indian Mineral Resources, Oxford and IBH Publication Company, New Delhi, 1984.
3. Bell F.G. Engineering Geology, Elsevier Publications, 2007.

CE9212 FLUID MECHANICS AND MACHINERY LABORATORY L T P C
0 0 3 2

1. **FLOW MEASUREMENT** **18**
   Calibration of Flow Measuring instruments – venturimeter, orificemeter, rotometer. Calibration of flows in open channels- weirs and notches. Estimation of friction factor in flow through pipes.

2. **PUMPS** **15**
   Determination of performance characteristics of pumps- centrifugal pumps, submersible pumps, turbine pumps & positive displacement pumps- reciprocating and gear pumps.

3. **TURBINES** **12**
   Determination of performance characteristics of turbines- reaction turbines & impulse turbines.

TOTAL = 45 PERIODS

ME9257 BASIC MECHANICAL ENGINEERING LAB FOR MINING L T P C
0 0 4 2

EXPERIMENTS
THERMAL

1. Study of I.C. Engines and Components
2. Performance Test on 4 S Diesel Engine
3. Heat Balance Test on 4 S Diesel Engine
4. Performance test on reciprocating air-compressor
5. Study of refrigeration system
6. Natural and Forced Convection studies

ENGINEERING DESIGN

1. Cam displacement and velocity analysis
2. Whirling of shaft-determination of critical speed of shaft with concentrated loads
3. Determination of moment of inertia by oscillation method for connecting rod and flywheel.
4. Vibrating system – spring mass system – determination of damping co-efficient of single degree of freedom system.
5. Transverse vibration – free – Beam, Determination of natural frequency and deflection of beam.
6. Study of Gears and linkage mechanisms

TOTAL = 60 PERIODS

MI9253 MINING MACHINERY LAB – I **L T P C**
0 0 2 1

1. Study of construction of different types of wire ropes
2. Types of rope cappels used for rope haulages
3. Construction and operation of compressed air operated drills
4. Study of different types of haulage systems – tensioning arrangement in endless haulage.
5. Study of haulage clips - various types of attachments of tubs to haulage rope
6. Study of haulage – track, curves and diamond crossing
7. Mine tubs and Mine cars construction
8. Study of safety devices provided of haulage roads
9. Electrical power distribution in mines, electrical layout for rope haulages and pumps
10. Study of aerial rope ways – loading/unloading and angle stations
11. Study of safety devices in locomotives
12. Exhaust conditioning and flame traps
13. Battery charging station layout
14. Electrical and hydraulic layouts for longwall faces

.

TOTAL = 30 PERIODS

MI9301 MINE ENVIRONMENTAL ENGINEERING – II **L T P C**
3 0 0 3

AIM: Impart complete knowledge about planning and design of mine ventilation system.

OBJECTIVES:

1. To study the physics of mechanical ventilators and the parameters governing their performance.
2. To study various methods of ventilation data collection.
3. To study about mine illumination, pollution and ecological systems.

UNIT I MECHANICAL VENTILATION **9**

Main mechanical ventilators, booster fans and auxiliary fans, and their selection, installation, fan performance, characteristics and testing, fans in series and parallel, fan drifts and evasees, reversal of air current, forcing versus exhaust ventilation, ventilation of long headings including overlap systems.

UNIT II VENTILATION SURVEY AND PLANNING IN MINES **11**

Instruments required for ventilation survey, pressure survey and quantity survey. Calculation of pressure and quantity requirements, ventilation standards, Ventilation Planning, Central and Bidirectional Ventilation system, Combined system of ventilation. Analysis of a simple ventilation system using Hardy-Cross method, monitoring of mine environment. Principles and computer applications.

UNIT III DESIGN OF MINE VENTILATION SYSTEMS 7

Air Distribution with different mining systems, Design of ventilation systems for Bord and Pillar, Longwall methods, Design of ventilation systems for various metal mining methods

UNIT IV MINE ILLUMINATION 8

Physics of Light, Light measuring techniques and instrumentation, Physiological requirements for human vision, Electric safety lamps, their maintenance and examination, lamp room design and organisation, lighting from mains, Underground Coal mine illumination, lighting on mechanised longwall faces and gassy mines, illumination survey, legislations related to illumination survey, Application of illumination standards in underground mines

UNIT V LAND, AIR, WATER AND NOISE POLLUTION 10

Pollutants, sources, hazards, sampling and analysis, standards, instrumentation and measurement, remedial measures and control. Dispersion of air pollutants, Textural classification and properties of soil. Noise Impact Index assessment.
Ground vibrations, air blast, miner's diseases, and environmental legislations.

TOTAL = 45 PERIODS

TEXT BOOKS:

1. Hartman, H.L. Mine Ventilation and Air Conditioning, Wiley Interscience publication, 1999.
2. Mishra, G.B. Mine Environment and Ventilation, Oxford University Press, 1992.
3. McPherson, M.J. Subsurface Ventilation and Environmental Engineering,Chapman & Hall Publication, London, 1993.

MI9302 ROCK MECHANICS AND GROUND CONTROL – I L T P C
3 0 0 3

AIM:

To learn the fundamentals of Rock Mechanics and its applications to Mining

OBJECTIVES:

- To study about application of Rock Mechanics
- Physico-Mechanical properties of rocks, non-destructive testing methods, time dependent properties of rock
- Different types of underground supports, etc.

UNIT I INTRODUCTION 12

Definition of some important terms used in rock mechanics, application of rock mechanics in mining, introduction to stress analysis, principal stresses and strains, differential equations of static equilibrium.

UNIT II PHYSICAL PROPERTIES OF ROCKS AND ROCK INDICES 6

Physical properties of rock – density, porosity, moisture content, permeability, swell index, slake durability index, thermal conductivity, hardness, durability, Protodyaknov index, impact strength index, point load index, rock mass classification.

UNIT III MECHANICAL PROPERTIES OF ROCKS 12

Preparation of test specimens, laboratory determination of mechanical properties of rocks, compressive strength, tensile strength, shear strength, modulus of elasticity, Poisson's ratio, triaxial strength of rocks, Mohr's envelope, effect of various parameters on the strength of rocks, in-situ strength, effect of joints and fracture on mechanical properties of rocks.

UNIT IV NON-DESTRUCTIVE TESTING AND TIME DEPENDENT PROPERTIES OF ROCKS 6

Dynamic wave velocities, dynamic elastic constants, their determination in the laboratory, application in mining, time dependent properties of rocks, creep, mechanism of creep of rocks – different stages, rheological models.

UNIT V UNDERGROUND SUPPORTS 9

Various methods of roof examination, pressure arch theory, ground forces and field stresses, mechanism, objectives and limitations of supports, conventional supports – column type, timber sets, arches, yielding type; rock and cable bolting, rock grouting, shotcreting, roof stitching, support of shaft bottoms, galleries, junctions and places of roof falls, design of supports, longwall powered supports.

TOTAL = 45 PERIODS

TEXT BOOKS:

1. Obert, L. and Duvall, W.I. Rock Mechanics and Design of Structure in Rock, John Wiley and Sons Inc., New York, 1967.
2. Vutukuri, V.S. and Lama, R.D. Handbook on Mechanical Properties of Rocks, Vol. I, II, III and IV, Transtech Publication, Berlin, 1974/78
3. Peng, S.S. Ground Control, Wiley Interscience, New York, 1987.
4. Brady, B.H.G. and Brown, S.T. Rock Mechanics for Underground Mining, Chapman and Hall, 1993
5. Hoek, E. and Brown, S.T. Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980.

MI 9303	SURVEYING - II	L	T	P	C
		3	1	0	4

AIM: To train the students on Mine Surveying techniques for application in underground as well as surface mines

OBJECTIVES:

1. To study methods of underground traversing and surveys.
2. To study methods on traversing in metal mines
3. To study the various modern surveying techniques and instrumentation.
4. To study methods of contouring and curves layouts.

UNIT I UNDERGROUND MINE SURVEYING 12

Role of mine surveying in mineral exploration and mining, aspects of difference between civil engineering surveys and map projection systems, mine correlation of mine surveys to national grid.

Underground traversing and its constraints, Correlation of underground and surface surveys by different methods, by traversing through shafts, assumed bearing, co-planning, Weiss quadrilateral, Weiss triangle methods, estimation of errors, correction in steep inclined sights, maintenance of alignment, gradients, verticality in mine development openings like Shafts, Raises, Winzes, Drives/Drifts, Tachometry – principles, equipment, methods (stadia, subtence, tangent), accuracy of stadia work, booking, computations. Transfer of levels to different horizons.

UNIT II STOPE SURVEYING AND MINE PLANS & SECTIONS 9

Objectives, methods - Tape triangulation, Tying In, Traversing, Radiation, preparation of stope plans, subsidence surveying.

Preparation of plans, stepped plan, assay section, duties and responsibilities of a mine surveyor, under Mines Act, statutory plans and sections.

UNIT III CONTOURING AND CURVE SETTING 7

Methods of contouring, Contour Gradient, uses of Contours Volume and Earthwork computation, Elements of underground mine curve and gradient – Simple, compound, reverse and transition curves, setting out of different curves and related problems.

UNIT IV MODERN SURVEYING METHODS 7

Elements of photogrammetry, application of terrestrial photogrammetry in mining, use of laser, introduction to remote sensing and its application to mining, basic concepts of construction and use of modern surveying equipment like – EDM, GPS, total survey station, etc., including application software.

UNIT V PROBLEMS 10

Dip, Strike, faults, gradients, areas & volumes, Borehole deviation, alignment of mine openings, fixing centre lines for shafts, sheave wheel raise, machinery foundation, shaft depth measurement, Determining XYZ co-ordinates in different directions and horizons, Application of Tacheometry, Correlation of underground and surface.

TOTAL : 45+15 PERIODS

TEXT BOOK

1. Winniberg, F. Metalliferous Mine Surveying
2. Punmia, B.C. Surveying Vol I and II, Laxmi Publication, New Delhi, 1991
3. Kenetkar, T.P. Surveying and Levelling, Vol I and Vol II, United Book
4. Corporation, Poona, 1991.

REFERENCES

1. Mason, E. Coal Mining Series, Surveying, Vol I And Vol II, Virtue And Company Limited, London.
2. Clark, D. Plane and Geodetic Surveying, Vol I And Vol II, CBS Publishing Co., 1986.
3. Assur, V.L. and Pilatov, A.M. Practical Guide to Surveying, MIR Publishers, Moscow 1988.
4. Borshch, V., Komponiets, A., Navitny, G. and Knysh. Mine Surveying, MIR Publishers Moscow,1989.
5. Sahni. Advanced Surveying, Lovely Prakashan, Dhanbad, 1992.
6. Alam Chand. Modern Concept of Mine Survey, Lovely Prakashan, Dhanbad,1992.
7. Ghatak. S. Mining Surveying, Lovely Prakashan, Dhanbad, 1990.

MI9304 **SURFACE MINING** **L T P C**
3 0 0 3

AIM:

To give the student complete knowledge on layout, design and planning of opencast mines.

OBJECTIVES:

1. To develop an understanding of surface mining equipments and its operations in a surface mine.
2. To achieve the ability to classify and select surface mining methods.
3. To understand the slope failures in a surface mine and study the concept of waste dump formations.

UNIT I INTRODUCTION 7

Status of surface mining, types of surface mines, applicability and limitations, compilation of basic data, concept of stripping ratio, stripping economics, concept of ultimate pit limits, design of haul roads, elements of surface mine planning.

UNIT II LAYOUT AND DESIGN OF SURFACE MINES 10

Selection of site for box cut, selection of operating parameters like bench height, width, slope, etc., Working pit slope and ultimate pit slope, various modes of slope failures, factors influencing slope stability, development of opencast mine layouts, stripping methods using different machinery, Various layout problems and their solutions

UNIT III GROUND PREPARATION METHODS 10

Preparation of the site – Ripping, Drilling and Blasting; Types, operation, selection, applications and limitations of ground preparation equipments – Rippers, Dozers, Blasthole drills. Mechanics of drilling and blasting, Types of explosives and accessories used in surface mines, Design of surface mine blasts, Rock fragmentation, Safety in blasting and environmental protection.

UNIT IV EXCAVATION SYSTEM IN SURFACE MINES 9

Selection criteria for excavation / loading and material transport equipment used in surface mines. Classification, construction, capacity, operation and application of different types of excavating / loading equipment used in surface mining projects - Shovels, Draglines, Front end loaders, Scrapers, Bucket wheel and bucket chain excavators, Surface miners. Placer mining and hydrulicking. Safety in surface mines.

UNIT V TRANSPORT AND WASTE DUMPS 9

Scope and application of different modes of transport system in surface mines –Trucks, Conveyors (shiftable and high-angle), Aerial ropeways, Rail transport and Pipeline transport systems. Scope and application of in-pit crushers in surface mines. Types of waste dump – internal and external; dump formation methods and corresponding equipment; Dump stability and stabilisation measures.

TOTAL = 45 PERIODS

TEXT BOOKS:

1. Kennedy, B.A., Surface Mining – 2nd Edition, SME, New York, 1990.
2. Hartman H.L., Introductory Mining Engineering, John Wiley and Sons, 2002.
3. Hartman, H.L. (Ed.), SME Mining Engg. Handbook Vol. I and II, Society for Mining, Metallurgy, and Exploration, Inc., Colorado, 1992.
4. Pfleider, E. P, Surface Mining, 1st Edition, New York, 1968.
5. Konya, C.J. and Walter, E.J., Surface Blast Design, New Jersey, 1990.
6. Rzhevsky V., Open pit Mining Operations, Mir Publications, 1971.

REFERENCES:

1. Amitosh De, Heavy Earth Moving Machinery, Lovely Prakashan, Dhanbad, 2000.
2. Hustrulid, W. and Kuchta, M, Open Pit Mine Planning & Design, Vol. 1, Fundamentals, Balkema, Rotterdam, 1998.
3. Singh, R.D., Principles and Practices of Modern Coal Mining, New Age International (P) Ltd., Publishers, 1997.
4. G.B.Mishra, Surface Mining, Dhanbad Publishers, Dhanbad, 1990.
5. Hustrulid, W. A., Mccarter, M. K., And Van Zyl, D. J. A., Ed., Slope Stability in Surface Mining, Littleton, 2000.
6. Hoek, E., and Bray, J. W., Rock Slope Engineering, 3rd edition., Institution of Mining and Metallurgy, London, 1974.
7. Das, S.K., Surface Mining Technology, Lovely Prakashan, Dhanbad, 1994.

MI9305 UNDERGROUND METHODS OF MINING (COAL) **L T P C**
3 0 0 3

AIM:

To study about the different methods of working and winning Coal.

OBJECTIVES:

To study the development of panels and extraction of coal in Bord and Pillar method
To study the Longwall advancing and retreating methods
To study the various special methods of winning coal

UNIT I INTRODUCTION **7**

Status of coal industry and deposit factors affecting choice of mining methods, classification of mining methods, grading and analysis of coal.

UNIT II BORD AND PILLAR METHOD-DEVELOPMENT **9**

Design and development of a district, bord and pillar, room and pillar methods, with conventional and continuous mining techniques; panel system.

UNIT III BORD AND PILLAR METHOD – EXTRACTION **8**

Pillar extraction by caving and stowing methods; mechanised extraction of pillars, shaft pillar extraction, systematic supports, surface, underground and face arrangements for stowing.

UNIT IV LONGWALL METHOD **8**

Advance and retreat methods, continuous and cyclic systems, extraction with different machines-ploughs, shearers, design of longwall workings, optimum length of face, size of panel, gates, support system, personnel, organistion and safety measures, salvaging in longwall.

UNIT V SPECIAL METHODS OF WORKING **13**

Problems of working thick & thin seams, multi slices, sublevel caving, horizon mining, gallery blasting method, contiguous seam working, working steeply inclined seams, working under surface structures and seams liable to spontaneous heating, outburst and bumps, etc. hydraulic mining, Wongawali, shortwall, underground coal gasification, shield mining.

TOTAL = 45PERIODS

REFERENCES

1. Singh, R.D. Principles and Practices of Modern Coal Mining, New Age International (P) Ltd., Chennai, 1994.
2. Singh, T.N.Singh, Underground Winning of Coal – Oxford & IBH Publishing Co. Ltd., 1992
3. Mathur, S.P., Coal Mining in India, M.S. Enterprises, Bilaspur, 1999
4. Das S.K., Modern Coal Mining technology, Lovely Prakashan, Dhanbad 1994
5. Singh T.N., Dhar, B.B. Thick Seam Mining, Problems and Issues, Oxford & IBH Publishers, 1992
6. Mathur, S.P., Mining Planning for Coal., M.G. Consultants, Bilaspur, 1993
7. Peng S.S., and Chiang, H.S., Longwall Mining, John Willey and Sons, New York, 1992.
8. Szwilski and Richards M.J., Underground Mining Methods and Technology, 1987.
9. Internet: **www.miningindia.com**

EE9361 INSTRUMENTATION ENGINEERING L T P C
3 0 0 3

AIM:

To study the basic instrumentation methods

OBJECTIVE:

To have a knowledge of

- Electronic Instruments
- Pressure measurements
- Flow measurements
- Vibration, Viscosity and Humidity Level measurement
- Various analyzers

UNIT I ELECTRONIC INSTRUMENTS 9

CRO- Storage oscilloscope - Digital voltage meter (DVM) -Digital multi meter - XY Recorder, Strip chart recorder - Digital recording- Data logger - Introduction to virtual instrumentation.

UNIT II PRESSURE MEASUREMENTS 9

Unit of Pressure - Manometers- Different types, - Elastic type pressure gauges - Bourdon tube - Bellows - Diaphragm - Elastic elements with L VDT and strain gauge - Capacitive type pressure gauge - Measurement of vacuum - McLeod gauge - Thermal conductivity gauge - lonisation gauge.

UNIT III FLOW MEASUREMENTS 9

Flow meters - Variable head type flow meter - Orifice plate - Venture tube - Positive displacement flow meter: Nutating disc, Reciprocating piston, oval gear and helix type flow meter - Rota meter - Mass flow meters.

UNIT IV VIBRATION, VISCOSITY, HUMIDITY, LEVEL MEASUREMENT 9

Mechanical type vibration measuring instruments - Seismic instruments as an accelerometer - Vibrometers - Viscosity - Saybolt viscometer. Humidity - Hot wire electro type hygrometer - Dew cell- Electrolysis type hygrometer.

UNIT V ANALYSERS 9

Dissolved Analyzer: Conductivity meter - pH meter - Dissolved oxygen analyser - Sodium analyser - Silica analyser - Turbidity meter - Gas analyser - NO_x analyser - H_2S analyser- CO and CO_2 monitor, Dust & Smoke measurement.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Alan S. Morrris. Principles of Measurement and Instrumentation, Print ice- Hall of India Pvt., Ltd. New Delhi, 1999.
2. Ernest O Doeblin. Measurement Systems Application & Design, Tata McGraw Hill Publishing Co., New. Delhi, 1999

REFERENCES:

1. Murthy, D.V.S. Transducers and Instrument and Instrumentation, Prentice Hall of India Pvt. Ltd. New Delhi.
2. Patranabir, D. Principle of Industrial Instrumentation, Tata McGraw Hill Publishing Co., New Delhi 1999.
3. Jain, R.K. Mechanical and Industrial Measurements, Khanna Publishing, New Delhi, 1999.
4. Liptak B.G. Instrumentation Engineers Hand Book (Measurement), Chilton Book Co., 1994.

CE9312 SURVEY LABORATORY – I L T P C
0 0 4 2

1. To study and understand the parts and terms common to different survey instruments such as chains, different types of tapes, prismatic compass, trough compass, and to learn to measure distance and magnetic bearing.

2. To fix a closed traverse on the ground, measure the length with a steel tape and magnetic bearing of the sides using a miner's dial, calculate the included angles, testing permanent adjustments of a theodolite. .

3. To learn the use of different types of theodolites, testing permanent adjustments of a theodolite, layout of a closed traverse, calculate the partial and total coordinates, closing error, distribute the closing error applying Bowditch rule and recalculate the coordinates - calculate the magnetic bearings of the lines, heights and distances, exercises.

4. Study of levels- establishing the difference in levels between points using both rise and fall and height of collimation methods.

5. To carry out leveling on a given line and prepare longitudinal section, run a fly level between two far off points and calculate the difference in height.

6. Measurement of base line, applying corrections, conduct a triangulation survey of a figure involving a braced quadrilateral and adjust the angles - calculation of true bearing, measure and compare with check base.

7. To study plane table and its accessories to carry out the plane table survey of the area using radiation, intersection, traversing and resection methods, two point problem and three point problems of plane table surveying.

TOTAL = 60 PERIODS

MI9307 MINE ENVIRONMENTAL ENGINEERING LAB – I L T P C
0 0 2 1

1. Determination of psychrometric properties of air.
2. Study of mine flame safety lamp, gas testing with flame safety lamp.
3. Mine air sampling and detection of various mine gasses, like, methane, carbon monoxide (CO), etc.
4. Determination of percentage of mine gasses using chromatograph and other methods.
5. Measurement of cooling power by Kata thermometer.
6. Study of centrifugal fans and fan characteristics.
7. Study of axial flow fan and fan characteristics.
8. Study of air-reversal arrangement in mine fans.
9. Study of pressure survey and quantity survey in mines using velometer, anemometer and barometer.
10. Study of electric cap lamps and lamp room layouts.
11. Illumination Survey.

TOTAL = 30 PERIODS

MI9308 PRACTICAL TRAINING – I L T P C
0 0 0 1

The Mining of mineral deposits including coal and lignite by surface and open-pit mining methods is being increasingly adopted all over the world. In fact more than 60% of the total production is from this branch of mining engineering.

The Students undergo training in open-pit mines in India, during the summer vacation **at the end of the IV Semester for a period of 4 weeks**. The students have to submit a report on the training which would be evaluated during the ensuing V Semester. This carries a total of one credit during the V Semester. Evaluation would be done by a faculty or a group of faculty on different marking heads such as training, viva voce report etc., or other approved evaluation systems.

Normally a student is not permitted to withdraw from this practical training. In case of unforeseen circumstances / valid reasons, if he could not undergo the training as scheduled, on the recommendation of the Head of the Department and approval by the competent authority, the student may be permitted to undergo practical training I in place of practical training II at the end of VI Semester before proceeding to VII Semester. Consequently practical training II would be undergone at the end of VIII Semester. The decision of the competent authority is final.

MI9309 **TECHNICAL SEMINAR - I** **L T P C**
0 0 2 1

To enrich the communication skills of the student and presentations of technical topics of interest, this course is introduced. In this course, a student has to present three Technical papers or recent advances in engineering/technology that will be evaluated by a Committee constituted by the Head of the Department.

TOTAL = 30 PERIODS

EE 9362 **INSTRUMENTATION ENGINEERING LAB** **L T P C**
0 0 2 1

1. Familiarization of Basic measuring instruments

2. Study of various Bridge circuits

3. Study of amplifiers, A/D converters

4. Study of active filters

5. Study of strain gauge circuits.

6. Study of characteristics of LVDT

7. Study of RTD and vibrating wire instruments

8. Study of Thermo couple and LDR

9. Study of Pressure to current converters.

TOTAL = 30 PERIODS

ME9362 INDUSTRIAL MANAGEMENT L T P C
3 0 0 3

AIM:
To provide a clear understanding of basic management principles that leads to corporate building.

OBJECTIVE:
To deliver the principles of management, functions of management, organizational structure and dynamics, modern concepts of Industrial Management.

UNIT I INTRODUCTION 9
Technology Management – Definition - Functions – Evolution of Modern Management – Scientific Management Development of Management thought. Approaches to the study of Management, Forms of Organization – Individual Ownership – Partnership – Joint Stock companies – Co-operative Enterprises – Public sector Undertakings, Corporate Frame Work – Share Holders – Board of Directors – Committees – Chief Executive – Line and Functional Managers, Constraints – Environmental – Financial – Legal – Trade Union.

UNIT II FUNCTIONS OF MANAGEMENT 9
Planning – Nature and Purpose – Objectives – Strategies – Policies and Planning Premises – Decision Making – Organizing – Nature and Process – Premises – Departmentalization – Line and staff – Decentralization – Organizational culture, Stating – selection and training – Placement – Performance appraisal – Career Strategy – Organizational Development. Leading – Managing human factor – Leadership – communication, Controlling – Process of Controlling – controlling techniques, productivity and operations management – Preventive control, industrial safety.

UNIT III ORGANIZATIONAL BEHAVIOUR 9
Definition – Organization – Managerial Role and functions – Organizational approaches, individual behaviour – causes – Environmental Effect – Behaviour and Performance, Perception – Organizational Implications. Personality – Contributing factors – Dimension – Need Theories – Process Theories – Job satisfaction. Learning and Behaviour – Learning Curves, Work Design and approaches.

UNIT IV GROUP DYNAMICS 9
Group behaviour – Groups – Contributing factors – Group norms Communication – Process – Barriers to communication – Effective communication leadership – formal and informal characteristics – Managerial Grid – Leadership Role in Group Decision, Group Conflicts – Types – Causes – conflict Resolution – inter group relations and conflict organization centralization and decentralization – Formal and informal – Organizational Structures – Organizational change and Development – Change Process – Resistance to change – Culture and Ethics.

UNIT V MODERN CONCEPTS 9
Management by objectives (MBO) – Management by Exception (MBE), Strategic Management – Planning for Future direction – SWOT analysis – Evolving development strategies, information technology in management – Decision support system – Management Games – Business Process Re-engineering (BPR) – enterprises Resource Planning (ERP) – Supply Chain Management (SCM) – Activity based management (ABM) – Global perspective – Principles and Steps – Advantages and disadvantages.

TOTAL= 45 PERIODS

TEXT BOOK

1. Herald Knottz and Heinz Weihrich, “Essentials of Management”, McGraw Hill Publishing Company, Singapore International Edition, 1980.

REFERENCES

1. S.Chandran, “Organizational Behaviours”, Vikas Publishing House Pvt.Ltd., 1994.
2. Ties,AF. Stoner and R.Edward Freeman, “Management”, Prentice Hall of India Pvt.Ltd., New Delhi 110011, 1992.
3. Joseph J. Massie, “Essentials of Management”, Prentice Hall of India Pvt.Ltd., 1985.

MI9351 MINING MACHINERY II L T P C
3 0 0 3

AIM:

To impart knowledge on Winding and Coal Face Machinery.

OBJECTIVES:

To understand the functioning of winding engines and other winding accessories
To study surface and pit bottom layouts
To study various coal face machinery, face haulage systems and conveyors

UNIT I WINDING ENGINES 10

Winding systems, drum winders, drives, mechanical braking of winders, safety devices in winding, over wind and overspeed protection, Koepe and multi-rope friction winding, electrical layouts. Duty cycles of drum winders of different drum cross sections. Special problems of deep shaft winding.

UNIT II WINDING ACCESSORIES 9

Head gear and their design, head sheave, cages and skips, suspension gear, shaft fittings and appliances – guides, keps, etc., signalling system, winding calculations.

UNIT III SURFACE AND PIT BOTTOM LAYOUTS 6

Mine car circuits at the surface and pit bottom, creepers, skip winding – loading and discharge arrangements.

UNIT IV COAL FACE MACHINERY 11

Construction, salient mechanical and electrical features and operations of coal drills and their control panels, coal cutters, different types of mechanical loaders coal ploughs, cutter loaders and continuous miners; development road headers in face mechanisation, longwall mining equipment, electrical and hydraulic layouts; condition monitoring of mining machinery for underground and opencast miens and ore handling plants.

UNIT V FACE HAULAGE AND CONVEYORS 9

Scraper chain conveyors, AFCs, belt conveyors, shaking and vibrating conveyors, armoured flexible conveyors, electrical layouts.

TOTAL = 45 PERIODS

REFERENCES
1. A Cummings, A.B. and Given, I.V. SME Mining Engg. Handbook Vol .I and II, New York, 1992.
2. Mason, E. Coal Mining Series, Surveying, Vol I and II, Virtue and Company Limited, London, 1985.
3. Cherkassky, B.M. Pumps, Fans, Compressors, MIR Publishers, 1980.
4. Department of Mining Engineering, Anna University, Chennai Regulations - 2008
5. Deshmukh, D.J. Elements of Mining Technology, Vol. I, II and III, EMDEEE Publishers, Nagpur, 1979.
6. Alemgren G., Kumar U., and Vagenas N. Mine Mechanisation and Automation, A.A., Balkema Publication, 1993.
7. Walker, S.C. Mine Winding and Transport, Elsevier, 1988.

MI9352 UNDER GROUND MINING METHODS (METAL) **L T P C**
3 0 0 3

AIM:
To impart detailed knowledge about metal mining methods and technology.

OBJECTIVES:
1. To introduce concepts of metal mining and metal mining terminology.
2. To study development and operations of metal mines.
3. To study about special methods of metal mining methods.

UNIT I BASICS **6**
Characteristics of metalliferous deposits; metal mining terminology; scope and limitations of metal mining., exploration, estimation of block wise and mine wise reserves and actual production –a comparison.

UNIT II MINE CONSTRUCTION **10**
Determination of basic parameter, sequence of extraction, production programming, and optimum haulage/ore pass/level interval, production capacity determination. Unit operations- X cuts, drives, drifts, shaft bins, winzes, raises, stope preproduction development operations, support of openings, arrangement for ore handling.

UNIT III STOPING I **10**
Classification of stoping methods; factors influencing selection of stoping methods; stopes with natural support, stopes with additional supports, timber supported systems, caving methods- general ore body requirements, reasons for adoption, applicability, stope layout, design, equipment selection.

UNIT IV STOPING II **12**
Details of methods – open stopes, cut & Fill, undercut & fill, sublevel stoping, caving methods-block caving, sublevel caving ,top slicing –details of stope unit operations like drilling, blasting etc., stope ore handling ,support of stopes , underground face arrangement for back filling, typical case studies and layouts.

UNIT V SPECIAL APPLICATIONS 7

Special aspects of deep mining, mining narrow veins, contiguous veins, remnant pillars, shaft pillars, faulted /geologically disturbed blocks its problems, method, safety precautions, ground control, solution mining.

TOTAL = 45 PERIODS

REFERENCES

1. Cummings,A.B.And Given,I,V., SME Mining Engg.Handbook Vol.I And II, Society Of Mining Engineers Of American Institute Of Mining, Metallurgical, Petroleum Engineers Inc., New York 1992.
2. Hartman, H.L., Introductory Mining Engineering, John Wiley and Sons, New York, 1987.
3. Hustrulid, W.A.Ed., Underground Mining Methods Handbook Society of Mining Engineering, AMIE, New York, 1990.

MI 9353 ROCK MECHANICS AND GROUND CONTROL – II L T P C

3 0 0 3

AIM: To impart knowledge on various approaches used in tackling mining problems.

OBJECTIVES:

1. Introducing the various instrumentation and measurement methods.
2. To study the theories of failure and approaches used for openpit and underground designs.

UNIT I INSTRUMENTATION AND STOWING/FILLING 14

Conventional testing machines and servo-controlled stiffness testing machines, load cells, strain gauges, flat jacks, convergence indicators, anchorage testing equipment, sag bolts, etc, in situ measurements.

Principal methods of stowing, collection, preparation and transport of materials, surface, underground and face arrangements, design of stowing plants.

UNIT II THEORIES OF FAILURE OF ROCKS AND PIT SLOPE STABILITY 11

Different theories of failure of rocks, modes of failure - Griffith, Coulumb, Navier, Mohr's, Hoek-Brown, etc.

Approach to slope stability, slope parameters, Geological and physico-mechanical parameters affecting slope stability, effect of water pressure, determination of factor of safety, introduction to methods of failure analysis.

UNIT III DESIGN OF UNDERGROUND WORKINGS 9

Stress distribution in underground workings, design of underground openings, measurement of rock movements, engineering rock mass classification, rock load assessment and support design, introduction to numerical methods of geomechanics; scaled model studies – principles of modeling and model material and testing.

UNIT IV PILLAR DESIGN AND ROCK BURST 6

Strength of pillars, barrier and shaft pillars design – load estimation, factor of safety, various formulae, rock burst, bumps.

UNIT V SUBSIDENCE 5

Theories of subsidence, factors affecting subsidence, subsidence surveys, subsidence prediction techniques, subsidence control – surface and underground measures, pseudo-mining damage.

TOTAL : 45 PERIODS

REFERENCES

1. Obert, L. and Duvall, W.I. Rock Mechanics and Design of Structure in Rock, John Wiley and Sons Inc., New York, 1967.
2. Vutukuri, V.S. and Lama, R.D. Handbook on Mechanical Properties of Rocks, Vol.I, II, III and IV, Transtech Publication Berlin, 1974/78.
3. Brady, B.H.G. and Brown, S.T. Rock Mechanics for Underground Mining, Chapman and Hall, 1993.
4. Hoek, E and Brown, E.T. Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980.
5. Peng, S.S. Ground Control, Wiley Interscience, New York, 1987.
6. Jumkis, A.R. Rock Mechanics, Transtech Publications, Berlin, 1983.
7. Stacey, T.R. and Page, C.H. Practical Handbook for Underground Rock Mechanics, Transtech Publications, Berlin, 1986.
8. Whittaker, B.N. and Reddish, D.J. Subsidence – Occurrence, Prediction and Control – Elsevier Science Publishers, the Netherlands, 1989.

MI 9354	MINERAL PROCESSING	L	T	P	C
		3	0	0	3

AIM:

To understand the need and the application of mineral processing

OBJECTIVES:

- To study comminution, laboratory and industrial sizing, separation/concentration
- To understand sampling of ores
- To study special methods of processing

UNIT I INTRODUCTION 6

Scope, objectives, minerals/ores for mineral processing, methods of treatment, choice of methods, sequence of operations, product, flow sheets, ore sorting – hand mechanical, electronic, removal of harmful materials, ore transportation.

UNIT II COMMINUTION 8

Introduction to comminution, primary/secondary/tertiary crushing, purpose, duty, theory of crushing, crushing sequence, reduction ratio, types of crushers and comparison, general crushing flow sheet, wet/dry grinding, mechanism and various affecting parameters.

UNIT III LABORATORY & INDUSTRIAL SIZING AND SAMPLING & CONTROL 11

Purpose, factors governing particle behaviour, laboratory and industrial screens, trommels, vibrating screens, etc. wet and dry screening, classification, classifiers.

Purpose, sampling - solid ore, pulp, head feed, grinding circuit samples, flotation products, etc., X-ray fluorescence, automatic sampling. Metallurgical accounting.

UNIT IV SEPARATION/CONCENTRATION 10

Newton's and Stoke's Laws of particle settlement, different concentration techniques – gravity, chemical froth flotation, wet & dry magnetic separation, electromagnetic, amalgamation, heavy media, jigging, shaking tables, sluicing, spirals, thickeners, filtration, etc., coal washing. Sampling - solid ore, pulp, head feed, grinding circuit samples, flotation products, etc., X-ray fluorescence, automatic sampling. Metallurgical accounting.

UNIT V SPECIAL METHODS 10

Chemical extraction, cyanide process, leaching, use of ion exchange, solvent extraction, pilot plant studies on ores, tailing dams; generalised plant practice/flow sheets for coal and other important ores – copper, aluminium, lead, zinc, silver, gold, uranium, iron, limestone, magnesite.

TOTAL:45 PERIODS

REFERENCES

1. Jain, S.K**.** Ore Processing, Oxford – IBH Publishing, 1984.
2. Gaudin, A.M. Principles of Mineral Dressing – McGraw Hill Book Company, 1971.
3. Taggart, A.F. Handbook of Mineral Dressing, John Wiley and Sons, New York, 1990.
4. Wills, B.A. Mineral Processing Technology, Pergamon Press, 1985.
5. Vijayendra, H.G. Handbook on Mineral Dressing, Vikas Publishing House Pvt. Ltd. 1995.

MI9355 MINE ENVIRONMENTAL MANAGEMENT L T P C
3 0 0 3

AIM:

To understand environmental management in mining

OBJECTIVES:

- To understand the various forms of environmental pollution
- To study land protection and reclamation
- Understand fundamental environmental management and environmental

UNIT I INTRODUCTION 9

Concept of Ecology, ecological principle, nature of the environment ecology and man, ecosystem, structure, functioning, components of the life support systems of the environment, biosphere, hydrosphere and atmosphere, nutrient cycles. National Policies on environment with respects to mining activities - Global and Local environmental issues ,Objectives of Sustainable Development.

UNIT II ENVIRONMENTAL POLLUTION 12

Environmental Pollutants - air, water, noise, sources and classification of pollutants and their effect on human health, structure of the atmosphere - ozone layer depletion - acid rain - green house gases and global warming ambient air quality and emission standards, air quality sampling and monitoring, water pollution standards, noise standards - measurement - control and preventive measures for air, water, noise pollution

UNIT III LAND PROTECTION AND RECLAMATION 6

Land for alternation dealing with mind out land, re-vegetation, tailing management, tailing dams, method and construction, land use plan, Mine closure planning.

UNIT IV ENVIRONMENTAL MANAGEMENT 9

Environmental quality objectives, Emission and ambient standards - Minimum National standards - International environmental standards - ISO 14000 - EIA Notification - Sitting of Industries - Environmental management plane.

Environmental management system audits, Environmental economics - Principles of cost benefit analysis - Valuing the Environment - Environmental Accounting, environmental administration- training awareness and competence,

UNIT V ENVIRONMENTAL LEGISLATIONS 9

Environmental laws, the Environmental (Protective) Act, 2004, The Water Act (1974), The Air act (1981), The Forest Act 1927, The forest conservation act 1980, Power and responsibilities of regularity agencies and occupation consent to establish and operate wild life protection act and rules, Environmental clearance procedure for a mining Project.

TOTAL = 45 PERIODS

TEXT BOOKS

1. Manahan S.E. Environmental Science and Technology.
2. Mackenthun, K.M. Basic Concepts in Environmental Management, Lewis Publications, London, 1998.
3. Shyam Divan and Armin Rosencranz, Environmental Law and Policy in India, Oxford University Press, New Delhi. (2001).

REFERENCES

1. Gregor I. Mcgregor. Environmental Law and Enforcement, Lewis Publishers, London, 1994.
2. Noel de Nevers, Air Pollution Control Engg., McGraw Hill, New York, 1995.
3. Anjaneyulu,Y. Air Pollution & Control Technologies, Allied Publishers (P) Ltd, India, 2002.
4. Nick Hanley, Jaison F. Shogren and Ben White. Environmental Economics – In Theory and Practice, Macmillan India Ltd, New Delhi, 1999.
5. Department of Mining Engineering, Anna University, Chennai Regulations - 2008
6. Roger Perman, Yue Ma and James McGilvray. Natural Resources and Environmental Economics, Second edition, Addision Wesley Longman Ltd, Singapore, 1997.
7. Christopher Sheldon and Mark Yoxon, Installing Environmental Management System – a step by step guide, Earthsecan Publications Ltd, London, 1999.
8. Lee Kuhre, ISO 14001 Certification –Environmental Management Systems, Prentice Hall, USA, 1995.

CE9361 SURVEY LABORATORY- II L T P C

0 0 4 2

1. Enlarging/reducing a given plan to a prescribed scale by the method of least squares and using pantograph/ediograph.
2. Simulate conditions for a correlation, survey on surface and find out the bearing and distance of a base line by different methods.
3. Simulate conditions in surface and conduct alignment surveys of drives and transfer of surveys through winzes and raises.
4. Contour a given area with reference to a benchmark and base line by trigonometric levelling and calculate the volume between two given reduced levels.
5. Establish a base line on the ground using a theodolite with reference to two elevated points whose coordinates are known but on which instrument cannot be set. Compare the calculated distance of the baseline with actual measurement.
6. Establish the true bearing of a baseline by observing a circumpolar star by the method of equal atitudes, extra-meridian observation of the Sun for the calculation of azimuth.

7. Heights and distances using tacheometric surveying - tangential, subtense, stadia methods.
8. Use of modern surveying equipment including experience in using application software.
9. Transfer of base line from one level to other by correlation.
10. Visit to Remote Sensing Centre for getting conversant with use of stereoscope for mine plan preparation.

TOTAL= 60 PERIODS

GE9371	**COMMUNICATION SKILLS AND SOFT SKILLS LAB**	**L T P C**
		0 0 2 1

1. PC based session

A. Career Viewing and discussing audio-visual materials (15 periods)

1. **Resume / Report Preparation / Letter Writing:** (3)
   Letter writing – Job application with Resume - Project report - Email etiquette.
2. **Presentation skills:** (3)
   Elements of effective presentation – Structure of presentation - Presentation tools – Body language.
3. **Soft Skills:** (3)
   Time management – Stress management – Assertiveness – Negotiation strategies, Psychometrics - Analytical and logical reasoning.
4. **Group Discussion:** (3)
   Group discussion as part of selection process, Structure of group discussion – Strategies in group discussion – Mock group discussions.
5. **Interview Skills:** (3)
   Kinds of interviews – Interview techniques – Corporate culture – Mock interviews.

II. Class Room Session 45 periods

1. **Resume / Report Preparation / Letter writing**: Students prepare their own resume and report. (9)
2. **Presentation Skills:** Students make presentations on given topics. (12)
3. **Group Discussion**: Students participate in group discussions. (12)
4. **Interview Skills**: Students participate in Mock Interviews (12)

Note: Classroom sessions are practice sessions.

REFERENCES:

1. Prakash P, Verbal and Non-Verbal Reasoning, Macmillan India Ltd., 2nd Edition, New Delhi, 2004.
2. John Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi 2004.
3. Paul V Anderson, Technical Communication, Thomson Wadsworth , 6th Edition, New Delhi, 2007.
4. Edgar Thorpe and Showick Thorpe, Objective English, Pearson Education, 2nd Edition, New Delhi 2007.
5. David Evans, Decision maker, CUP, 1997

LAB REQUIREMENT:

1. Teacher console and systems for students.
2. English Language Lab Software
3. Tape recorders

MI9356 MINING MACHINERY LAB – II L T P C
0 0 2 1

1. Study of different types of safety hooks and rope cappels used in winding.
2. Study of various types of head gear-fleet angle
3. Study of shaft fittings-signal systems, guides, safety dogs and protective roofing
4. Study of rope guides– methods of support and tensioning arrangements.
5. Study of fittings of winding engines- drums, brakes, and depth indicators.
6. Study of mine car circuits on surface and pit bottom.
7. Study of loading and discharge arrangements of skips in vertical and inclined shafts
8. Study of armoured face conveyors
9. Study of belt conveyors and shaker and vibrating conveyors.
10. Study of coal drill and its electrical panel/gate end box
11. Study of continuous miners and road headers
12. Study of coal ploughs and shearers

TOTAL = 30 PERIODS

MI9357 ROCK MECHANICS AND GROUND CONTROL LABORATORY - I L T P C
0 0 2 1

1. Determination of RQD of rocks.
2. Determination of Protodyaknov index of a given rock sample.
3. Determination of point load index strength of a given rock sample
4. Determination of porosity of rocks.
5. Determination of hardness of rocks.
6. Determination of uniaxial compressive strength of a given rock sample.
7. Determination of tensile strength of a given rock sample using Brazilian method.
8. Determination of shear strength of rocks.
9. Determination of modulus of elasticity of given rock sample using strain gauge.
10. Determination of triaxial strength of rock and drawing of Mohr's envelope.
11. Determination of slake durability of rocks.

TOTAL = 30 PERIODS

MI9358 MINERAL PROCESSING LABORATORY L T P C
0 0 3 2

1. Study of grab sampling and different sample division techniques like coning and quartering, riffle sampling techniques, etc.
2. Determination of crushing characteristics of a given mineral sample using jaw crusher
3. Determination of the grinding characteristics of a given mineral sample using ball mill
4. Sieve analysis of a given sample and to calculate (a) percentage sample retained on screens (b) average size of sample material and (c) to plot sizing curves
5. Concentration of a given mineral sample using mineral jig
6. Concentration of a given mineral using Wilfley table
7. Concentration of a given mineral using froth flotation cell
8. concentration of a given mineral using magnetic separator
9. Study of washability characteristic of a coal sample using float and sink test.
10. Study of sedimentation characteristics of a given sample

TOTAL = 45 PERIODS

MI9359 SURVEY CAMP L T P C
0 0 0 1

The course of mine surveying is sharply demarcated into general principles and practice of surveying in mines. The subject of Surveying is applied in nature and is best learnt in an operating mine. This is done during the mine survey camp organised in an underground mine as part of the curriculum.

The students of VI Semester have to undergo the survey camp during the semester for a period of 10 days and submit a report.

If due to valid reasons a student could not undergo this survey camp as scheduled he could do so along with the succeeding batch with the recommendation of the Head of the Department and approval by the competent authority, whose decision is final in this regard.

MI9401 **MINE PLANNING & DESIGN** **L T P C**
3 0 0 3

AIM:
To understand the fundamental principles of mine planning and design

OBJECTIVES:
- To understand the planning of opencast mining, underground mining and equipment utilization
- To study project implementation and monitoring

UNIT I INTRODUCTION 7
Technical factors in mine planning, methodology of mine planning, short range & long range, mine modelling, mine simulation systems approach to mine planning based on mine sub-system and their elements, mine plan generation

UNIT II OPENCAST MINING 10
Selection of initial mine cuts, location of surface structures, division of mining area into blocks, mine design, bench drainage, geometry, haul roads, slope stability; open pit limits and optimisation, calendar plan, production planning, production scheduling, economic productivity indices.

UNIT III UNDERGROUND MINING 10
Location of mine entries, mine and auxiliary, optimisation of mine parameters, design of shaft pillars and protective pillars, planning of production capacity, layout of development drives / raises / winzes etc, length of faces, size of panels, etc, planning of support systems, ventilation, lay out of drainage system, planning production schedule and monitoring, selection of depillaring / stoping method, manpower management economic/ productivity indices, techno-economic analysis, mine reclamation design.

UNIT IV EQUIPMENT PLANNING 10
Latest technological developments in increase in both types and capacities of equipment used in mining operations. Planning and selection of equipment for different mining conditions. Equipment design for optimum drilling and blasting operations. Equipment information – performance monitoring and expert systems, Innovative mining systems.

UNIT V PROJECT IMPLEMENTATION AND MONITORING 8
Pre-project activities – feasibility report, environment clearance, detailed project, report, sources of funds, import of technology, selection of contracts and contract administration, time management, cost control material management system, project quality assurance, social responsibility, government orders and guidelines. Environmental impact assessment and preparation of environmental management plan. Mine closure plan.

TOTAL= 45 PERIODS

REFERENCES

1. Jayanth Bhattacharya,Principles of Mine Planning-Allied Publishers,Delhi 2003.
2. Hustrulid, W. and Kuchta, M., (eds)., Fundamentals of Open pit Mine Planning and Design, Elsevier, 1995
3. Ehrenburger, V and Fajkos., A., Mining Modelling, Elsevier, 1995.
4. Bawden, W.F., and Archibald., J.F., Innovative Mine Design for the 21st Century Elsevier, 1993
5. Passamehtoglu, A.G., Karpuz, C., Eskikaya, S. and Hizal, T., (Eds), Mine Planning and Equipment Selection, Elsevier, 1994.
6. Pazdziora, J., Design of Underground Hard Coal Mines, Elsevier, 1988
7. Swilski, and Richards., Underground Hard Coal Mines, Elsevier, 1986
8. Singh, B. and Pal Roy, P., Blasting in Underground excavations and mines, CMRS Dhanbad, 1993
9. Raj, K Singhal (Ed), Mine Planning & Equipment Selection, A.A., Balkema, 1988
10. Peng, S.S. and Chaing, H.S., Longwall Mining, John Wiley & Sons, New York, 1984
11. Rzhevsky, V.V., Opencast Mining – Technology and Integrated Mechanisation, MIR Publishers, Moscow, 1987
12. Rzhevsky, V.V., Opencast Mining – Unit Operations, MIR Publishers, Moscow, 1987

MI9402 MINE ECONOMICS AND INVESTMENT L T P C
3 0 0 3

AIM:

To study the fundamentals of mineral economics

OBJECTIVES:

- Study of estimation and valuation of mineral deposits
- Study of project appraisal
- Study of finance and accounting

UNIT I INTRODUCTION 4

Mineral industry and its role in national economy; world and national mineral resources; Mining - A unique investment environment; special risk factors in mine investment and evaluation; national mineral policy.

UNIT II ORE RESERVE ESTIMATION 9

Methods of sampling, sampling frequency; analysis of sampling data, estimation of reserves, introduction to geo-statistical methods, classification of reserves.

UNIT III MINE VALUATION 12

Time value of money; annuity; redemption of capital, net present value; depletion allowance; depreciation; inflation; escalation; rates of return; Hoskold's Two rate method; capital and operating cost including wages, incentives, material, etc.; assets; liabilities; cash flows and discounted cash flow; profitability index – their implications in mine economic evaluation.

UNIT IV PROJECT APPRAISAL 12

Methods of project evaluation – pay back, annual value, benefit/cost ratio, ERR and IRR, etc., evaluation of exploratory mining areas and operating mines; mine project financing, its risks and constraints; mine taxation; critical impact of depreciation, depletion, type of funding, reserves, life, etc., on mine profitability.

UNIT V FINANCE AND ACCOUNTING 8

Sources of mine funds – shares, debentures, fixed deposit, sinking fund, capital gearing, P & L account, balance sheet, typical case studies of mine feasibility. Cost estimation of individual mining operations and overall mining cost, cost control methods.

TOTAL = 45 PERIODS

REFERENCES

1. Sloan, D.A., Mine Management, Chapman and Hall, London, 1983.
2. Deshmukh, R.T., Mineral and Mine Economics, Mira Publications, Nagpur, 1986.
3. Arogyaswamy, R.N.P. Courses in Mining Geology, Oxford and IBH Publishing Co., 1994.
4. Chatterjee, K.K., Mineral economics, Wiley Eastern, 1992.
5. Park, R.J., Examination and Valuation of mineral property.
6. How to read a balance sheet ILO 1992.
7. Indian Mining Year Book 1994 – MMRD Act and Mineral Concession Rules.

MI9403 COMPUTER APPLICATIONS IN MINING L T P C
3 0 0 3

AIM: To impart skills on designing and development of mining software**.**

OBJECTIVES:

- To impart knowledge on hardware and software issues concerned with development of programs
- To develop algorithms and programs on various mining related problems in basic programming languages.
- To impart knowledge on high-end simulation methodologies.
- To study modern techniques of solving mining problems.

UNIT I INTRODUCTION TO COMPUTERS 9

Introduction to microprocessors – overview of input, output and memory devices – interfacing concepts; evolution of operating systems; operating systems functions, characteristics.

UNIT II SOFTWARE 8

Application of structured and object oriented programming languages to mining problems; development of algorithms for mine design problems like pillar design, blast design, subsidence, etc.

UNIT III DATABASE MANAGEMENT SYSTEMS 8

Introduction to basic database concepts; operational data, data independence, database architecture; distributed database; relational approach; mining applications.

UNIT IV PROBLEM SOLVING – APPLICATIONS IN MINING 12

Ventilation network analysis; on-line and off-line monitoring and control. MINOS, FIDOS, CAD in mining – opencast and underground mines like krigging, orebody modelling, pit optimisation, mine scheduling, TDS, etc. Management information systems; digitisation of mine maps.

UNIT V MODERN TRENDS 8

Computer graphics, multimedia, artificial intelligence, neural networks, robotics and virtual reality

TOTAL = 45 PERIODS

REFERENCES

1. Fytas, K. and Singhal, R.K. Computer Applications in the Mineral Industry, A.A. Balkema Publication, 1988.
2. Ramani et al., Computers in Mineral Industry, Oxford and IBH Publishers, 1994.
3. Elbrond, J., et al. Applications of Computers and Operations Research in the Mineral Industry, A.A. Balkema Publication, 1995.
4. Rajaraman, V. Fundamentals of Computers, Prentice Hall of India, New Delhi, 1999.
5. Basandra, S.K. Computers Today, Galgotia Co. Ltd., New Delhi, 1999.
6. www. Infomine.com
7. www. Nottingham.ac.uk
8. www. smenet.org
9. www. miningindia.com

MI9404 MINE LEGISLATION AND SAFETY L T P C
4 0 0 4

AIM:

To study about the various legislations relating to mineral industries

OBJECTIVE:

To study various acts, rules and regulations relating to the mineral industry Study accidents, diseases and mine safety

UNIT I INTRODUCTION TO MINING LAWS AND LEGISLATION 5

General principles of mining laws, development of mining legislation of India.

UNIT II ACTS, RULES AND REGULATIONS – I 20

Mines Act, Mines Rules, Coal and metalliferous mines Regulations, Bye-laws, Circulars, and standing orders

UNIT III ACTS RULES AND REGULATIONS – II 20

Indian Electricity Rules, Coalmines Conservation and Development Act, Workman's Compensation act., General provisions of Mines and Minerals Regulation and Development Act, Mineral Concession Rules, Vocational Training .Rules, Crèche rules, Maternity Benefit Act, Payment of Wages Act, Gratuity and P.F. Rules, Explosives act, Rescue Rules, Factory Act, Environmental Protection Act.

UNIT IV ACCIDENTS AND DISEASES 10

Classification of accidents, causes and prevention of accidents, accident enquiry reports, cost of accidents, occupational diseases and their social effects.

UNIT V MINE SAFETY 5

Role of management, labour and government, Safety audit, instrumentation, organisation for disaster management in mines, safety conferences.

TOTAL = 60 PERIODS

REFERENCES

1. Mines Act 1952, Lovely Prakashan, Dhanbad, 1995.
2. Coal Mines Regulations, 1961, Lovely Prakashan, Dhanbad 1995.
3. Metal Mines Regulations, 1961, Lovely Prakashan, Dhanbad 1995.
4. DGMS Circulars, By National Council of Safety in Mines, Dhanbad, 1995.
5. Mines rules, 1955, Lovely Prakashan, Dhanbad, 1995.
6. The Mines Rescue Rules, 1986, Lovely Prakashan, Dhanbad 1995.
7. The Indian Electricity Rules, 1995, Lovely Prakashan, Dhanbad 1995.
8. The Payment of Wages Act, 1936, Ram Narain Lal Beni Prasad, 1995.
9. Vocational Training Rules, Lovely Prakashan, Dhanbad 1995.
10. The Workmen's compensation Act, 1923, Ram Narainlal Beni Prasad, Allahabad, 1995.
11. Kejriwal, B.H., Safety in Mines, Gyan Khan Prakashan, Dhanbad 1994.

MI9405 MINE ENVIRONMENTAL ENGINEERING – III L T P C

3 0 0 3

AIM:

To have a fundamental knowledge of natural disasters related to mining

OBJECTIVES:

- To study about spontaneous heating, mine fires, inundation and explosions
- To study about mine rescue and first aid

UNIT I SPONTANEOUS HEATING 6

Causes, detection, incubation period, precautions against spontaneous heating in underground and surface coalmines including coal benches, surface coal stocks, and dumps.

UNIT II FIRES 9

Detection, prevention and control of underground fires, fire fighting, study of atmosphere behind sealed-off fire areas for reopening, methods of reopening sealed off fire areas.

UNIT III EXPLOSIONS 10

Causes, prevention and control of underground fire-damp and coal dust explosions including stone dusting, stone dust barriers, water barriers and triggered barriers, investigation after an explosion.

UNIT IV INUNDATION 9

Surface and underground inundation, their causes and preventive measures, precautions to be taken while approaching old waterlogged workings, safety boring apparatus, design and construction of water dams and barriers, recovery of flooded mines, dewatering of old workings, layout of drainage systems and sumps.

UNIT V MINE RESCUE AND FIRST AID 11

Classification of rescue apparatus including self rescuer, various types of rescue and escape apparatus, rescue organisation of a mining company, layout of a modern rescue station including personnel, first aid to the persons injured in mine-accidents, electric shock, asphyxiation, different methods of artificial respiration, rescue and recovery work in mines including through boreholes, rescue rules.

TOTAL = 45 PERIODS

TEXT BOOK:

1. Ramlu, M.A., Mines Fires, Explosion, Rescue, Recovery and Inundations, Mukhertu Publishers, Kharagpur, 1989.
2. Ramlu, M.A., Mine Disasters and Mine Rescue, Oxford and IBH Publishers, 1991.
3. McPherson, M.J., Subsurface Ventilation and Environmental Engineering, Chapman & Hall Publication, London, 1993.

REFERENCES:

1. Misra, G.B. Mine Environment and Ventilation, Oxford University Press, 1993.
2. The Mine Rescue Rules, 1986, Lovely Prakashan, Dhanbad, 1992.
3. Classified Circulars by D.G.M.S., Dhanbad.
4. Kaku, L.C. Fires in Coal Mines, Oriental Publishers, 2nd Edition, 1985

MI9406 MINE ENVIRONMENTAL ENGINEERING LABORATORY – II L T P C
0 0 2 1

1. Assessment of air borne dust by gravimetric dust samplers.
2. Air sampling with high volume air sampler
3. Noise survey
4. Determination of crossing point temperature of coal
5. Determination of the index of inflammability
6. Study of Burnside safety boring apparatus and pattern of bore holes in exploratory headings with water logged workings
7. Study of MSA Chemox apparatus and self rescuers.
8. Study of self contained breathing apparatus
9. Determination of pH, TDS, TSS in a water sample.
10. Determination of dissolved oxygen and chemical oxygen demand in a water sample.
11. Determination of organic carbon in soil sample.
12. Determination of percentage of volatile matter, moisture ash, and fixed carbon by proximate analysis of a coal sample.
13. Study of Vibration Monitoring.

TOTAL = 30 PERIODS

MI9407 COMPUTER APPLICATIONS IN MINING LABORATORY L T P C
0 0 3 2

1. Computer programming for mining problems like design of pillars, pit slope design, and blast design.
2. Mine ventilation network analysis.
3. Database systems and analysis.
4. Digitisation and scanning of mine plans.
5. Ore body modelling.
6. Pit optimisation.
7. Truck Dispatch System optimisation.
8. Production Scheduling for grade control.
9. Digital Terrain modelling and Wire-frame modelling.
10. Mine modelling.
11. Stress distribution modelling across a circular opening using finite element method.
12. Modelling of airflow through underground workings using finite element method.

TOTAL = 45 PERIODS

MI 9408 ROCK MECHANICS AND GROUND CONTROL LAB– II L T P C
0 0 2 1

1. Study of time dependent properties of rocks
2. Study of drillability index of rocks.
3. Study of different types of supports used in mines.
4. Study of stress and fracture patterns around underground model openings
5. Study of design of mine pillars.
6. Prediction of Subsidence.
7. Study of measurement of in situ stresses and strengths.
8. Determination of rock anchorage capacity of a rock bolt
9. Study of different types of roof convergence and other ground control instruments

TOTAL = 30 PERIODS

MI9409 **COMPREHENSION** **L T P C**
0 0 2 1

The objective of this comprehension is to achieve an understanding of the fundamentals of contemporary manufacturing systems including materials, manufacturing process, product and process control, computer integrated manufacture and quality. The students work in groups and solve a variety of problems given to them. The problems given to the students should be of real like industrial problems selected by a group of faculty members of the concerned department. A minimum of three small problems have to be solved by each group of students. The evaluation is based on continuous assessment by a group of Faculty Members constituted by the professor in-charge of the course.

TOTAL = 45 PERIODS

MI9410 **PRACTICAL TRAINING II** **L T P C**
0 0 0 1

Coal and metaliferrous mining by underground methods is an important aspect of the mining engineering programme having many characteristic features of their own.

The students have to undergo training in underground coal and metaliferrous mines, during the summer vacation at the end of the VI Semester for a period of 4 weeks. The students have to submit a report on the training which would be evaluated during the ensuing VII Semester. This carries a total of one credit during the VII Semester. Evaluation would be done by a faculty or a group of faculty on different marking heads such as training, viva voce report etc., or other approved evaluation systems.

Normally a student is not permitted to withdraw from this practical training. In case of unforeseen circumstances / valid reasons if he could not undergo the training as scheduled, on the recommendation of the Head of the Department and approval by the competent authority the student may be permitted to undergo practical training II at the end of VIII semester. The decision of the competent authority is final.

MI9451 **PROJECT WORK** **L T P C**
0 0 12 6

A Project topic must be selected either from published lists or the students themselves may propose suitable topics in consultation with their guides. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.

A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

MI 9021 ADVANCED COAL MINING AND MECHANISATION **L T P C**
3 0 0 3

UNIT I COAL FACE MECHANISATION **8**

Recent Trends, mechanised bord and pillar mining, case studies.

UNIT II MINING OF THICK SEAMS **8**

Problems, past experiences in India, current methods, mining of thick, contiguous, and steep seams

UNIT III HYDRAULIC MINING **9**

Applicability, operating parameters, equipment, layouts, Indian experience. Computer applications such as remote control and environmental monitoring in hydraulic mining.

UNIT IV LONGWALL MINING **10**

Powered supports, development of powered supports, their types and designs, selection for different conditions, last drivages for longwall panelling, remotely operated powered support and longwall faces, Indian experiments, salvaging in longwall.

UNIT V UNDERGROUND COAL GASSIFICATION **10**

Scope, application, methods of gasification, design of gasification plants, coal bed methane. Environmental monitoring techniques and computer applications in coal gasification techniques.

TOTAL :45 PERIODS

REFERENCES

1. Das S.K. Modern Coal Mining Technology, Lovely Prakashan, Dhanbad, 1994.
2. Singh, T.N. and Dhar, B.B. Thick Seam Mining, Problems and Issues, Oxford & IBH Publishers, 1992.
3. Mathur, S.P. Mining Planning for Coal, M G Consultants, Bilaspur, 1993.
4. Peng S.S. and Chiang, H.S. Longwall Mining, John Willey and Sons, New York, 1992.
5. Singh, T.N. Underground Winning of Coal, Oxford IBH Publishers, 1999.
6. Singh, R.D. Principles and Practices of Modern Coal Mining, New Age International, 1997.

MI9022 ADVANCED METAL MINING AND MECHANISATION L T P C
3 0 0 3

UNIT I ADVANCED MINE DEVELOPMENT 9

Recent advances in raising, winzing, development of drives, tunnels, cross- cuts, drifts, stope preparations, opening up of mineral deposit, enlargement of drives and raises, recent trends in shaft sinking. Techno economic aspects.

UNIT II ADVANCED METAL MINING AND STOPING PRACTICES 9

Recent advances in stoping practices, VCR mining, deep mining, stoping practices in rock burst prone mines, back-filling, recent developments in metal mining in India.

UNIT III MECHANISATION, SUPPORT SYSTEMS IN METAL MINES 9

Mechanisation in metal mines – LHD declines, hydraulic transport, trackless mining, modern support system used in metal mines, recent developments in winding and transport

UNIT IV SPECIAL MINING TECHNIQUES 9

Marine mining methods – sea water, marine beaches, continental shelves, sea-bed sediments and polymetallic nodules, solution mining, ore leaching, in situ leaching techniques.

UNIT V SPECIAL PROBLEMS OF ORE MINING 9

Special problems of deep mines – rock pressure, heat, humidity, rock burst, noise and dust pollution, deep winding and transport, etc.

TOTAL = 45 PERIODS

REFERENCES

1. Cummings, A.B. and Given, I.V. SME Mining Engg. Vol. I and II, Society of Mining Engineers of American Institute of Mining, Metallurgical Petroleum Engineers, Inc., New York, 1994.
2. Hartman, H.L. Mine Ventilation and Air Conditioning, Wiley Inter Science Publication, New York, 1986.
3. Peng, S.S. Ground Control, Wiley Interscience, New York, 1985.
4. Hustrulid, W.A. (Ed.). Underground Mining Methods Handbook, AMIE Publication, 1992.
5. Karmakar, H. Mine Working, Vol. I and II, Lovely Prakashan, Dhanbad, 1995.
6. Hustrulid, W.A. Underground Mining Methods and Technology, Elsevier Science Publishers, 1990.

MI9023 ROCK EXCAVATION ENGINEERING L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Concepts, historical developments in rock excavation, systems, factors affecting the rock fragmentation, mechanism of rock breakage and fracture; their application to rock fragmentation methods for rock fragmentation – explosive action, cutting, ripping and impacts.

UNIT II ROCK MECHANICS 9

Rock properties related to machining process; application of compressive, tensile and multi-axial strengths, index tests and abrasivity, anisotropy, elasticity, porosity, laminations, bedding and jointing in rock fragmentation process.

UNIT III ROCK CUTTING TECHNOLOGY 9

Mechanism of drilling – rotary, percussive, rotary, rotary percussive, mechanics of rock machining, theory of single tool rock cutting, crack initiation and propagation, breakage pattern, rock excavation by cutting action – picks, discs, roller cutters water jet cutting, methods of evaluation of drillability and cuttability of rocks.

UNIT IV ROCK CUTTING TOOLS 9

Rock cutting tool materials, different types, relative applications and their choice, tool shape and size, specific energy consumption, tool wear, effect of operational parameters on tool performance, maintenance and replacement of cutting tools of excavating machines.

UNIT V ROCK EXCAVATING MACHINES 9

Excavating machines, principles, operation, applicability and technical indices of road headers, TBM'S coalface machines and bucket wheel excavators.

TOTAL = 45 PERIODS

REFERENCES

1. Cummings, A.B. and Given, I.V., SME Mining Engg. Vol. I and II, Society of Mining Engineers, America, 1992
2. Hartman, H.L., Introductory Mining Engineering, John Wiley and Sons, New York, 1987
3. Chugh, C.P., Diamond Drilling, Oxford-IBH, 1984
4. Clark, G.B. Principles of Rock Fragmentation, John Wiley and Sons, New York, 1987

MI9024 NUMERICAL METHODS IN MINING ENGINEERING L T P C
3 0 0 3

UNIT I INTRODUCTION TO ELASTIC AND PLASTIC MODELS 9
Fundamentals, elastic, plastic, homogeneous and isotropic, non-linear elastic and elasto-plastic models.

UNIT II FINITE DIFFERENCE METHODS 9
Concept, formation of mesh element, finite difference patterns, solutions, application to mining.

UNIT III FINITE ELEMENT METHODS 9
Concept, discretisation, element configuration, element stiffness, assemblage and solutions, two and three dimensional solutions, linear and non-linear analysis, applications in geomechanics; simulation of joints in strata.

UNIT IV BOUNDARY ELEMENT METHOD 9
Concept, discretisation, different methods of solution for isotropic and infinite media.

UNIT V PRACTICAL APPLICATIONS IN MINING AND ROCK MECHANICS 9
Practical Applications in stress analysis, slope stability, subsidence prediction, pillar design, rock burst, etc.

TOTAL = 45 PERIODS

REFERENCES

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

MI9025 **ADVANCED SURFACE MINING** **L T P C**
3 0 0 3

UNIT I PLANNING 10

Open-pit optimisation techniques for mine geometry and output, mine development phases, quality control and conservation. Output and manpower planning; calendar planning, mine scheduling, production scheduling, truck dispatch system, design of sumps and pumping systems and drainage.

UNIT II GEOTECHNICAL PARAMETERS 7

Application of geotechnical investigation for design of ultimate pit slope and other design parameter, slope stability analysis including mine waste rock dumps and tailing dumps.

UNIT III EQUIPMENT MANAGEMENT 7

Machine availability, productivity, maintenance, maintenance scheduling, preventive maintenance, control and monitoring inventory. Workshops for HEMM. Power supply arrangements in opencast mines.

UNIT IV SAFETY AND ENVIRONMENT 10

Safety aspects in opencast mines regarding height, width and slope of benches, drilling and blasting, fly rock, nearby dwellings, mine illumination, gradient and other aspects of haul roads, formation of spoil dumps, tailings management etc. pollution due to noise, vibrations due to machinery and blasting, water pollution, measurement monitoring and control measures for the same, land reclamation and afforestation, environmental audit.

UNIT V MODERN TRENDS IN OPENCAST MINES 11

Recent developments in mining methods and layouts. In pit crushing & conveying, continuous surface mining. Selective extraction and dumping. Extraction of seams developed/extracted by underground methods. Deep OCM.Placer mining and solution mining – scope of applicability, sequence of development and machinery

TOTAL = 45 PERIODS

REFERENCES

1. Cummings, A.B. and Given, I.V., SME Mining Engg. Hand book Vol.I and II, New York, 1994
2. Proceedings of National Seminar on Surface Mining, IME Publications/ Calcutta, 1995
3. Das, S.K., Surface Mining Technology, Lovely Prakashan, Dhanbad, 1994
4. Das, S.K., Modern Coal Mining Technology, Lovely Prakashan, Dhanbad, 1994
5. Kennedy, B.A., Surface Mining – 2nd Edition, SME, New York, 1990
6. Hustrulid, W. and Kuchta, M., (eds)., Fundamentals of Open Pit Mine Planning & Design, Elsevier, 1995

MI9026 **LONGWALL MINING** **L T P C**
3 0 0 3

UNIT I PLANNING 10

History of longwall mining and its development, techno-economic consideration of the modified longwall retreat panels, longwall advance panels with caving method and stowing method, design of gate roadways and their size disposition, layout of panels, production and manpower planning, sublevel caving systems for thick seams, caving system in thin seams, multi-slice longwall mining, application of longwall mining for steep seams, longwall caving in metal mines.

UNIT II SUPPORTS 10

Types of supports used in longwall mining in the past and present, design of powered supports for different situations, longwall face end problems, supports in longwall gate roadways during drivage and extraction, pressure distribution around a moving longwall face, caving of thick seams. Main roof fall, local fall and induced roof wall, floor heaving, precautions during main fall and surface subsidence.

UNIT III EXTRACTION AND TRANSPORT ON A LONGWALL FACE 10

Methods of mining coal on longwall faces, machines – shearers, ploughs etc., methods of cutting and face advancement, stables and sumping, gate road pillar extension. Mode of transporting coal or ore in longwall face and machinery used. Shortwall Mining – a modified longwall mining. Remotely operated longwall faces. Shifting of longwall equipment.

UNIT IV DEVELOPMENT AND WORKING OF LONGWALL FACES 8

Methods of driving gate roadways, choice of selection of machinery, road headers and dinters, special problems associated with working of longwall faces - faults, roof caving, face spalling, overburden movement, subsidence control, hydraulic stowing, dealing with spontaneous heating while working thick seams in coal.

UNIT V ENVIRONMENT AND ANCILLARY 7

Methods of ventilating longwall faces and gate roadways. Methane control, dust controland noise control, monitoring at longwall faces. Assessment of cost of ventilation. Electric and hydraulic circuits. Surface and ground water effects. Strata monitoring withinstruments.

TOTAL = 45 PERIODS

TEXT BOOKS:

1. Peng , S.S. Longwall Mining, 2rd Edition, John Willey and Sons, New York, 2006.
2. Peng , S.S. Coal Mine Ground Control, 3rd Edition, John Willey and Sons, New York, 2008.
3. Singh, R.D. Principles and Practices of Modern Coal Mining, New Age International, 1997
4. Singh, T.N. Underground Winning of Coal, Oxford IBH Publishers, 1999.

REFERENCES:

1. Mathur, S.P. Mining Planning for Coal, M.G. Consultants, Bilaspur, 1999.
2. Singh T.N., Dhar, B.B. Thick Seam Mining, problems and Issues, Oxford & IBH Publishers, 1992
3. Das S.K. Modern Coal Mining Technology, Lovely Prakashan, Dhanbad, 1994.
4. Longwall Mining in Company Seminar – Proceedings – The Singareni Collieries Co. Ltd., 1990

MI9027	SYSTEMS ENGINEERING IN MINING	L	T	P	C
		3	0	0	3

UNIT I INTRODUCTION 9

Introduction to systems engineering, systems concept and analysis, models in systems analysis, tools and methodology of system analysis.

UNIT II OPERATIONS RESEARCH 9

Introduction to operations research, introduction to linear programming, application to mineral industry.

UNIT III SIMULATION TECHNIQUES 9

Introduction to Monto-carlo sampling and deterministic simulation of different mining subsystems and total system, simulation application for equipment selection and production scheduling.

UNIT IV NETWORK ANALYSIS 9

Network analysis, monitoring and control of developmental activities in mining project by CPM and PERT.

UNIT V MISCELLANEOUS 9

Inventory of mineral resources, basic models and optimisation, introduction to statistical decision theory and its application in mineral industry.

TOTAL = 45 PERIODS

REFERENCES

1. Syal, I.C., and Gupta, B.P. Computer Programming and Engineering Analysis, A.B., Wheeler and Company, Madras 1986
2. Anon, Management by Network Analysis, The Institution of Engineers (India), 1976
3. Rao, S.S., Finite Element Methods in Engineering, Pergamon Press, 1982
4. Cummings, A.B., and Given I.V., SME Mining Engg., Handbook Vol.I and II, SME-41 ME, Inc, New York, 1973
5. Zambo, J., and Kiado, A., Optimum Location of Mining facilities, Springer verlag, Budapest, 1968.

MI9028 MATERIAL HANDLING L T P C
3 0 0 3

UNIT I BULK HANDLING SYSTEMS 9

Basic principles in material handling exclusive to mining industry and its benefits. Classification of material handling equipments. Current state of art of bulk handling materials in mining in the world and Indian scenario; Selection of suitable types of systems for application. Stacking, blending, reclaiming and wagon loading, machinery and systems used at the stack yards; stock piles, silos, bunkers – their design, reclamation from them, various types of weigh bridges. Segregation – size wise and grade wise, Railway sidings.

UNIT II SHORT CONVEYORS AND HAULAGE SYSTEMS 9

Roller conveyor, overhead conveyor, screw conveyor, auger conveyor, apron feeder, bucket elevators, scraper haulage, conveyors in steep gradient, Armoured face conveyor, Off-highway Trucks, haul roads, In-pit crushers and modular conveyors, electric trolley assisted haulage, shuttle cars, skip hoist, winders, LHD's, pneumatic conveying, hydraulic transport.

UNIT III BELT CONVEYOR SYSTEM 9

Design, capacity, calculations with respect to the size, speed, troughing, power requirement, tension requirement, belt selection, factor of safety; developments in the design, of various components of belt conveyor systems such as; structures, rollers, gear boxes and motors, drums and pulleys, belting, ancillary components and safety gadgets.

UNIT IV NEW TYPES OF BELT CONVEYOR SYSTEMS 9

Curved conveyors, cable belts, pipe conveyors, rock belts – mine-run-rock conveyor, steel belt conveyors, steel slot conveyor, chain belt conveyors, etc., and other new developments, stackers and reclaimers, High Angle Conveyors (HAC); New inventions in HAC , Mobile or fixed installations; Woven wire belts, En Masse conveyor, Vibrating conveyor, gravity bucket conveyor.

UNIT V MATERIAL HANDLING IN DIMENSIONAL STONE QUARRIERS 9

Mobile cranes, derrick cranes, pillar cranes, tower cranes, radial cranes, bridge cranes, fork lifters, over head gantry material handling in workshops. Mineral handling in dimensional stone quarries, Mineral handling plants(coal, etc.,) Locomotives, rail tracks, rail cars, railways wagons; Aerial ropeways, gravity ropeways; Containers and shipping; Rope haulage - different types.

TOTAL = 45 PERIODS

TEXT BOOKS:

1. Allegri (Sr.), T.H. Material Handling – Principles and Practices, CBS Publishers and Distributors, Delhi, 1987.
2. Hustrulid, W. and Kuchta, M. Open Pit Mine Planning & Design, Vol. 1, Fundamentals, Balkema, Rotterdam, 1998.
3. Peng, S.S., and Chiang, H.S. Longwall Mining, John Wiley and Sons, New York, 1984.
4. Hartman, H.L. (Ed.), SME Mining Engg. Handbook Vol.I and II, Society for Mining, Metallurgy, and Exploration, Inc., Colorado, 1992.

REFERENCES:

1. Kennedy, B.A., Surface Mining – 2nd Edition, SME, New York, 1990.
2. Deshmukh, D.J. Elements of Mining Technology, Vol.I, II and III, EMDEE Publishers, Nagpur, 1979.
3. Vorobjev, B.M., and Deshmukh, R.T. Advanced coal Mining, Vol.I and II, Mrs Kusum Deshmukh, P.O. Indian School of Mines, 1966.
4. Woodruff, S.D. Methods of Mining, Working, Coal and Metal Mines, Vol.II and III, Pergamon Press, 1968.
5. Sinclair, J. Winding and Transport in Mines, Sir Isaac Pitman and Sons, Ltd., London, 1959.

AG9071 MINERAL EXPLORATION L T P C
3 0 0 3

UNIT I MINERAL RESOURCES AND PROSPECTING 10

Introduction to important mineral resources in India and world wide, surface and aerial prospecting, reconnaissance, application of geochemical, geophysical and geostatistical methods.

UNIT II EXPLORATION 9

Preliminary and detailed exploration by boring, exploratory mining by shafts, drifts, cross-cuts, collection and compilation of data for computer processing.

UNIT III EXPLORATION STRATEGY 8

Exploration investment decision, exploration techniques and strategies, exploration targets.

UNIT IV EXPLORATION GROUPS AND THEIR ROLE 8

Strategy and structure of the exploration group, government policies, aspects of exploration, role of exploration in the mining company.

UNIT V PREPARATION AND EVALUATION OF PROJECT REPORTS 10

Evaluation of exploration and development projects, study of typical prefeasibility and feasibility reports.

TOTAL = 45 PERIODS

REFERENCES

1. Deshmukh, R.T., Mineral and Mine Economics, Mira Publications, Nagpur, 1986
2. Cummings, A.B. and Given, I.V., SME Mining Engg. Handbook, Vol.I and II, society of Mining Engineers of American Institute of Mining, Metallurgical, Petroleum Engineers INC, New York, 1992
3. Sloan, D.A., Mine Management, Chapman and Hall, London, 1983
4. Arogyaswamy, R.N.P., Courses in Mining Geology, Oxford and IBH Publishing Company Private Limited, 1994
5. Bhattacharjee, S., Frontiers in Exploration geophysics Oxford and IBH Publishing Company, 1992
6. A.K. Ghosh, Strategies for Exploitation of Mineral Resources in developing countries, Oxford & IBH Publishing Company, 1992
7. Kuzvart, M. and Bohmer, M., Prospecting and Exploration of Mineral Deposits, Elsevier Science Publishers, 1993

MI9029 **SUBSIDENCE ENGINEERING** **L T P C**
3 0 0 3

UNIT I INTRODUCTION 9
Strata movement at the mining horizon, convergence in mine working, factors influencing convergence in mine workings.

UNIT II SUBSIDENCE MECHANISM 9
Zones of movement in the overlying beds, vertical and horizontal movement, subsidence trough, angle of draw, angle of break, sub-surface subsidence.

UNIT III SUBSIDENCE PREDICTION 9
Different methods of surface subsidence prediction – graphical, analytical, profile function, empirical and theoretical models.

UNIT IV TIME INFLUENCE AND IMPACT ON STRUCTURES 9
Influence of time on subsidence, example from longwall and bord and pillar workings. Calculation of ground movement over time.Types of stress on structures, stress-strain behaviour of soils, mining damage to buildings, industrial installations, railway lines, pipes, canals, etc.

UNIT V SUBSIDENCE CONTROL, GOVERNING LAWS AND STANDARDS 9
Measures to reduce mining damage, mining methods to minimise damage, laws governing mining damage, different standards suggested for mining and building ground in respect of subsidence.

TOTAL = 45 PERIODS

REFERENCES

1. Kratzsch, H., Mining Subsidence Engineering, Springer Vertag Publications, Berlin, 1983
2. Whittaker, B.N. and Reddish, D.J., Subsidence, Occurrence, Prediction and Control Elsvier Publications, Amsterdam, 1989
3. Brauner, G. Subsidence due to Underground Mining, Part I, II and III, U.S. Department of Interior, Bureau of Mines, 1973.
4. Singh, B. (Ed) Mine Subsidence, Parijat Maduramalaya Publications, Dhanbad, 1982.
5. Peng, S., Surface Subsidence Engineering, SME, New York, 1992

MI9030 SMALL SCALE AND MARINE MINING L T P C
3 0 0 3

UNIT I INTRODUCTION TO SMALL SCALE MINING 9

Concept of small scale mining, small scale mines – world wide, Indian Policy in small scale mines – practices, policies and perspectives, problems of small scale mines – finance, legislative support, technical expertise, environmental obligations, safety, health and training, environmental impacts and protection.

UNIT II SMALL SCALE MINING METHODS 9

Classification and mode of occurrence of granite and other minor minerals, physical, mechanical and chemical properties, geological aspects of mining, granite and dimensional stone mining – manual, semi-mechanised and mechanised mining methods, conventional and novel techniques, recent trends, processing, finishing, quality control, marketing and export of minerals. case studies of mining of other minerals such as sandstone, marble, beach sands, alluvial mining, mica, barytes, diamond and gemstones, etc.

UNIT III INTRODUCTION TO MARINE MINING 9

Introduction to marine environment, development and status of ocean resources of mining in India and other parts of the world, Ocean profile, ocean floor topography, economic exclusive zone and fundamentals of law of the sea, coastal zone and its characteristics.

UNIT IV MARINE GEOLOGY AND RESOURCES 9

Physical and chemical properties of seawater, overview of marine mineral deposits, deep-sea bed mineral resources, polymetallic nodules, sulphate nodules, chemicals from the ocean, dissolved and undissolved mineral deposits, sea water as resource and beach placers.

UNIT V EXPLOITATION OF MARINE DEPOSTS 9

Shallow and deep sea bed, oceanographic instruments, mining of manganese nodules, deep sea drilling methods, ocean bottom samplers, drag buckets, grab buckets, coring systems, ocean bathymetry, temperature measurement systems, water samplers, ocean dynamic analysis, beach placer mining, underwater photographs, vehicles and transportation, offshore oil platforms.

TOTAL = 45 PERIODS

REFERENCES

1. Chatterjee, S.K. An Introduction to Mineral Resources, Wiley Eastern Ltd., 1983
2. Ghose, A.K. (Ed), Small Scale Mining – A Global Overview, Oxford - IBH Publishers, 1991
3. Shepherd, F.P. Sub-marine Geology, Harper and Row, New York, 1963
4. Graff, W.J. Introduction to Offshore Structures: Design, Fabrication and Installation, Gulf Publishing Company, London, 1961
5. Herbich, J.B. Coastal and Deep Ocean Dredging, Gulf Publishing Co. Houston, 1975
6. Murthy, T.K.S., Mining the Ocean, CSIR Golden Jubilee Series, CSIR Publications, New Delhi, 1995.

MI9031 DRILLING AND BLASTING L T P C
3 0 0 3

UNIT I EXPLORATORY DRILLING 7

Drilling for exploration and other purposes; various types of drilling equipment – their merits, demerits and limitations; core recovery –single and double tube core barrels, wire line drilling; directional drilling, fishing tools; borehole surveying; borehole logging; novel and special drilling techniques.

UNIT II PRODUCTION DRILLING 7

Production drilling; Various methods of drilling - percussive, rotary, rotary percussive, Factors affecting drilling; mechanics of drilling; drillability and drilling index; micro-bit drilling; selection of drilling equipment; different types of bit, bit wear; drill hole economics; case studies.

UNIT III EXPLOSIVES, ACCESSORIES AND TOOLS 10

Blasting Agents; Selection of explosives; Blasting accessories, Initiation systems, Testing of explosives; Storage, transportation and handling of explosives; Theories of rock breakage; mechanics of rock fragmentation by explosive action, Instrumentation in Blasting –V.O.D probe, vibration monitoring, high speed video camera, etc.

UNIT IV BLASTING IN UNDERGROUND MINES 9

Design of blast for underground mines – coal and metal, drilling pattern for tunneling and shaft sinking, controlled blasting techniques, dangers associated with underground blasting and preventive measures; misfires, blown out shots, incomplete detonation – their causes and remedial measures.

UNIT V BLASTING IN SURFACE MINES AND MISCELLENEOUS APPLICATIONS 12

Methods of blasting in surface mines, Blast design, Primary and secondary blasting, ock fragmentation studies, Dangers associated with blasting in opencast mines and preventive measures, Environmental impacts due to blasting, Controlled blasting techniques, Blasting in opencast coal mines of developed galleries, Blasting economics, Computer aided design of blasts.

Blasting for road constructions, trench cutting, demolition of buildings etc; Blasting for Dimensional stones; Underwater blasting. Alternatives to blasting.

Note: Relevant portions of Coal and Metalliferrous Mines Regulations shall be covered wherever required.

TOTAL = 45 PERIODS

TEXT BOOKS:

1. Hustrulid, W. A. Blasting Principles of Open Pit Mining, vol. 1- General Design Concept, A.A. Balkema, Rotterdam, 1999.
2. Jimeno, C.L., Jimeno, E.L, Carcedo, E.J. Drilling and Blasting of Rocks, A.A.Balkema, Rotterdam, 1995.
3. Clark, G.B. Principles of Rock fragmentation, Wiley Interscience publication, 1987.
4. Konya, C.J. and Walter, E.J. Surface Blast Design, New Jersey, 1990.
5. Bhandari, Sushil. Engineering Rock Blasting Operations, A.A.Balkema, Rotterdam, 1997.
6. Per-Anders Persson, Roger Holmberg, and Jaimin Lee. Rock Blasting and Explosives Engineering, CRC Press, 1994.

REFERENCES:

1. Kennedy, B.A. Surface Mining – 2nd Edition, SME, New York, 1990.
2. Pijush Pal Roy. Rock blasting: effects and operations, A.A. Balkema, Rotterdam, 2005.
3. Rao Karanam, U.M and Mishra, B. Principles of Rock Drilling, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi, 1998.
4. Janusz Reś, Krzysztof Wladzielczyk and Ajoy K. Ghose. Environment-friendly techniques of rock breaking, CRC Press, 2003.
5. Muhamed Sućeska. Test Methods for Explosives, Springer, 1995.

MI9032 ROCK REINFORCEMENT L T P C
3 0 0 3

UNIT I ROCKMASS CLASSIFICATION 12

Basic concepts of rockmass classification; Rock Quality Designation (RQD) ; Norwegian Geomechanics Classification i.e. Q-system; Rock Mass Rating (RMR); CMRI system; Application of rockmass classification in assessing the support requirement for underground caverns.

UNIT II GROUTING, GUNITING AND SHOTCRETING 6

Mechanisms of rock reinforcement by grouting; selection of optimum pressure and water- cement ratio for grouting; layout for grouting, working principle and field of application for grouting; Guniting and shotcreting operations and their field of application; fibre reinforced shotcreting.

UNIT III ROCK BOLTS 10

Elements of rock bolts; types of rock bolts and their fields of application; rock bolting machines and installation of rock bolts; pre-tensioning of rock bolts; principles of rock bolting; anchorage test and factors affecting anchorage strength of bolts; modes of failure; Design of rock bolting system for underground excavation i.e. determination of bolt length and bolt pattern.

UNIT IV CABLE BOLTS AND ROCK ANCHORS 8

Classification of cable bolts; installation and testing; modes of failure; different type of grouting materials; types of anchors; use of anchors for stabilising rock slope, dam etc. ; testing of anchors.

UNIT V SPECIAL METHODS OF ROCK REINFORCEMENT 9

Ground freezing for slope stabilisation; berms for slope stabilisation; fore-poling; resin grouted rock bolts of fibre glass; geo-textiles and it's area of application; water drainage and rock reinforcement; dump stabilisation by vegetation.

TOTAL = 45 PERIODS

REFERENCE

1. Schach, R., Garshael, K. and Heltzen, A. M., Rock bolting – a practical handbook, Pergamon Press, 1979.
2. Peng, S.S., Ground Control, Wiley Interscience, New York, 1987

MI9033 ROCK SLOPE ENGINEERING L T P C
3 0 0 3

UNIT I BASIC MECHANICS OF ROCK SLOPE FAILURE 8

Rock slope economics; continuum mechanics approach to slope stability; slope parameters; effect of water pressure; factor of safety of slopes; slope height vs slope angle; design of slopes;

UNIT II GEOLOGICAL AND STRENGTH PROPERTIES 12

Geological parameters affecting slope stability; graphical representation of geological data; plotting and analysis of field measurements; physico-mechanical properties affecting slope stability, shearing on incline plane, determination of shear strength of rock and rock discontinuities; Ground water flow in rock masses; field measurement of permeability; measurement of water pressure

UNIT III PLANE FAILURE 6

Plane failure analysis; graphical analysis of stability; influence of ground water on stability; influence of tension crack; rock reinforcement; analysis of failure on a rough plane; case studies.

UNIT IV WEDGE FAILURE 5

Analysis of wedge failure; wedge analysis including cohesion and water pressure; case studies.

UNIT V CIRCULAR AND TOPPLING FAILURE 14

Conditions for circular failure; derivation of circular failure analysis; effect of ground water; circular failure charts; Bishop's and Janbu's methods of failure analysis; case studies.Types of toppling failure; secondary toppling; analysis of toppling failure; limit equilibrium analysis of toppling failures; Influence of slope curvature on stability; slope depressurisation; protection of slopes; control of rock falls; measurement and monitoring and interpretation of slope displacements

TOTAL = 45 PERIODS

REFERENCES

1. Hoek, E and Bray, J.W., Rock Slope Engineering, Institution of Mining and Metallurgy, 1991.
2. Goodman, R.E. Rock Mechanics, John Wiley and Sons, 1989.
3. Singh, R.N. and Ghose, A.K. Engineered Rock Structures in Mining and Civil Construction, A.A. Balkema, Netherlands, 2006.

MI9034	MINE SAFETY ENGINEERING	L	T	P	C
		3	0	0	3

UNIT I MINE ACCIDENTS 8

Accident in mines;- different types, accident investigations; accident analysis; accident prevention and corrective action, accident proneness, creating and maintaining safety awareness, ZAP and MAP, job safety analysis, safety meeting and committee.

UNIT II HEALTH AND MINE SAFETY 8

Definition of health and safety, management's role – function; evolution of management involvement, management's training, responsibility, cost of health and safety, role of labour organizations – Union impact and involvement, role of government – statutory controls and directions, spot and regular inspections, enforcement of standards, penalties for violations, collection and distribution of statistical data.

UNIT III FAULT TREE ANALYSIS 8

Introduction – methodology, symbols and Boolean techniques, qualitative analysis, computerized methods, statistical analysis, safety information, systems design.

UNIT IV RISK ASSESSEMENT AND DISASTER MANAGEMENT 11

Principles, risk and hazard control, risk and hazard evaluation and data collection for identified health risks, exposure assessment and risk characterization, probabilistic risk analysis, risk management, safety culture, human factors, reliability evaluation, safety audit. Identification of causes of mine disasters, preventive action, disaster management and mitigation, typical cases of mine disasters in India

UNIT V MINER'S OCCUPATIONAL DISEASES AND ENQUIRYCOMMITTEE 10

Miner's occupational health and diseases, preventive medical examinations, various types of injuries, compensable diseases, medical attention and removable of causative factors in the mines. Recommendations of inquiry committee carried out for safety and health issues in India.

TOTAL :45 PERIODS

REFERENCES

1. Brown, D.B. System Analysis and Design for Safety, Prentice Hall, 1976.
2. Stranks, J. Management Systems for Safety, Pitman Publishing, 1994.
3. DeReamer, R. Modern Safety Practices, John Wiley and Sons.
4. Wahab Khair. A. New Technology in Health and Safety, SMME, 1992.
5. Zyl, D.A., Koval, M, Li Ta, M. (Ed.). Risk Assessment / Management Issues in the Environmental Planning in Mines, SMME, 1992.
6. Prasad, S.D. and Rakesh. A Critical Appraisal of Mine Legislations. Lovely Prakashan, 1995. Dhanbad.
7. Mine Disasters of India, NCSM Publication.
8. Kejriwal, B.K. Safety in Mines, Gyan Khan Prakashan, Dhanbad, 1994.

AG9072 **PETROLEUM ENGINEERING** **L T P C**
3 0 0 3

UNIT I EXPLORATION METHODS AND RESERVE ESTIMATION 9

Concept of Petroleum Engineering; Regional Petroleum prospecting – magnetic and Gravity methods, procedures for data collection, corrections, Interpretation; Seismic reflection method data acquisition, seismic processing, display of seismic data interpretation, hot spots for oil and gas, 3D surveying Volumetric oil and gas reserve estimation – Deterministic methods – Monte Carlo method, parametric methods, Three point estimates – uncertainty of input to estimation.

UNIT II DRILLING OPERATIONAL PRACTICES 9

Rotary oil well rig, rotary drilling, basic operations for brakes, Betties Protector, drill-pipe wiper, Tong pull back, making-up joints, breaking up joints, connecting and disconnecting Kelly & Hook, checking conditions of Rotary ships and Master Busting – Operational practices for spudding-in-drill-color and pipe connection, pulling out, running in stabilization tools and operation, fitting of well head, installation of blow-out preventor (BOP) and testing drill stem assembly, failure of drill pipes, drill stem design, tension loading, external fluid pressure- height on bit, drill collar bending, strength ratio, transition zone, quick guide to solve drill stem failures – directional drilling, inclinometer survey, horizontal drilling

UNIT III HYDRAULIC (MUD) PROGRAMME 9

Drilling fluid, function, classification of drilling fluid, drilling complication and mud importance, designing hydraulic programme for drilling operations, equations used in hydraulic programme, pump characteristics, calculation of system processor losses, selection of nozzle size, optimization of hydraulic programme.

UNIT IV CASING AND CEMENTATION 9

Tensile requirements for casing, API casing list, casing performance properties, types of casings, casing policy, casing and lines, calculation of fracture pressure gradient, casing settings depth selection, casing design, specialization of casing, collapses pressure, tensile load, burst pressure, tension on collapse strength of casing, design factors, casing design, cementation, cement properties, types procedures and purposes.

UNIT V WELL COMPLETION AND PRODUCTION 9

Logging operations, logging methods, interpretation calculation of saturation, gas saturation, water saturation, porosity, permeability, oil and gas findings, performation techniques, well completion, production tubing, well head x'mas tree fittings – transportation - oil to gas and water separator – oil to stockyard Reservoir Engineering – concept and approach, oil recovery – primary, secondary, enhanced oil recovery techniques. Offshore drilling technology, rigs of offshore drilling, general jacking procedures, drilling from a floating vessel. International oil business, management, economics.

TOTAL: 45 PERIODS

REFERENCES:

1. Whittaker, A., Theory and Application of Drilling Fluid Hydraulics, International Human Resources Development Corporation, Boston, 1985.
2. Rebig, H.Oil well drilling Engineering: Principles& Practices, Graham & Trotman, London, 1988
3. Gatlin, C. Petroleum Engineering: Drilling and Well Completion, Prentice Hall, Inc., USA., 1980
4. Archer, J.S. and Wall, C.G., Petroleum Engineering, Graham & Trotman, London, 1988
5. Bhagwan Sahay, Petroleum Exploration and Exploration Practices, Allied Publishers Ltd., 2003
6. Frank John, Mark Cook and Mark Gratan, Hydro Carbon exploration and production, Elsevier, 2003
7. Australlian Drilling Industry Training Committee Ltd., Drilling: The Manual of Methods, application and management, Lewis Publishers, 1997.

GE9021 PROFESSIONAL ETHICS IN ENGINEERING L T P C
3 0 0 3

AIM:

To sensitize the engineering students on blending both technical and ethical responsibilities.

OBJECTIVES:

- Identify the core values that shape the ethical behavior of an engineer.
- Utilize opportunities to explore one's own values in ethical issues.
- Become aware of ethical concerns and conflicts.
- Enhance familiarity with codes of conduct.
- Increase the ability to recognize and resolve ethical dilemmas.

UNIT I ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Research thics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – ReducingRisk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal

UNIT IV RESPONSIBILITIES AND RIGHTS 9

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TOTAL : 45 PERIODS

TEXT BOOKS :

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics Concepts and Cases", Thompson Learning, (2000).

REFERENCES :

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003)
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001).
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, (2004).
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

GE9022 TOTAL QUALITY MANAGEMENT L T P C

3 0 0 3

AIM

To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES

- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II TQM PRINCIPLES 9

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Dale H.Besterfiled, et at., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).

REFERENCE BOOKS:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, Third Edition (2003).
3. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd. (2006)
4. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd. (2006)

GE9023 FUNDAMENTALS OF NANOSCIENCE L T P C

3 0 0 3

AIM:

To make the students understand the importance ,relevance and potentialities of this emerging field of study.

OBJECTIVES:

- Study the basic nano technology and nano science.
- Understand interdisciplinary nature of this field.
- Understand the important role of physics, chemistry ,biology.
- Recognize that the rules of nano science are fundamentally different than those we experience.
- Study the basic fabrication strategies of nano science.

UNIT I INTRODUCTION 10

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II PREPARATION METHODS 10

Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES 5

Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV PREPARATION ENVIRONMENTS 10

Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V CHARECTERISATION TECHNIQUES 10

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

TOTAL = 45 PERIODS

TEXT BOOKS:

1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale charecterisation of surfaces & Interfaces", 2nd Edition, Weinheim Cambridge, Wiley-VCH, 2000

REFERENCES:

1. G Timp (Editor), "Nanotechnology", AIP press/Springer, 1999
2. Akhlesh Lakhtakia (Editor), "The Hand Book of Nano Technology,Nanometer Structure", Theory, Modeling and Simulations", Prentice-Hall of India (P) Ltd, New Delhi, 2007.

CS9079 OBJECT ORIENTED PROGRAMMING L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Programming methodologies – comparison – features of object oriented programming – basics of java environment.

Classes

Definition – fields – methods – access specifiers – object creation – construction overloading – methods – static members this keyword – nested classes.

UNIT II EXTENDING CLASSES 9

Inheritance – constructors – member accessibility – overriding methods – abstract classes – interfaces – flow control – exceptions

UNIT III THREADS AND PACKAGES 9

Threads – creation – synchronization – scheduling – ending – packages – I/O package streams – byte – character – buffered – filter – pipe.

UNIT IV EVENT HANDLING AND NETWORKING 9

Applets development execution – passing params GUI objects – programming – event handling – network – ping – socket programming – standard utilities – standard packages.

UNIT V C++ 9

Differences between Java and C++ - multiple inheritance – pointers – templates.

TOTAL = 45 PERIODS

REFERENCES

1. H.M. Deital and P.J. Deital, “Java How to Program”, Prentice Hall, 1998.
2. Ken Arnold and James Gosling, “The Java Programming Language”, Addition Wesley, 1998.
3. “The Complete Reference JAVA”, Tata McGraw Hill Publishing Company, 1997.
4. Deitel & Deitel, “C++ How to Program”, Prentice Hall, 1998.

MI9035 MATERIAL MANAGEMENT L T P C
3 0 0 3

UNIT I INTRODUCTION 8

Introduction to material management, importance of integrated materials management, need for integrated materials management concept, definition, scope and advantage - an overview, A-B-C analysis, codification, variety reduction, standardisation.

UNIT II PURCHASING MANAGEMENT 10

Material planning and purchase, purchase system, procedures, price forecasting, purchasing of capital equipment, vendor development, account procedure, purchasing decisions, procurement policies.

UNIT III WARE HOUSING AND STORE MANAGEMENT 10

Store keeping principles – past and latest techniques, stores-general layout, cost aspect and productivity, problems and development, store system procedures incoming material control, store accounting and stock incoming material control, store accounting and stock verification, value analysis

UNIT IV INVENTORY MANAGEMENT 10

Introduction, basic models, definition of commonly used terms, replenishment model, choice of systems, etc. inventory work in progress, safety stock, computerisation in materials management control, information to materials management case study, spare parts management.

UNIT V MATERIAL PROCUREMENT PROCEDURES 7

Arbitration Act – Octroi, central and local sales tax, excise duties – customs tariff, import control policies, procurement from govt. agencies and international market – insurance, DGS and D tariff.

TOTAL = 45 PERIODS

REFERENCES

1. Gopalakrishnan, P., and Sundaresan, M., Material Management, An Integrated Approach, Prentice Hall of India Pvt. Ltd., New Delhi, 1982
2. Datta, A.K. Materials Management procedure, Test and cases, Prentice Hall of India Pvt Ltd., New Delhi, 1984
3. Peckam, H.H. Effective Materials Management, Prentice Hall of India Pvt Ltd., 1984
4. Prichard, J.W., and Eagle, R.H., Modern Inventory Management, N.Y., Wiley and Breach Science Publishers, 1972

ME9072 ENTREPRENEURSHIP DEVELOPMENT L T P C
3 0 0 3

UNIT I ENTREPRENEURSHIP ENVIRONMENT 8

Definition of entrepreneur – Entrepreneurship – Entrepreneurial Potential – Business Environment – Role of Family / Society in entrepreneur development – Entrepreneur support organisations (Financial & Non-Financial) – Entrepreneur Training Organisations – Government Policies about Industrial and Entrepreneur Development – Incentives and Subsidies for Industries – Entrepreneurship as a Career.

UNIT II PRODUCT IDENTIFICATION AND SELECTION 5

Sources of Product Identification – Criteria for Selection of products – Prefeasibility study – preparation of project profile – Matching of entrepreneur profile with project profile.

UNIT III BUSINESS PLAN / FEASIBILITY REPORT PREPARATION 8

Importance of feasibility report – Format for preparation of Business Feasibility Report – Project history – Marketing, Production, Financial, Human Resource Development and Implementation plan of the Projects.

UNIT IV ESTABLISHMENT OF BUSINESS UNIT 8

Mobilisation of Resources (Financial, Personnel & Material) Operation and Training of Human Resource – Purchase of Project equipments and raw materials – Plant location – Infrastructure building – Installation of machinery – Trail Production – Marketing Channel Selection – Commercialization of Product – Legal aspects of Business.

UNIT V MANAGEMENT OF BUSINESS UNIT 8

Introduction to General Management – Financial Management – Management Accounting – Production Management – Human Resources Development – Marketing Management – Organisation Development – Sickness of Industries.

6. CASE STUDIES 8

Case study of a successful Entrepreneur – cast study on identification and selection of products – case study on preparation of project feasibility report – case study on establishment of business unit – case study on sickness of business unit.

TOTAL = 45 PERIODS

REFERENCES:

1. Udai Pareek and T.V. Venkateswara Rao, Developing Entrepreneurship – A Hand Book, Learning Systems, New Delhi, 1978
2. EDI – Faculty and External Experts, A Hand Book for New Entrepreneurs, Entrepreneurship Development Institute of India, Ahmadabad, 1986
3. Saravanavel, P., Entrepreneurship Development, Ess Pee Kay Publishing House, Madras, 1987
4. Prasanna Chandra, Projects – Preparation, Appraisal, Budgeting and Implementation, Tata McGraw Hill, 1987
5. Francis Chorunilam, Business Environment, Himalaya Publishing House, Bombay, 1989
6. Malik, P.L., Industrial Law, Eastern Book Company, Lucknow, 1989

ME9022 NEW AND RENEWABLE ENERGY SOURCES L T P C
3 0 0 3

UNIT I SOLAR ENERGY 9

Solar Radiation – Measurements of solar Radiation and sunshine – Solar Thermal Collectors – Flat Plate and Concentrating Collectors – Solar Applications – fundamentals of photo Voltaic Conversion – solar Cells – PV Systems – PV Applications.

UNIT II WIND ENERGY 9

Wind Data and Energy Estimation – wind Energy Conversion Systems – Wind Energy generators and its performance – Wind Energy Storage – Applications – Hybrid systems.

UNIT III BIO - ENERGY 9

Biomass, Biogas, Source, Composition, Technology for utilization – Biomass direct combustion – Biomass gasifier – Biogas plant – Digesters – Ethanol production – Bio diesel production and economics.

UNIT IV OTEC, TIDAL, GEOTHERMAL AND HYDEL ENERGY 9

Tidal energy – Wave energy – Data, Technology options – Open and closed OTEC Cycles – Small hydro, turbines – Geothermal energy sources, power plant and environmental issues.

UNIT V NEW ENERGY SOURCES 9

Hydrogen, generation, storage, transport and utilisation, Applications: power generation, transport – Fuel cells – technologies, types – economics and the power generation

TOTAL = 45 PERIODS

TEXT BOOK

1. G.D. Rai, Non Conventional Energy Sources, Khanna Publishers, New Delhi, 1999.
2. S.P. Sukhatme, Solar Energy, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.

REFERENCES

1. Godfrey Boyle. Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K., 1996.
2. Twidell, J.W. & Weir, A. Renewable Energy Sources, EFN Spon Ltd., UK, 1986.
3. Tiwari, G.N. Solar Energy – Fundamentals Design Modelling and Applications, Narosa Publishing House, New Delhi, 2002.
4. Freris, L.L. Wind Energy Conversion Systems, Prentice Hall, UK, 1990.

ME9021 ENERGY CONSERVATION AND MANAGEMENT L T P C
3 0 0 3

UNIT I IMPORTANCE OF ENERGY CONSERVATION AND MANAGEMENT 8

World, national Energy consumption – environmental aspects – Energy prices, policies – Energy auditing : methodology, analysis, energy accounting – Measurements – Thermal and Electrical.

UNIT II ELECTRICAL SYSTEMS 12

AC / DC current systems, Demand control, power factor correction, load management, Motor drives : motor efficiency testing, energy efficient motors, motor speed control – Lighting : lighting levels, efficient options, daylighting, timers, Energy efficient windows – electrical distribution systems – Transformers – Power quality – harmonic distortion.

UNIT III THERMAL SYSTEMS 10

Boiler – efficiency testing, excess air control, Steam distribution & use – steam traps, condensate recovery, flash steam utilization, Thermal Insulation. Heat exchanger networking – concept of pinch, target settling, problem table approach.

UNIT IV ENERGY CONSERVATION 8

Energy conservation in Pumps, Fans (flow control) and blowers, Compressed Air Systems, Refrigeration and air conditioning systems – Waste heat recovery recuperators, heat sheets, heat pipes, heat pumps.

UNIT V ENERGY MANAGEMENT, ECONOMICS 7

Energy resource management – Energy Management information systems – Computerized energy management – Energy economics – discount rate, payback period, internal rate of Return, life cycle costing – Financing energy conservation Projects.

TOTAL =45 PERIODS

TEXT BOOK

1. L.C. Witte, P.S. Schmidt, D.R. Brown, “Industrial Energy Management and Utilisation” Hemisphere Publ, Washington, 1988.
2. O. Callaghn, P.W. “Design and Management for Energy Conservation”, Pergamon Press, Oxford, 1981.

REFERENCES

1. IDryden, I.G.C. The Efficient Use of Energy, Butterworths, London, 1982
2. Turner, W.C. Energy Management Hand Book, Wiley, New York, 1982.
3. Murphy, W.R. and Mc KAY, G. Energy Management, Butterworths, London 1987.

ME9027 **MANAGEMENT SCIENCES** **L T P C**
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UNIT I PRINCIPLES OF MANAGEMENT AND PERSONNEL MANAGEMENT **5**

General Principles of Management – Management Functions – Organization – Types – Comparison – Functions of Personnel Management – Recruitment – Training Leadership/Motivation – Communication – Conflict Industrial Relations – Trade union.

UNIT II INVENTOR MANAGEMENT **9**

Purpose of Inventory – Cost Related to inventors – Basic EOQ Model – Variations in EOQ Model – Finite Production – Quality Discounts – ABC Analysis – MRP Analysis – MRP – Lot size under constraints.

UNIT III OPERATIONS MANAGEMENT **19**

Plant Location – Layout – Materials Handling – Method Study – Time Study Ergonomics – Aggregate Planning – Value Analysis – Statistical Quality Control – Quantitative techniques – Linear programming – sequencing – queuing theory – Network analysis.

UNIT IV FINANCIAL MANAGEMENT **7**

Capital – Types – Sources – Break Even Analysis – Financial Statements – Income Statement – Balance Sheet – Capital Budgeting – Working Capital Management – Inventory Pricing.

UNIT V MARKETING MANAGEMENT **5**

Functions of Marketing – Sales Promotion Methods – Advertising – Product Packaging – Marketing Variables – Distribution Channels – Organisation – Market research – Market Research Techniques.

TOTAL = 45 PERIODS

TEXT BOOK

1. Martand t. Telesang – Industrial and Business Management – S.Chand & Co., 2001.

REFERENCES:

1. Panneerselvam, K. – Production and Operations Management-Prentice Hall of India, 2003.
2. Koont and O'donnel-Essentials of Management, Mc Graw Hill 1992.
3. Philips Kotler – Principles of Marketing, Prentice Hall of India, 1995.
4. Pandey, I.M. – Financial Management, Vikas Publishing house, 1995.
5. Ahuja, K.K. – Personal Management, Kalyane Publication, 1992.

ME9351 FINITE ELEMENT ANALYSIS L T P C
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UNIT I INTRODUCTION 9

Historical Background – Mathematical Modeling of field problems in Engineering – Governing Equations – Discrete and continuous models – Boundary, Initial and Eigen Value problems – Weighted Residual Methods – Variational Formulation of Boundary Value Problems – Ritz Technique – Basic concepts of the Finite Element Method.

UNIT II ONE-DIMENSIONAL PROBLEMS 9

One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher order Elements – Derivation of Shape functions and Stiffness matrices and force vectors. Assembly of Matrices - solution of problems from solid mechanics and heat transfer- Longitudinal vibration frequencies and mode shapes. Fourth Order Beam Equation – Transverse deflections and Natural frequencies of beams.

UNIT III TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS 9

Second Order 2D Equations involving Scalar Variable Functions – Variational formulation – Finite Element formulation – Triangular elements – Shape functions and element matrices and vectors. Application to Field Problems - Thermal problems – Torsion of Non circular shafts – Quadrilateral elements – Higher Order Elements.

UNIT IV TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS 9

Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Body forces and temperature effects – Stress calculations - Plate and shell elements.

UNIT V ISOPARAMETRIC FORMULATION AND MISCELLANEOUS TOPICS9

Natural co-ordinate systems – Isoparametric elements – Shape functions for isoparametric elements – One and two dimensions – Serendipity elements – Numerical integration and application to plane stress problems - Matrix solution techniques – Solutions Techniques to Dynamic problems.

TOTAL = 45+15 PERIODS

TEXT BOOKS

1. J Seshu. P. “Textbook of Finite Element Analysis” Prentice Hall of India, 2003.
2. N. Reddy, “ Finite Element Method” Tata McGraw Hill, 2003.

REFERENCES

1. Chandrupatla and Belegundu, “Introduction to Finite Elements in Engineering” PHI / Pearson Education, 2003.
2. Logan. D.L. “A first course in Finite Element Method”, Thomson Asia Pvt. Ltd., 2002.
3. Cook R.D., Malkus. D.S. Plesha, ME., “Concepts and Applications of Finite Element Analysis”, John – Wiley Sons 2003.
4. S.S. Rao, “The Finite Element Method in Engineering “Butter worth Heinemann, 2001.

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UNIT I LIQUID PENETRANT AND MAGNETIC PARTICLE INSPECTION 9

Liquid penetrant systems - processing cycles - inspection of surface defects - Generation of Magnetic fields - Magnetic particle inspection equipments - Demagnetization - Applications and limitations.

UNIT II RADIOGRAPHY 11

Production of x-rays - Characteristic rays and white ray - Tube current and Voltage - Sources of 8 rays - Half life period - Penetrating power - Absorption of x and y rays - Radiation contrast and film contrast - exposure charts - pentameters and sensitivity - Safety.

UNIT III EDDY CURRENT INSPECTION 7

Eddy current production - Impedance concepts - inspection of magnetic materials - inspection of non magnetic materials - influences of various parameters - Advantages and limitations.

UNIT IV ULTRASONIC TESTING 10

Production of ultrasonic waves - Different types of waves - Normal beam inspection - Angle beam inspection - thickness measurements - Applications.

UNIT V RECENT TECHNIQUES 8

Principles of acoustic emission - instrumentation for non destructive testing - Principles of holography - Applications of holographic techniques non destructive inspection - advantages and limitations - Other techniques.

TOTAL= 45 PERIODS

TEXT BOOK :

1. Barry Hull and Vernon John, “Non Destructive Testing”, Mac Millan, 1988.

REFERENCES :

1. American Society of Metals, Metals Hand Book, 9th Edition, Volume 11, (1980)
2. Birchan.D,Non Destructive Testing”, Oxford University Press, 1977
3. Proceedings of the 10th International Acoustic Emission Symposium, Japanese Society for Non Destructive Inspection, Sendai, 1990.
4. Holler,P., “New Procedures in Non Destructive Testing” Springer Verlag , 1983.