ANNA UNIVERSITY
CHENNAI - 600 025

UNIVERSITY DEPARTMENTS

REGULATIONS 2012

CURRICULA AND SYLLABI FOR
I TO VIII SEMESTERS

B.E. MINING ENGINEERING
(FULL TIME)

ANNA UNIVERSITY::CHENNAI 600 025

UNIVERSITY DEPARTMENT

R – 2012

B.E. MINING ENGINEERING

I TO VIII SEMESTERS CURRICULA AND SYLLABI

SEMESTER – I

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
HS8151	Technical English - I	3	1	0	4
MA8151	Mathematics – I	3	1	0	4
PH8151	Engineering Physics	3	0	0	3
CY8151	Engineering Chemistry	3	0	0	3
GE8151	Computing Techniques	3	0	0	3
GE8152	Engineering Graphics	2	0	3	4
PRACTICAL					
PH8161	Physics Laboratory	0	0	2	1
CY8161	Chemistry Laboratory	0	0	2	1
GE8161	Computer Practices Laboratory	0	0	3	2
GE8162	Engineering Practices Laboratory	0	0	3	2
	TOTAL	**17**	**2**	**13**	**27**

**Note:* The Common Course Committee for I Semester shall provide the syllabus for all the subjects of I Semester.

SEMESTER – II

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
HS8251	Technical English II	3	1	0	4
MA8251	Mathematics II	3	1	0	4

PH8251	Materials Science	3	0	0	3
CY8202	Chemistry for Mining Engineering	3	0	0	3
GE8251	Engineering Mechanics	3	1	0	4
EE8251	Basic Electrical Engineering and Measurements	3	0	0	3
MI8201	Mine Development	3	0	0	3
PRACTICAL					
ME8261	Computer Aided Machine Drawing	0	0	3	2
ME8262	Manufacturing Technology Laboratory – I	0	0	3	2
	TOTAL	**21**	**3**	**6**	**28**

**Note: The syllabus for the course – MINE DEVELOPMENT is provided herewith and the Common Course Committee for II Semester shall provide the syllabus for the remaining subjects

SEMESTER – III

CODE NO.	**COURSE TITLE**	**L**	**T**	**P**	**C**
THEORY					
AG8301	Geology – I	3	0	0	3
CE 8353	Strength of Materials	3	0	0	3
EC8302	Basic Electronics Engineering	3	0	0	3
EE8305	Electrical Drives and Control	3	0	0	3
ME8303	Basic Mechanical Engineering for Mining	3	0	0	3
MI8301	Drilling and Blasting	3	0	0	3
PRACTICAL					
EC8361	Electronics Engineering Laboratory	0	0	3	2
EE8262	Electrical Engineering Laboratory	0	0	3	2
MI8311	Practical Training – I*	0	0	0	1
	TOTAL	**18**	**0**	**6**	**23**

* The students would be undergoing **Training in Mines** during the Summer Vacation at the end of the **Second Semester** for a period of 15 to 30 days. The students have to submit a report on the Training which would be evaluated and the grades for the same would be awarded and reported in the ensuing **Third Semester**.

SEMESTER – IV

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
AG8401	Geology – II	3	0	0	3
CE8352	Fluid Mechanics and Machinery	3	0	0	3
CE8405	Engineering Surveying	3	0	0	3
EE8408	Instrumentation Engineering	3	0	0	3
MI8401	Mine Environmental Engineering - I	3	0	0	3
MI8402	Mining Machinery- I	3	0	0	3
MI8403	Surface Mining	3	0	0	3
PRACTICAL					
AG8411	Geology Laboratory - I	0	0	2	1
CE8361	Fluid Mechanics and Machines Laboratory	0	0	3	2
ME8412	Basic Mechanical Engineering Laboratory for Mining	0	0	4	2
	TOTAL	**21**	**0**	**9**	**26**

SEMESTER – V

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MA8501	Statistics and Numerical Methods	3	1	0	4
MI8501	Mine Environmental Engineering - II	3	0	0	3
MI8502	Mine Surveying	3	0	0	3
MI8503	Mineral Processing	3	0	0	3
MI8504	Mining Machinery - II	3	0	0	3
MI8505	Rock Mechanics and Ground Control - I	3	0	0	3
MI8506	Underground Mining Methods -Coal	3	0	0	3
PRACTICAL					
AG8511	Geology Lab II and Field work	0	0	2	1

EE8514	Instrumentation Engineering Laboratory	0	0	2	1
MI8511	Practical Training – II**	0	0	0	1
CE8514	Survey Laboratory - I	0	0	4	2
	TOTAL	**21**	**1**	**8**	**27**

** The students would be undergoing **Training in Mines** during the Summer Vacation at the end of the **Fourth Semester** for a period of 15 to 30 days. The students have to submit a report on the Training which would be evaluated and the grades for the same would be awarded and reported in the ensuing **Fifth Semester**.

SEMESTER – VI

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
ME8652	Industrial Management	3	0	0	3
MI8601	Computer Applications in Mining	3	0	0	3
MI8602	Rock Mechanics and Ground Control - II	3	0	0	3
MI8603	Underground Mining Methods - Metal	3	0	0	3
	Elective - I	3	0	0	3
PRACTICAL					
HS8561	Employability skills	0	0	2	1
MI8611	Mineral Processing Laboratory	0	0	2	1
MI8612	Mining Machinery Laboratory	0	0	2	1
MI8613	Rock Mechanics and Ground Control Laboratory - I	0	0	2	1
CE8613	Survey Lab - II	0	0	4	2
	TOTAL	**15**	**0**	**12**	**21**

SEMESTER – VII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MI8701	Mine Economics and Investment	3	0	0	3

MI8702	Mine Environmental Engineering - III	3	0	0	3
MI8703	Mine Planning and Design	3	0	0	3
	Elective - II	3	0	0	3
PRACTICAL					
MI8711	Comprehension	0	0	2	1
MI8712	Computer Applications in Mining Laboratory	0	0	4	2
MI8713	Mine Environmental Engineering Laboratory	0	0	2	1
MI8715	Practical Training – III***	0	0	0	1
MI8716	Rock Mechanics and Ground Control Laboratory- II	0	0	2	1
MI8717	Survey Camp	0	0	0	1
MI8714	Mini Project	0	0	4	2
	TOTAL	**12**	**0**	**14**	**21**

******* The students would be undergoing **Training in Mines** during the Summer Vacation at the end of the **Sixth Semester** for a period of 15 to 30 days. The students have to submit a report on the Training which would be evaluated and the grades for the same would be awarded and reported in the ensuing **Seventh Semester**.

SEMESTER – VIII

CODE NO.	**COURSE TITLE**	**L**	**T**	**P**	**C**
THEORY					
MI8801	Mine Legislation and Safety	3	0	0	3
	Elective – III	3	0	0	3
PRACTICAL					
MI8811	Project Work	0	0	12	6
	TOTAL	6	0	**12**	**12**

TOTAL CREDITS: 185

ELECTIVES

Sl.No.	Code No.	Course Title	L	T	P	C
1.	MI8001	Advanced Coal Mining and Mechanization	3	0	0	3
2.	MI8002	Advanced Metal Mining and Mechanization	3	0	0	3
3.	MI8003	Advanced Surface Mining	3	0	0	3
4.	MI8004	Energy Conservation and Management	3	0	0	3
5.	MI8005	Longwall Mining	3	0	0	3
6.	MI8006	Material Handling	3	0	0	3
7.	MI8007	Material Management	3	0	0	3
8.	MI8008	Mine Safety Engineering	3	0	0	3
9.	MI8009	Mineral Exploration	3	0	0	3
10.	MI8010	Non-destructive Testing	3	0	0	3
11.	MI8011	Numerical Methods in Mining Engineering	3	0	0	3
12.	MI8012	Object Oriented Programming	3	0	0	3
13.	MI8013	Petroleum Engineering	3	0	0	3
14.	MI8014	Rock Excavation Engineering	3	0	0	3
15.	MI8015	Rock Reinforcement	3	0	0	3
16.	MI8016	Rock Slope Engineering	3	0	0	3
17.	MI8017	Small Scale and Marine Mining	3	0	0	3
18.	MI8018	Subsidence Engineering	3	0	0	3
19.	MI8019	Systems Engineering in Mining	3	0	0	3
20.	GE8071	Fundamental of Nano Sciences	3	0	0	3

21.	GE8751	Engineering Ethics and Human Values	3	0	0	3
22.	MG8652	Management Sciences	3	0	0	3
23.	MG8654	Total Quality Management	3	0	0	3
24.	ME8076	Entrepreneurship Development	3	0	0	3
25.	ME8078	New and Renewable Sources of Energy	3	0	0	3
26.	ME8752	Finite Element Analysis	3	0	0	3
27.	MF8078	Quality Control and Reliability Engineering	3	0	0	3
28.	GE8072	Disaster Management	3	0	0	3
29.	GE8073	Human Rights	3	0	0	3

HS8151 **TECHNICAL ENGLISH I** **L T P C**

(For all branches of B.E / B.Tech programmes) **3 1 0 4**

OBJECTIVES:

- To enable all students of engineering and technology develop their basic communication skills in English.
- To give special emphasis to the development of speaking skills amongst the students of engineering and technology students.
- To ensure that students use the electronic media such as interne and supplement the learning materials used in the classroom.
- To inculcate the habit of reading for pleasure.

UNIT I

Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); Speaking - Speaking about one's place, important festivals etc. – Introducing oneself, one's family / friend; Reading - Skimming a reading passage – Scanning for specific information - Note-making; Writing - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one's leisure time activities, hometown, etc.); Grammar - Prepositions - Reference words - Wh-questions - Tenses (Simple); Vocabulary - Word formation - Word expansion (root words / etymology); E-materials - Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II

Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking & answering questions - Telephone skills – Telephone etiquette; Reading – Critical reading - Finding key information in a given text - Sifting facts from opinions; Writing - Biographical writing (place, people) - Lab descriptions (general/specific description of laboratory experiments) - Definitions - Recommendations; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association; E-materials - Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities.

UNIT III

Listening - Listening to specific task - focused audio tracks; Speaking - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading - Reading and interpreting visual material; Writing - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause & effect / compare & contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) -

Paraphrasing; Grammar - Tenses (Past) - Use of sequence words - Adjectives; Vocabulary - Different forms and uses of words, Cause and effect words; E-materials - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV

Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Different forms of interviews - Speaking at different types of interviews; Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; Grammar - Adverbs – Tenses – future time reference; Vocabulary - Single word substitutes - Use of abbreviations & acronyms; E-materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.

UNIT V

Listening - Listening to different accents, Listening to Speeches / Presentations, Listening to broadcast & telecast from Radio & TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email Writing - Creative writing, Poster making; Grammar - Direct and indirect speech; Vocabulary - Lexical items (fixed / semi fixed expressions); E-materials - Interactive exercises for Grammar & Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents, - Interpreting posters

TOTAL : 60 PERIODS

OUTCOMES:

Learners should be able to

- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.
- Listen/view and comprehend different spoken discourses/excerpts in different accents

TEXT BOOK:

1. Mindscapes: English for Technologies and Engineers, Orient Black Swan, 2012.
2. S.P. Dhanavel, English and Communication Skills for students of Science and Engineering Oriented Black Swan, Chennai 2011.

REFERENCE BOOKS:

1. Pickett, Nell Ann, Ann A.Laster and Katherine E.Staples. Technical English: Writing, Reading and Speaking. New York: Longman, 2001.
2. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.

3. Morgan, David and Nicholas Regan. Take-Off: Technical English for Engineering. Reading: Garnet Publishing Limited, 2008.
4. Thorn, Michael and Alan Badrick. An Introduction to Technical English. Harlow: Prentice Hall Europe, 1993.
5. Rizvi, M.Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill PublishingCompany, 2007.

EXTENSIVE READERS

1. Murthy, Sudha. Wise & Otherwise. New Delhi: Penguin Books India, 2006.
2. Gates, Bill and Collins Hemingway. Business @ the Speed of Thought: Succeeding in the Digital Economy. New York: Warner Business Books, 2000.

WEBSITE RESOURCES:

1. www.uefap.com
2. www.eslcafe.com
3. www.listen-to-english.com
4. www.owl.english.purdue.edu
5. www.chompchomp.com

MA8151 MATHEMATICS – I L T P C
(Common to all branches of B.E. / 3 1 0 4
B.Tech. Programmes in I Semester)

OBJECTIVES:

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/ she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I MATRICES 9+3

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley-Hamilton Theorem – Diagonalization of matrices –

Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II INFINITE SERIES 9+3

Sequences – Convergence of series – General properties – Series of positive terms – Tests of convergence (Comparison test, Integral test, Comparison of ratios and D'Alembert's ratio test) – Alternating series – Series of positive and negative terms – Absolute and conditional convergence – Power Series – Convergence of exponential, logarithmic and Binomial Series.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9+3

Limits and Continuity – Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables –Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Errors and approximations – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV IMPROPER INTEGRALS 9+3

Improper integrals of the first and second kind and their convergence – Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions – Properties – Evaluation of integrals using Beta and Gamma functions – Error functions.

UNIT V MULTIPLE INTEGRALS 9+3

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in double and triple integrals – Area of a curved surface.

TOTAL : 60 PERIODS

OUTCOMES:

- This course equips students to have basic knowledge and understanding in one field of materials, integral and differential calculus

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.

REFERENCES:

1. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
2. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
3. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.

4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH8151 ENGINEERING PHYSICS L T P C

(Common to ALL Branches of B.E./B.Tech. Programmes) 3 0 0 3

OBJECTIVE:

To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

Elasticity - Poisson's ratio and relationship between moduli (qualitative) - Stress-strain diagram

- factors affecting elasticity - bending of beams - cantilever - bending moment - theory and experiment of Young's modulus determination - Uniform and non-uniform bending - I shaped girders - twisting couple - hollow cylinder - shaft - torsion pendulum - determination of rigidity modulus- moment of inertia of a body (regular and irregular).

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - rate of growth and decay of sound intensity - derivation of Sabine's formula - absorption coefficient and its determination - factors affecting acoustics of buildings : focussing, interference, echo, Echelon effect, resonance - noise and their remedies. Ultrasonics - production - magnetostriction and piezoelectric methods - detection of ultrasound - acoustic grating - industrial applications - NDT - Ultrasonic method: scan modes and practice.

UNIT III THERMAL PHYSICS 9

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity

- conductions in solids - Forbe's and Lees' disc methods - Rectilinear flow of heat through a rod - flow of heat through a compound materials - radical flow of heat through a spherical shell - thermal insulation of buildings – Laws of blackbody radiation: Kirchoffs law, Stephens law, Wiens law, Raleigh-Jean law and Planks law (derivation). Laws of thermodynamics - Otto and diesel engines and their efficiency - entropy - entropy of Carnot's cycle - reverse Carnot's cycle - refrigerator.

UNIT IV APPLIED OPTICS 9

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its application - Lasers - Einstein's coefficients - CO2, Nd:YAG and semiconductor lasers - homo junction and hetro junction - construction and working - applications - Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical Aperture - fibre optic communication system - active and passive sensors.

UNIT V SOLID STATE PHYSICS **9**

Nature of bonding - growth of single crystals (qualitative) - crystal systems - crystal planes and directions - expressions for interplanar distance - coordination number and packing factor for simple structures: SC, BCC, FCC and HCP - structure and significance of NaCl, ZnS, diamond and graphite - crystal imperfections: point defects, dislocations and stacking faults - unit cell, Bravais space lattices - miller indices.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXTBOOKS:

1. Gaur R.K., and Gupta, S.L., Engineering Physics, Dhanpat Raj Publications,2003.
2. Palanisamy, P.K., Engineering Physics, Scitech Publications (P) Ltd, 2006.
3. Arumugam, M., Engineering Physics, Anuradha Publications, 2000.

REFERENCES:

1. Sankar, B.N., Pillai.S.O., Engineering Physics, New Age International (P) Ltd., 2007.
2. Rajendran.V Engineering Physics, Tata McGraw-Hill, 2009.

CY8151 ENGINEERING CHEMISTRY L T P C

(Common to all branches of Engineering and Technology) 3 0 0 3

OBJECTIVES:

- To make the students conversant with basics of polymer chemistry.
- To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
- To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.
- To acquaint the students with the basics of nano materials, their properties and applications.

UNIT I CHEMICAL THERMODYNAMICS **9**

Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius-Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

UNIT II POLYMER CHEMISTRY 9

Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

UNIT III KINETICS AND CATALYSIS 9

Introduction – reaction velocity, factors affecting reaction velocity, rate constant, order of reaction, molecularity, pseudo molecular reactions, zero, first, second and third order reactions, reactions of fractional orders, determination of order of reactions. Catalysis: Auto catalysis - Enzyme Catalysis: Michaelis-Menton equation; factors affecting enzyme catalysis. Heterogeneous Catalysis: Types of adsorption isotherms: Langmuir–Hinselwood and Rideal–Eley Mechanism.

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Photoprocesses - Internal Conversion, Inter-system crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitisation. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. Width and intensities of spectral lines. Spectrophotometric estimation of iron. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram) and applications.

UNIT V NANOCHEMISTRY 9

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: Nanocluster, nanorod, nanotube and nanowire. Synthesis: Precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and Applications. Risk discussion and Future perspectives.

TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on polymer chemistry, thermodynamics. spectroscopy, phase rule and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.

TEXT BOOKS

1. P. Kannan and A. Ravikrishnan, “Engineering Chemistry”, Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2009.
2. S. Vairam, P. Kalyani and Suba Ramesh, “Engineering Chemistry”, Wiley India, 2011

REFERENCE BOOKS:

1. P.W. Atkins and de Paula Julio, “Physical Chemistry”, Oxford University Press, 8th Ed., (Indian Student Edition) (2009).
2. K. K. Rohatgi-Mukherjee, “Fundamental of Photochemistry” New Age International (P)

Ltd., New Delhi, 1986.
3. G.A. Ozin and A.C. Arsenault, “Nanochemistry: A Chemical Approach to Nanomaterials”, RSC Publishing, 2005.
4. V.R.Gowariker, N.V.Viswanathan and Jayadev Sreedhar, “Polymer Science”, New Age International P (Ltd.,), Chennai, 2006

GE8151 COMPUTING TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

The students should be made to:

- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I INTRODUCTION 8

Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

UNIT II C PROGRAMMING BASICS 10

Problem formulation – Problem Solving - Introduction to ‘ C’ programming –fundamentals – structure of a ‘C’ program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in ‘C’ – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

UNIT IV FUNCTIONS AND POINTERS 9

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

UNIT V STRUCTURES AND UNIONS 9

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design C Programs for problems.
- Write and execute C programs for simple applications.

TEXTBOOKS

1. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
3. Yashavant P. Kanetkar. " Let Us C", BPB Publications, 2011.

REFERENCES

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006
2. Byron S Gottfried, " Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007

GE8152 ENGINEERING GRAPHICS L T P C
2 0 3 4

OBJECTIVES

To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

Concepts and conventions (Not for Examination) 1

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING 14

Basic Geometrical constructions, Curves used in engineering practices

Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 14

Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 14

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids hen the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 15

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3

Introduction to drafting packages and demonstration of their use.

TOTAL: 75 PERIODS

OUTCOMES:

On Completion of the course the student will be able to

- perform free hand sketching of basic geometrical constructions and multiple views of objects.
- do orthographic projection of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- prepare isometric and perspective sections of simple solids.
- demonstrate computer aided drafting.

TEXT BOOKS

1. N.D.Bhatt and V.M.Panchal, “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010

REFERENCES

1. K.R.Gopalakrishna., “Engineering Drawing” (Vol I&II combined) Subhas Stores, Bangalore, 2007
2. Luzzader, Warren.J., and Duff,John M.,,’’ Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production”, Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005
3. M.B.Shah and B.C.Rana, “Engineering Drawing”, Pearson, 2nd Edition, 2009
4. K.Venugopal and V.Prabhu Raja, “Engineering Graphics”, New Age International (P) Limited ,2008.
5. K. V.Natrajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
6. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi,2008.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection

Methods:

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3 The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

PH 8161	PHYSICS LABORATORY	L T P C
	(Common to all branches of B.E. / B.Tech. Programmes)	**0 0 2 1**

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

1.	Torsional pendulum	Determination of rigidity modulus of wire and moment of inertia of disc
2.	Non–uniform bending	Determination of young's modulus
3.	Lee's disc	Determination of thermal conductivity of a bad conductor
4.	Potentiometer	Determination of thermo e.m.f. of thermocouple
5.	Air wedge	Determination of thickness of a thin sheet of paper
6.	i. Optical fibre	Determination of Numerical Aperture and acceptance angle
	ii. Compact disc	Determination of width of the groove using laser
7.	Acoustic grating	Determination of velocity of ultrasonic waves in liquids
8.	Post office box	Determination of Band gap of a semiconductor
9.	Spectrometer	Determination of wavelength using grating
10.	Viscosity of liquids	Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

TOTAL : 30 PERIODS

OUTCOMES:

- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

CY 8161 **CHEMISTRY LABORATORY** **L T P C**

(Common to all branches of Engineering and Technology) **0 0 2 1**

OBJECTIVES:

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by vacometry.

1. Estimation of HCl using Na2CO3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1,10-phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics – ester hydrolysis.
13. Corrosion experiment – weight loss method.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

OUTCOMES:

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters

REFERENCE BOOKS

1. A text of quantitative inorganic analysis, A. L. Vogel , ELBS London. 1995.
2. Experiments in physical chemistry, D.P. Shoemarker and C.W. Gardad, McGraw Hill, London, 2001.
3. American Public Health Association.

GE8161 **COMPUTER PRACTICES LABORATORY** **L T P C**

0 0 3 2

OBJECTIVES:

The student should be made to:

- Be familiar with the use of Office software.
- Be exposed to presentation and visualization tools.
- Be exposed to problem solving techniques and flow charts.
- Be familiar with programming in C.

- Learn to use Arrays, strings, functions, structures and unions.

LIST OF EXPERIMENTS:

1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function and conversion from given program to flow chart.
10. Program using structures and unions.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:

- Apply good programming design methods for program development.
- Design and implement C programs for simple applications.
- Develop recursive programs.

GE8162 ENGINEERING PRACTICES LABORATORY L T P C
(COMMON TO ALL BRANCHES OF B.E./B.TECH. PROGRAMMES) 0 0 3 2

OBJECTIVE

To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICE 12

Plumbing

Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.

Laying pipe connection to the suction side of a pump – inlet.

Laying pipe connection to the delivery side of a pump – out let.

Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

Wood Work

Sawing, planning and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint.

Study

Study of joints in door panels, wooden furniture

Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICE **9**

Basic household wiring using switches, fuse, indicator – lamp etc.,
Preparation of wiring diagrams

Stair case light wiring

Tube – light wiring

Study of iron-box, fan with regulator, emergency lamp

GROUP – B (MECHANICAL AND ELECTRONICS) **15**

3. MECHANICAL ENGINEERING PRACTICE

Welding

Arc welding of butt joints, lap joints, tee joints

Gas welding Practice.

Basic Machining

Simple turning, drilling and tapping operations.

Machine assembly Practice.

Study and assembling the following:

Centrifugal pump, mixies and air conditioners.

Demonstration on

(a) Smithy operations like the production of hexagonal bolt.

(b) Foundry operation like mould preparation for grooved pulley.

4. ELECTRONIC ENGINEERING PRACTICE **9**

Soldering simple electronic circuits and checking continuity.
Assembling electronic components on a small PCB and
testing. Study of Telephone, FM radio, low-voltage power
supplies.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to fabricate carpentry components and pipe connections including plumbing works.
- Ability to use welding equipments to join the structures
- Ability to fabricate electrical and electronics circuits

HS8251	TECHNICAL ENGLISH II	L T P C
	(For all branches of B.E / B.Tech programmes)	**3 1 0 4**

- To make the students acquire listening and speaking skills meant for both formal and informal contexts
- To help them develop their reading skills by exposing them to different types of reading strategies
- To equip them with writing skills needed for academic as well as workplace situations
- To make them acquire language skills at their own pace by using e-materials and language lab component

UNIT I

Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on something, weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using 'emoticons' as symbols in email messages; Grammar - Regular & irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. 'can') - Homophones (e.g. 'some', 'sum'); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

UNIT II

Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his success, thanking one's friend / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials

- Interactive exercise on Grammar and vocabulary, Extensive reading activity (reading

stories / novels from links), Posting reviews in blogs - Language Lab - Dialogues (Fill up exercises), Recording students' dialogues.

UNIT III

Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret etc.); Reading - Speed reading – reading passages with the time limit - Skimming; Writing - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading the articles from the journals - Format for the journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. 'rock', 'train', 'ring'); E-materials - Interactive exercise on Grammar & vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU materials – Attending a meeting and writing minutes.

UNIT IV

Listening - Listening to a telephone conversation, Viewing a model interview (face-to-face, telephonic and video conferencing) and observing the practices; Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping the interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar & Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V

Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading Writing - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises - Pictures for discussion; Language Lab - Different models of group discussion

TOTAL: 45 PERIODS

OUTCOMES:

Learners should be able to

- Speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.
- Write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- Read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
- Listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.

TEXT BOOK:

1. Mindscapes: English for Technologies and Engineers, Orient Black Swan, 2012.
2. S.P. Dhanavel, English and Communication Skills for students of Science and Engineering Oriented Black Swan, Chennai 2011.

REFERENCE BOOKS:

1. Laws, Anne. Presentations. Hyderabad: Orient BlackSwan, 2000.
2. Lewis, Hedwig. Body Language: A Guide for Professionals. New Delhi: Sage Publications, 1998.
3. Naterop, Jean B. and Rod Revell. Telephoning in English. Cambridge: Cambridge University Press, 1987.
4. Rutherford, Andrea J. Basic Communication Skills for Technology. New Delhi: Pearson Education, 2001.
5. Ur, Penny. Teaching Listening Comprehension. Cambridge: Cambridge University Press, 1984.

EXTENSIVE READERS

1. Abdul Kalam, A P J. Ignited Minds: Unleashing the Power within India. New Delhi: Penguin Books India, 2002.
2. Parameswaran, Uma. C.V.Raman: A Biography. New Delhi: Penguin Books India, 2011.

WEB RESOURCES

1. www.esl-lab.com
2. www.englishgrammar.org
3. www.englishclub.com
4. www.mindtools.com
5. www.esl.about.com

MA8251 MATHEMATICS - II L T P C

(Common to all branches of B.E. / B.Tech. Programmes in II Semester) 3 1 0 4

OBJECTIVES:

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I DIFFERENTIAL EQUATIONS 9+3

Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

UNIT II VECTOR CALCULUS 9+3

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION 9+3

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9+3

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS 9+3

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem — Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL : 60 PERIODS

OUTCOMES:

- The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana, B.V. "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 2010.

REFERENCES:

1. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH8251 MATERIALS SCIENCE L T P C
(Common to Manufacturing, Industrial, Mining, Mechanical, Aeronautical, Automobile and Production Engineering) 3 0 0 3

OBJECTIVE:

To introduce the essential principles of materials science for mechanical and related engineering applications.

UNIT I MECHANICAL PROPERTIES 9

Introduction to mechanical properties - tensile test - plastic deformation mechanisms - slip and twinning - role of dislocations in slip - strengthening methods - strain hardening - refinement of the grain size - solid solution strengthening - precipitation hardening - creep resistance - creep curves - mechanisms of creep - creep-resistant materials - fracture - the Griffith criterion - critical stress intensity factor and its determination - fatigue failure - fatigue tests – methods of increasing fatigue life - hardness - Rockwell and Brinell hardness - Knoop and Vickers microhardness.

UNIT II PHASE DIAGRAMS 9

Solid solutions - Hume Rothery's rules - free energy of solid solution - intermediate phases - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the level rule - application to isomorphous

system - eutectic phase diagram - peritectic phase diagram - other invariant reactions - microstructural change during cooling.

UNIT III FERROUS ALLOYS AND HEAT TREATMENT 9

The iron-carbon equilibrium diagram - phases, invariant reactions - microstructue of slowly cooled steels - eutectoid steel, hypo and hypereutectoid steels - effect of alloying elements on the Fe-C system - diffusion in solids - Fick's law - phase transformations - pearlitic transformations - T-T-T-diagram for eutectoid steel - baintic and martensitic transformations - tempering of martensite - heat treatment of steels - annealing - normalizing - quenching and tempering - case hardening - induction, flame and laser hardening - carburizing, cyaniding, carbonitriding and nitriding.

UNIT IV ELECTRONIC MATERIALS 9

Classification of solids - energy bands - concept of Fermi level - conductor, semiconductor, insulator - Semiconductors: intrinsic, extrinsic - carrier concentration expression (qualitative) - compound semiconductors (qualitative) - dielectric materials - polarization mechanisms – dielectric breakdown - magnetic materials - ferromagnetic materials &hysterisis - ferrites - superconducting materials, properties, types and applications.

UNIT V NEW MATERIALS AND APPLICATIONS 9

Introduction to Ceramics and its applications - Ceramic Fibres - Fibre reinforced Plastics – Fibre reinforced Metal – Metallic glasses – Shape memory alloys – Copper base alloys – Nickel – Titanium alloys – Relaxor- Ferroelectric materials – Electro and magneto rheological fluids - Sensors and Actuators – polymer semiconductos – photoconducting polymers – liquid crystals - Bio-sensors - Scintillation detectors (Position sensitive) –Bio materials – hydroxyapatite – PMMA – Silicone.

TOTAL : 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply the different materials, their processing, and heat treatments in suitable application in mechanical engineering fields.

TEXT BOOK:

1. Raghavan, V., Materials Science and Engineering, Prentice Hall of India, 2007.
2. Palanisamy, P.K., Applied Materials Science, Scitech, 2003.
3. Raghavan, V., Physical Metallurgy, Prentice Hall of India, 2002.

REFERENCE BOOKS:

1. Calister, W.D., Materials Science and Engineering an Introduction, John Wiley, 2003.
2. Rajendarn V and Marikani A, Materials Science, Tata McGraw Hill, 2006

CY8202 CHEMISTRY FOR MINING ENGINEERING L T P C

3 0 0 3

AIM

To impart knowledge on the Applied Chemistry topics important in Mining Engineering.

OBJECTIVES:

To make the students conversant with

- Treatment of water for domestic and industrial purpose
- Applications of different kinds of Polymers, Lubricants and adhesives.
- Types and mechanism of corrosion and control measures
- Application of different types of abrasives and chemical nature of building materials and composites
- Chemistry of different types of Fuels and Explosives

UNIT I WATER TREATMENT 8

Different types of impurities in water-disadvantages of hard water in industries – conditioning methods – external treatment methods –zeolite and ion exchange methods – internal treatment (colloidal, phosphate, calgon, carbonate methods) – desalination (reverse osmosis and electro-dialysis) – requisites of drinking water – treatment of domestic water (screening, sedimentation, coagulation, filtration, disinfection – by chlorination, UV treatment, ozonization).

UNIT II POLYMERS, LUBRICANTS AND ADHESIVES 10

Thermosetting and thermoplastics resins – properties and applications of polythene, polypropylene, TEFLON, polystyrene, polyvinyl chloride, PMMA, polyamides, polyesters, bakelite, vulcanization of rubber – rubber blended plastics – laminated plastics – laminated glass – thermocole. Lubricants and lubrication- functions- classification with examples-properties (viscosity index, flash and fire point, oiliness, carbon residue, aniline point, cloud and pour point)- greases (calcium based, sodium based, lithium based only)- solid lubricants-graphite and molybdenum sulphide. Adhesives – adhesive action – development of adhesive strength – physical and chemical factors influencing adhesive action – bonding process of adhesives –phenol formaldehyde resins, polyurethane, epoxy resins, urea formaldehyde

UNIT III CORROSION AND CORROSION INHIBITION 8

Corrosion – causes of corrosion – principles of chemical corrosion – Pilling – Bedworth rule – principles of electrochemical corrosion – difference between chemical and electrochemical corrosion – factors influencing corrosion – types of corrosion – galvanic corrosion – differential aeration corrosion – stress corrosion – soil corrosion – pitting corrosion, water line corrosion – corrosion control – cathodic protection – sacrificial anode – selection of materials and proper designing – corrosion inhibitors, protective coatings.– Paints, varnishes and lacquers-Electroplating- hot dip process.

UNIT IV ABRASIVES AND CHEMISTRY OF BUILDING MATERIALS 9

Cement – chemical composition – setting and hardening – concrete – weathering of cement and concrete and its prevention- special cements – high alumina cement, sorel cement, white Portland cement, water proofing, and quick setting cement – lime – classification – manufacture, setting and hardening – refractories – requisites –classification – common refractory bricks – preparation, properties and uses of silica bricks, high alumina bricks, magnesite bricks, carbon bricks, zirconia bricks and carborundum – composites – definition of composites – characteristics – constituents of composites – types – fibre reinforced plastic (FRP) – metal matrix composites (MMC) – ceramic matrix composites (CMC) – properties and applications. Mohr's scale of hardness- natural abrasives (diamond, corundum, emery, garnets and quartz)- artificial abrasives (silicon carbide, boron carbide).

UNIT V FUELS AND EXPLOSIVES 10

Classification of fuels (solid, liquid and gases) comparison- coal varieties- analysis of coal, proximate analysis and ultimate analysis - significance- coke manufacture (Beehive coke oven and Otto-Hoffman by product coke oven method)- characteristics of metallurgical coke- Petrol- knocking-Octane Number- improvement of antiknock characteristics- diesel engine fuel- Cetane Number- gaseous fuels- composition and uses of producer gas, water gas and natural gas- combustion –gross and net calorific values- theoretical calculation of calorific value (Dulong's formula)- calculation of minimum requirement of air (simple calculations)- explosive range, spontaneous ignition temperature – flue gas analysis – Orsat apparatus. Chemistry of different types of industrial explosives like – gun powder, dynamite, Nitroglycerin Based explosives, Ammonium Nitrate Based explosives, Ammonium Nitrate fuel oil, PETN, TNT, Liquid oxygen, slurry explosives and emulsion explosives.

TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on water treatment, polymer chemistry, corrosion, adhesive and fuels and explosives will provide a strong platform to understand the concepts on these subjects for further learning.

TEXT BOOKS:

1. Jain P.C. and Monica Jain, Engineering Chemistry, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2002.
2. Dara.S.S., A Textbook of Engineering Chemistry, S.Chand & Company Ltd., New Delhi, 2003.

REFERENCE BOOKS

1. Nanjundan, S. and Sreekultan Unnithan, C., Applied Chemistry, Sree Lakshmi Publications, Chennai, 2001.
2. Sadasivam, V., Modern Engineering Chemistry – A Simplified Approach, Vol.I, Kamakya Publications, Coimbatore, 2003.

GE8251 ENGINEERING MECHANICS L T P C

3 1 0 4

OBJECTIVE

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering

UNIT I BASICS AND STATICS OF PARTICLES 12

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces — Vectorial representation of forces – Vector operations of forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

UNIT II EQUILIBRIUM OF RIGID BODIES 12

Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS 12

Centroids and centre of mass– Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula –Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem –Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion -Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL: 60 PERIODS

OUTCOMES:

- ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
- ability to analyse the forces in any structures.
- ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:

1. Beer, F.P and Johnston Jr. E.R. "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004)
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

REFERENCES:

1. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education (2010).
2. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education (2006)
3. J.L.Meriam and L.G.Kraige, " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2,Third Edition, John Wiley & Sons,(1993)
4. Rajasekaran, S and Sankarasubramanian, G., "Engineering Mechanics Statics and Dynamics",3rd Edition, Vikas Publishing House Pvt. Ltd., (2005).
5. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, (1998).
6. Kumar, K.L., "Engineering Mechanics", 3rd Revised Edition, Tata McGraw-Hill Publishing company, New Delhi (2008)

EE8251 BASIC ELECTRICAL ENGINEERING AND MEASUREMENTS L T P C

3 0 0 3

AIM

To provide knowledge in the basic concepts of Electric Circuits, Electrical machines and Measurement techniques.

OBJECTIVE:

To impart knowledge on

I. Electric circuit laws

II. Principle of Electrical Machines

III. Various measuring instruments

UNIT I ELECTRICAL CIRCUITS 9

Ohms Law – Kirchhoff's Law-Steady state solution of DC circuits – introduction to AC circuits – waveforms and RMS value – Power and power factor- Three phase balanced and unbalanced circuits-Three phase Power measurement.

UNIT II ELECTRICAL MACHINES 9

Construction and Principle of operation DC machines- Characteristics of DC machines Construction and Principle of operation of single phase transformers, synchronous machines, three-phase and single-phase induction motors

UNIT III MEASUREMENT AND INSTRUMENTATION 9

Classification of instruments – moving coil and moving iron meters – Induction type, dynamometer type wattmeters – Energy meter – Megger – Instrument transformers (CT &PT) –Wheatstone's bridge for measurement of unknown resistance ,Maxwell's bridge for unknown inductance and Schering Bridge for unknown capacitance

UNIT IV TRANSDUCERS 9

Classification of transducers, strain, RTD, thermocouples, Piezo-electric transducer, LVDT,Turbine and electromagnetic flow meters, level transducers ultrasonic and fiber optic transducers, type of sensors, elastic sensors, viscosity, moisture and pH sensors, Digital transducers, vibrating wire instruments like load cells, stress meter, etc.

UNIT V SIGNAL CONDITIONING AND DISPLAY 9

Instrumentation amplifiers- Filters- A/D and D/A converters - Multiplexing and data acquisition - LED, LCD and CRT displays.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon Completion of this subject, the students can able to explain different types of electrical machines and their performance

TEXT BOOKS

1. Del Toro 'Electrical Engineering Fundamentals' Pearson Education, New Delhi, 2007.
2. V.K Mehta and Rohit Mehta ' Principle of Electrical Engineering' S Chand & Company,2008
3. Alan S. Moris, Principles of Measurements and Instruments, Printice-Hall of India Pvt. Ltd., New Delhi, 1999.
4. Smarjit Ghosh 'Fundmentals of Electrical and Electronics Engineering, Second Edition 2007

REFERENCES

1. Rajendra Prasad 'Fundamentals of Electrical engineering' Prentice Hall of India, 2006.
2. Thereja .B.L 'Fundamentals of Electrical Engineering and Electronics' S chand & Co Ltd, 2008.

3. Sanjeev Sharma 'basics of Electrical Engineering' S.K International Publishers, New Delhi 2007.
4. John Bird, Electrical Circuits theory and Technology, Elsevier, First India Edition, 2006.
5. Doebeling, E.O., Measurements Systems – Application and Design', McGrawHill Publishing Co, 1990.

MI 8201 MINE DEVELOPMENT L T P C
3 0 0 3

AIM:

To impart knowledge on mineral deposits and development of mining industry.

OBJECTIVES:

- To introduce the field of mining and provide basic input about mining unit operations.
- To know the history of mining and describe the correlation between the development of mining and cultural progress.
- To study concept of exploration & development drilling, blasting and the technology employed.
- To learn the various modes of access and study the methods of designing the access.

UNIT I INTRODUCTION TO MINING 8

History of mining, contribution of mining to civilisation and national economy Indian mineral resources and world status, role of mining engineers in industry. Introduction to opencast and underground coal & metalliferous mining – selection criteria, comparison. Modes of entry into deposits for underground mining – shafts, inclines, adits, etc.

UNIT II INTRODUCTION TO DRILLING 10

Principles of drilling, methods, selection, applications and limitations, drill bits, flushing methods, fields of application, exploration and production drilling, drilling in undergroundworkings, variables affecting the performance of drilling, novel methods of drilling.

UNIT III SHAFT SINKING 10

Selection of site and size, sinking methods, support system, ventilation, lighting and drainage arrangements during sinking, material handling and safety in sinking shafts.Introduction to piling, caisson and freezing methods - cementation method - widening and deepening of shafts. Modern techniques of shaft sinking – shaft boring, design of shaft insets, pit bottom excavation and shaft raising.

UNIT IV INTRODUCTION TO EXPLOSIVES AND BLASTING 10

Types of explosives, fuses, detonators and other accessories, alternatives to explosives, cause of accidents and safety precautions, drilling and blasting pattern for underground excavations,

merits, demerits and limitations of blasting. Storage and transport of explosives.

UNIT V DRIFTING AND TUNNELING 7

Drivage of drifts, organisation and cycle of operations, supporting of development workings, modern methods of drifting, tunnelling, road heading and tunnel boring.

TOTAL: 45 PERIODS

OUTCOME:

- The students will have basic insight into field of mining along with basic concept relating to history of mining, drilling methods, shaft sinking, explosive and blasting along with drifting and tunneling technology.

REFERENCE BOOKS:

1. Hartman, H.L., Introduction to Mining Engineering, John Wiley and Sons, Second Edition, 1999.
2. Deshmukh,D.J., Elements of Mining Technology, Vol.I, Vidyaseva Prakashan, Nagpur, 1994.
3. Chugh,C.P., Drilling Technology Hand Book, Oxford & IBH Publications, 1994.
4. Chugh,C.P. Diamond Drilling, Oxford & IBH Publishers, 1999.
5. Karnam,U.M.R., Principles of Rock Drilling, 1999.
6. Bhandari S., Engineering rock blasting operations, A. A. Balkema, 1997.
7. Cummings,A.B. and Given, I.A., SME Mining Engineers' Handbook, Vol.I and II, Society of Mining Engineers, New York, 1993.
8. Universal Mining School - Lecture notes, cardiff, U.K

ME8261 COMPUTER AIDED MACHINE DRAWING L T P C
0 0 3 2

OBJECTIVE

- To make the students understand and interpret drawings of machine components so as to prepare assembly drawings both manually and using standard CAD packages.
- To familiarize the students with Indian Standards on drawing practices and standard components.

UNIT I DRAWING STANDARDS 3

Code of practice for Engineering Drawing, BIS specifications – Welding symbols, riveted joints, keys, fasteners – Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc.

UNIT II FITS AND TOLERENCES 3

Limits, Fits – Tolerancing of individual dimensions – Specification of Fits – Preparation of production drawings and reading of part and assembly drawings, basic principles of geometric dimensioning & tolerancing.

UNIT III INTRODUCTION TO DRAFTING PACKAGE 6

Drawing, Editing, Dimensioning, Plotting Commands, Layering Concepts, Matching, Detailing, Detailed drawing, Basic principles of geometric dimensioning & tolerancing.

UNIT IV ASSEMBLY DRAWING (Preparation of 2D assembled views for the given part details) 33

Preparation of assembled views, both manually and using software package, given part details for components such as Shaft couplings – Plummer block – Screw jack – Lathe Tailstock – Universal joint – Machine Vice – Stuffing box – Crosshead – Safety Valves – Non-return valves – Connecting rod – Piston and crank shaft – Multi plate clutch – Preparation of Bill of materials and tolerance data sheet.

TOTAL: 20% of classes for theory classes and 80% of classes for practice = 45 PERIODS

Note: 50% of assembly drawings must be done manually and remaining 50% of assembly drawings must be done by using any 2D drafting package)

OUTCOMES

- Ability to develop engineering drawing for the industrial component using Indian Standard code of practice.

TEXT BOOKS

1. Gopalakrishna K.R., “Machine Drawing”, 17th Edition, Subhas Stores Books Corner, Bangalore, 2003.

REFERENCES

1. N. D. Bhatt and V.M. Panchal, “Machine Drawing”, 45th Edition, Charator Publishers, 2010
2. Goutam Pohit and Goutam Ghosh, “Machine Drawing with AutoCAD”, 1st Edition, Pearson Education, 2004
3. Junnarkar, N.D., “Machine Drawing”, 1st Edition, Pearson Education, 2004
4. N. Siddeshwar, P. Kanniah, V.V.S. Sastri, ”Machine Drawing” , published by Tata Mc GrawHill,2006
5. S. Trymbaka Murthy, “A Text Book of Computer Aided Machine Drawing”, CBS Publishers, New Delhi, 2007

ME8262 MANUFACTURING TECHNOLOGY LABORATORY – I L T P C

0 0 3 2

OBJECTIVES:

- To Study and practice the various operations that can be performed in lathe, shaping, drilling, milling etc. and to equip with the practical knowledge required in the core

industries.

LIST OF EXPERIMENTS:

Machining , Measurement and Machining time estimations of :

Taper Turning

External Thread cutting

Internal Thread Cutting

Eccentric Turning Knurling

Square Head Shaping

Hexagonal Head Shaping

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to demonstrate and fabricate different types of components using the machine tools

AG8301 GEOLOGY – I L T P C
3 0 0 3

AIM:

To familiarize the students with the fundamental concepts of geology and its role in mining engineering

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 STRATIGRAPHY 9

Geological time scale – mineral resource distributions and economic importance of Archean, Paleozoic, Mesozoic and Cenozoic rocks of India.

UNIT III MINERALOGY 9

Classification of minerals – Physical properties of minerals – Properties of quartz, feldspar, pyroxene, amphibole, mica, olivine and garnet group of minerals and calcite.

UNIT IV 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 laboratory tests.

UNIT V STRUCTURAL GEOLOGY **9**

Introduction to geological structures – folds, faults, joints and unconformities – classification, criteria for recognition in the field and significance in mineral exploration. Determination of strata thickness. Dip and strike calculations.

TOTAL:45 PERIODS

OUTCOME:

- The students will know about minerals, rocks and structures. They will also learn about stratigraphy, petrology and structural geology

TEXT BOOKS:

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 Minerology (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 Ino., N. Jersey, USA, 1972.
6. Krishnan M.S. Geology of India and Burma, 3rd Edition, IBH Publishers, N. Delhi, 1984.

REFERENCE BOOKS:

1. Blyth F.G.H. and de Freitas M.H. Geology for Engineers, 7th edition, Elsevier Publications, 2006.
2. Bell F.G. Engineering Geology, Elsevier Publications, 2007.

CE8353 **STRENGTH OF MATERIALS** **L T P C**

(Common for Mechanical, Manufacturing, Industrial, Mining, Printing, Material Science and Engineering and Agriculture and Irrigation Engineering) **3 0 0 3**

OBJECTIVE:

To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumertric strains – Stresses on inclined planes – principal stresses and principal planes – Mohr's circle of stress.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending – bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

UNIT III TORSION 9

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFLECTION OF BEAMS 9

Double Integration method – Macaulay's method – Area moment Theorems for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell's reciprocal theorems.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS 9

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame's theory – Application of theories of failure.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
- Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

TEXT BOOKS:

1. Bansal, R.K., Strength of Materials, Laxmi Publications (P) Ltd., 2007
2. Jindal U.C., Strength of Materials, Asian Books Pvt. Ltd., New Delhi, 2007

REFERENCES:

1. Egor. P.Popov " Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2001
2. Subramanian R., Strength of Materials, oxford University Press, Oxford Higher Education Series, 2007.

3. Hibbeler, R.C., Mechanics of Materials, Pearson Education, Low Price Edition, 2007
4. Ferdinand P. Been, Russell Johnson, J.r. and John J. Dewole Mechanics of Materials, Tata Mcgraw Hill publishing 'co. Ltd., New Delhi.

EC8302 BASIC ELECTRONICS ENGINEERING L T P C
3 0 0 3

AIM:

To familiarize the students with the fundamental concepts in electronics engineering

OBJECTIVE:

To lay emphasis on the study of electronics engineering. At the end of the course the students will have an understanding of engineering of electronics.

UNIT I SEMICONDUCTORS AND RECTIFIERS 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, Half and Full wave rectifiers, Zener effect, Zener diode, Zener diode Characteristics, Zener diode as a regulator.

UNIT II TRANSISTOR AND AMPLIFIERS 9

Bipolar junction transistors – CB, CE, CC configurations and characteristics, Biasing circuits – Fixed bias, Voltage divider bias, CE amplifier, Concept of feedback, Negative feedback, voltage series feedback amplifier, Current series feedback amplifier.

UNIT III FET AND POWER ELECTRONIC DEVICES 9

FET – Configuration and characteristics, FET amplifier, Characteristics and simple applications of SCR, Diac, Triac and UJT.

UNIT IV SIGNAL GENERATORS AND LINEAR ICs 9

Positive feedback, Sinusoidal oscillators – RC phase shift, Hartley, Colpitts, Wein bridge oscillators, Operational amplifier – Adder, Inverting and Non-inverting amplifiers, integrator and differentiator, IC 555 based Astable and Monostable Multivibrators.

UNIT V DIGITAL ELECTRONICS 9

Boolean algebra, Logic Gates, , Half and Full adders, Decoder, Encoder, Multiplexer, Demultiplexer, Flip flops, Digital to Analog converters - R-2R and weighted resistor types, Analog to Digital converters - Successive approximation and Flash types.

TOTAL : 45 PERIODS

OUTCOME:

- The students will have knowledge about semiconductors, rectifiers, transistor, amplifiers, FET, power electronics, signal generators and linear ICs. They will also know about digital electronics.

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, ‘Electronics Devices’, Pearson Education, 2002.
3. Thomas L. Floyd, ‘Digital Fundamentals’, Pearson Education, 2003.
4. Millman, Halkias Jacob, Jit Christos and Satyabrata, ‘Electronic devices and Circuits’, Tata McGraw Hill, 2nd Edition.

EE8305 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

OBJECTIVES:

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

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

OUTCOMES:

- Upon Completion of this subject, the students can able to explain different types of electrical machines and their performance

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. G.K.Dubey. 'Fundamentals of Electrical Drives' Narosa, Second Edition.

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.

ME8303 BASIC MECHANICAL ENGINEERING FOR MINING L T P C

3 0 0 3

OBJECTIVES

- To gain an understanding of the basic concepts of various aspects of Mechanical Engineering, fields of application, their merits, demerits, and limitations and applications to Mining Engineering.

UNIT I BASIC CONCEPTS OF THERMODYNAMICS AND HEAT TRANSFER 10

Definitions – continuum concept – properties – point and path functions – systems – processes – thermodynamic equilibrium - laws of thermodynamics – Steady Flow Energy Equation (SFEE) - first law applied to open and closed systems – steady and unsteady flow systems - Second law – heat engines and heat pumps – efficiency and Coefficient of Performance (COP).

Heat transfer – conduction – general conduction equation in Cartesian coordinates – conduction in composite walls. Convection – free and forced convection – simple empirical correlations. Radiation – laws – black body and grey body radiation.

UNIT II IC ENGINES AND AIR CONDITIONING 8

I C engines – classification - construction and working - two and four stroke engines – S I and C.I. engines – 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 9

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 9

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.
Cams and followers – terminology and definitions, displacement diagrams – uniform velocity, parabolic and simple harmonic motions.

UNIT V ROTODYNAMIC AND VIBRATORY MACHINES 9

Fans and compressors – types, construction, working principle, characteristics and applications. Single stage and multistage air compressors – intercooling. Simple calculations for output and efficiency.
Vibration – Importance of free and forced vibration. Vibrators and shakers – construction, working principle, applications and limitations. HMT Data book to be permitted

TOTA L: 45 PERIODS

OUTCOMES:

- To equip the mining engineering students with the basic principles of operation of MiningMachinery.

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. Shigley J.E., Pennock G.R. and Uicker J.J. Theory of Machines and Mechanisms, Oxford University Press, 2003.

REFERENCE BOOKS:

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

MI 8301 DRILLING AND BLASTING L T P C
3 0 0 3

AIM:

To impart knowledge on drilling and blasting operations to extract the mineral deposit.

OBJECTIVES:

- To understand the exploratory and production drilling in mines.
- To study the explosives and blasting agents, accessories and tools.
- To study the various theories of rock fragmentation.
- To study the design of blasting in underground and surface mines.

UNIT I EXPLORATORY DRILLING 9

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. Drilling for oil and ground water.

UNIT II PRODUCTION DRILLING 9

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 8

Explosives and Blasting Agents- ANFO, slurry, emulsion, LOX, permitted explosives, bulk explosives; Selection of explosives; Blasting accessories, Initiation systems, Testing ofexplosives; Storage, transportation and handling of explosives; Destruction of explosives and accessories. 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 8

Design of blast for coal and metal underground mines – gallery, Solid blasting techniques, periphery blasting, 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 ALLIED ENGG. FIELDS 11

Methods of blasting in surface mines, Blast design, Primary and secondary blasting, Rock 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, DGMS Circulars shall be covered wherever required.

TOTAL: 45 PERIODS

OUTCOME:

- The students will have knowledge on drilling and blasting operations in underground and surface mines. They will also know to design blasting pattern for mines, dimensional stones, road constructions, oil and ground water.

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.

EC 8361 ELECTRONICS ENGINEERING LABORATORY L T P C

0 0 3 2

OBJECTIVES:

- Students should able to verify the principles studied in theory by performing experiments in the laboratory

1. VI Characteristics of PN Junction and Zener Diodes.
2. Characteristics of CE configuration of Transistor.
3. Characteristics of UniJunction Transistor.
4. Characteristics of FET.
5. Operational Amplifier Applications – Adder, Multiplier.
6. RC Oscillator
7. LC Oscillators
8. IC 555 Astable and Monostable multivibrators
9. Half and Full adders
10. RS , T and D FFs
11. BCD counter using IC 7490

TOTAL: 45 PERIODS

OUTCOMES:

- ability to use of diodes, transistors for rectifiers
- ability to use of operational amplifiers

EE 8262 ELECTRICAL ENGINEERING LABORATORY L T P C

0 0 3 2

OBJECTIVES:

- Students should able to verify the principles studied in theory by performing experiments in the laboratory

1. Speed Control of DC Shunt Motor
2. Load Test on DC Shunt Motor
3. Study of starters
4. Swinburne's Test
5. Load Test on DC Series Motor
6. Load Test on three Phase Alternator
7. Load Test on three Phase Induction Motor

8. Wheatstone's Bridge
9. Load Test on single phase Induction Motor.
10. Load test on Single Phase Transformer.

TOTAL: 45 PERIODS

OUTCOMES

- Ability to perform speed characteristic of different electrical machine

MI 8311	**PRACTICAL TRAINING – I**	**L T P C**
		0 0 0 1

AIM:

To impart practical experience to the student for gaining deeper understanding of the various activities and principles of mining.
Gaining practical experience is an important aspect of the mining engineering programme having many characteristic features of its own.

The students have to undergo training in mines during the summer vacation at the end of the II Semester for a period of 10 to 15 Days and obtain a valid certificate from the competent authority of the organisation provide training. 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 III Semester. Evaluation would be done by a faculty or a group of faculties 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 the practical training. In case of any 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 before proceeding to V Semester. The decision of the competent authority is final.

AG8401	**GEOLOGY - II**	**L T P C**
		3 0 0 3

AIM:

To study about the origin, distribution and exploration of economic minerals.

OBJECTIVE:

To familiarize the students with the economic mineral deposits and the techniques used to explore mineral and fossil fuel deposits.

UNIT I ECONOMIC GEOLOGY 9

Ore forming process, mineral deposits formed from magmatic, hydrothermal and volcanic process: mechanical 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, radioactive minerals, 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 is sedimentary basins of India.

UNIT IV GEOPHYSICS 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 remote sensing, identification of photo recognition elements; applications of remote sensing and GIS in geological mapping and mineral exploration.

TOTAL: 45 PERIODS

OUTCOME:

- The students will have familiarity about economic geology and Indian mineral deposits. They will have deep knowledge about geophysics, remote sensing and GIS.

TEXT 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. Arogyaswamy, R.N.P., courses in Mining Geology, Oxford and IBH Co., New Delhi, 1988.

REFERENCE BOOKS:

1. Bales, R.L., Geology of the Industrial Rocks and Minerals, Harper press (India) Ltd., Faridabad, 1988.
2. Arogyaswamy, R.N.P., courses in Mining Geology, Oxford and IBH Co., New Delhi, 1988.
3. Umapathy, R.M., Text book of Mining Geology, Daltsons, 2002.

CE 8352 FLUID MECHANICS AND MACHINERY L T P C
3 0 0 3

OBJECTIVE:

- The applications of the conservation laws to flow through pipes and hydraulic machines are studied .To understand the importance of dimensional analysis. To understand the importance of various types of flow in pumps and turbines.

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 8

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, capillarity and surface tension. Flow characteristics – concept of control volume - application of control volume to continuity equation, energy equation and momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS 7

Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli- Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation – friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series and parallel.

UNIT III DIMENSIONAL ANALYSIS 8

Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV PUMPS 12

Impact of jets - Euler's equation - Theory of rotodynamic machines – various efficiencies – velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps – working principle - work done by the impeller - performance curves - Reciprocating pump - working principle – indicator diagram – work saved by fitting air vessels – Rotary pumps – classification – comparison of working principle with other pumps – advantages.

UNIT V TURBINES 10

Classification of turbines – heads and efficiencies – velocity triangles – axial, radial and mixed flow turbines – Pelton wheel and Francis turbine - working principles - work done by water on the runner – draft tube - specific speed - unit quantities – performance curves for turbines – governing of turbines.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

TEXT BOOKS:

1. Streeter, V. L. and Wylie E. B., Fluid Mechanics, McGraw Hill Publishing Co.(2010)
2. Kumar K. L., Engineering Fluid Mechanics, Eurasia Publishing House(p) Ltd. New Delhi(2004)
3. Modi P.N. and Seth, S.M. Hydraulics and Fluid Mechanics, Standard Book House (2002), New Delhi

REFERENCES:

1. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, “Fluid Mechanics and Machinery”, ISBN 978-0-470-54755-7, 2011.

CE8405 ENGINEERING SURVEYING L T P C

3 0 0 3

AIM:

To comprehend the principles of Surveying for efficient field operations

OBJECTIVES:

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

UNIT I INTRODUCTION AND LINEAR MEASUREMENTS 9

Objectives and general principles of mine surveying, definitions of plane and geodetic surveying, 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 II ANGULAR MEASUREMENT 9

Construction, testing, correction/adjustments of angle-measuring instruments-theodolite, compass, 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 III LEVELLING **9**

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

UNIT IV TRIANGULATION **9**

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, computation of triangulation scheme, transfer coordinates through two, three four point interpolation, reduction to centre(satellite station) methods, broken baseline method.

UNIT V TRUE NORTH FIXATION AND PLANE TABLE SURVEYING **9**

Common terms and definitions in astronomical surveys – determination of true north, sun/ star observations and connection to triangulation base line. Descriptions of plane table and accessories – adilade plumbing fork, etc., methods and use of plane table surveying, two and three point problems.

TOTAL : 45 PERIODS

OUTCOME:

The students will have knowledge about leveling, triangulation and determination of azimuth for field operations. They will also know about true north fixation and plane table surveying.

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, 2010.
3. Punmia, B.C. Surveying, Vols. 1, 2 and 3, Laxmi Publications, 2010.

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.

EE8408 INSTRUMENTATION ENGINEERING **L T P C**

3 0 0 3

AIM:

To study the basic instrumentation methods

OBJECTIVES:

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 LVDT and strain gauge – Capacitive type pressure gauge – Measurement of vacuum – McLeod gauge – Thermal conductivity gauge – Ionisation 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 hygro meter – 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 – NOx analyser – H2S analyser – CO and CO2 monitor, Dust & Smoke measurement.

TOTAL : 45 PERIODS

OUTCOMES:

- The knowledge gained on electronic, pressure, flow and vibration measurement will provide a strong platform to understand the concepts on these subjects for further learning.

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

RERERENCES:

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.

MI8401 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 10

Occurrence, properties, physiological effects, detection – types of instruments, construction, principle and limitations, measurement and analysis, methane layering, methane drainage. Methods of ventilation survey, Instruments required for ventilation survey,

UNIT II MINE CLIMATE AND CONTROL 7

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 conditioning. Psychrometric surveys.

UNIT III PRINCIPAL LAWS OF AIR MOVEMENT IN UNDERGROUND 8

Fundamentals of fluid flow and its application in mine ventilation with special reference to Bernoulli's Equation, Reynolds number, Poiseuille's equation, Atkinson's equation, Karman-Prandtl equation for rough flows, resistance of mine roadways, friction and shock resistance, etc.

UNIT IV 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. Retrograde and boundary, ascensional, decensional, homotropal and antitropal ventilation systems, Ventilation in deep and hot mines, remedial measures.

UNIT V MECHANICAL VENTILATION & VENTILATION PLANNING 12

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. Calculation of pressure and quantity requirements, economic analysis, ventilation standards, network analysis, monitoring of mine environment. principles and computer applications.

Note: All the above are to be studied with emphasis on CMR, MMR and the relevant circulars.

TOTAL : 45 PERIODS

OUTCOME:

- The students will have basic knowledge of underground mine atmosphere, ventilation methods, parameters influencing mine environment, measurement methods and instrumentation. They will also know about the principal laws governing mine ventilation systems.

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.

REFERENCE BOOKS:

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.

MI8402 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. Elements of the transport system, classification and techno-economic indices.

UNIT II ROPE HAULAGE 12

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 and tubs– 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 haulages – 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, principles of hydraulic& pneumatic transportation and their fields of application, electric layouts, man-riding systems.

UNIT IV PUMPING 5

Different types of drives, installation and maintenance of pumps and pipes in shafts and roadways, electrical layouts, 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. Mine telephone system and latest development in mine communications.

Note: All statutory aspects like CMR, MMR and the relevant DGMS circulars are to be covered by the faculty.

TOTAL: 45 PERIODS

OUTCOME:

- The students will have basic knowledge on motive power used in mines, pumping, rope haulage and other transport systems. They also will know about mine electrical engineering in all statutory aspects.

REFERENCE BOOKS:

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.

MI8403 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 5

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. Conversion of Underground mine to opencast mines.

UNIT III GROUND PREPARATION METHODS 6

Preparation of the site – Ripping, Drilling and Blasting; Types, operation, selection, applications and limitations of ground preparation equipments – Rippers, Dozers, Blasthole drills and rock breakers, Placer mining and hydrulicking. Economics of Drilling and blasting.

UNIT IV EXCAVATION SYSTEM IN SURFACE MINES 12

Selection criteria for excavation / loading and material transport equipment used in surface mines. Classification, construction, capacity, operation, productivity 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. Problems of Deep open cast mining.

UNIT V TRANSPORT AND WASTE DUMPS 12

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

Note: All Statutory aspects like CMR, MMR and relevant DGMS circulars are to be covered by the faculty.

OUTCOME:

The students will have ability to classify and select the suitable surface mining methods and equipment based on site conditions. They will also have a concept of waste dump formations and slope failures in surface mines.

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. Mishra G.B., 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.

AG8411 GEOLOGY LABORATORY – I L T P C
0 0 2 1

OBJECTIVE:

To practice the determination of engineering properties of rocks, preparation of weathering profiles, RMR, RQD, preparation of geological and structural maps and recognisition of geological structures in the field.

UNIT I MINEROLOGY 6

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

UNIT II PETROLOGY 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.

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.

UNIT IV GEOLOGICAL MAPPING METHODS 6

Topo sheets, Map scale – types, preparation and interpretation of contour maps, drainage maps, symbols, rock and geological structures, use of clinometers, Brunton compass and knowledge on GPS.

UNIT V GEOLOGICAL FIELD WORK 6

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

TOTAL: 30 PERIODS

OUTCOME:

The students will have knowledge about ore reserve estimation, ore assaying, remote sensing, geological mapping and identification of geological structures in the field.

CE 8361 FLUID MECHANICS AND MACHINES LABORATORY L T P C
0 0 3 2

OBJECTIVES:

Students should able to verify the principles studied in theory by performing the experiments in lab.

A. Flow Measurement

1. Calibration of Rotometer
2. Flow through Venturimeter
3. Flow through a circular Orifice
4. Determination of mean velocity by Pitot tube
5. Verification of Bernoulli's Theorem

B. Losses in Pipes

6. Determination of friction coefficient in pipes
7. Determination of losses due to bends, fittings and elbows

C. Pumps

8. Characteristics of Centrifugal pumps
9. Characteristics of Gear pump
10. Characteristics of Submersible pump
11. Characteristics of Reciprocating pump

D. Turbines

12. Characteristics of Pelton wheel turbine
13. Characteristics of Francis turbine

E. Determination of Metacentric height

14. Determination of Metacentric height

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to use the measurement equipments for flow measurement
- Ability to do performance trust on different fluid machinery

REFERENCE BOOKS:

1. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, 2004.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House. New Delhi, 2000.
3. Subramanya, K.. Flow in open channels, Tata McGraw - Hill pub. Co., 1992.
4. Subramanya, K. Fluid mechanics, Tata McGraw- Hill pub. Co., New Delhi, 1992.

ME8412	BASIC MECHANICAL ENGINEERING LABORATORY FOR MINING EXPERIMENTS	L T P C 0 0 4 2

OBJECTIVES:

- Students should able to verify the principles studied in thermal and engineering design course by performing experiments in the laboratory

THERMAL EXPERIMENTS

1. Study of I.C. engines and components
2. Performance test on 4 S diesel engine
3. Performance test on reciprocating air-compressor
4. Study of refrigeration system
5. 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

OUTCOMES:

- ability to use of thermal experiments related to IC and refrigeration and air-

conditioning
- ability to use of various engineering design experiments

MA8501 STATISTICS AND NUMERICAL METHODS L T P C
3 1 0 4

OBJECTIVES
- To introduce testing of hypothesis analysis which is central to many applications in engineering
- To acquaint the student with analysis of correlation and Eigen value problems used in wide variety of situations.

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 ANALYSIS OF CORRELATION, REGRESSION DESIGN OF EXPERIMENTS 9

Correlation – Types of Regression - Completely randomized design – randomized block design – latin square design - 22 - 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.- Curve Fitting – Method of Group Averages – Method of least squares

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 equations.

TOTAL: 45+15

OUTCOMES
- The understanding of the mathematical principles on numerical differentiation and integration and numerical solutions to ODE would provide them the ability to formulate and solve some of the physical problems of engineering.

TEXT BOOKS:

1. Johnson, R.A., and Gupta,C.B., 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.

BOOKS FOR REFERENCES:

1. Walpole, R.E., Myers,R.H., Myers,S.L., and Ye.K.,, Probability and Statistics for Engineers and Scientists, Pearson Education, Asia , 8th edition, 2007.
2. Spiegel, M.R., Schiller, J., and Srinivasan, R.A., Schaum's Outlines on 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.

MI 8501 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. 000000000000To study various methods of ventilation data collection.
3. To study about mine illumination, pollution and ecological systems.

UNIT I ENVIRONMENT & ECOLOGY 9

Concept of Ecology, ecological principle, nature of the environment ecology and man. Goals, strategies and tools for environmental management – systems approach to environmental management – environmental guideline – National Policies on environment with respects to mining activities – Global and Local environmental issues – resource degradation – desertification – Industrialization, Objectives of Sustainable Development.

UNIT II ENVIRONMENTAL POLLUTION - I 9

Environmental Pollutants due to surface and underground Mining – Air, Water, Noise, Sources and Classification of pollutants including dust and their effect on human health, Sources, hazards, sampling and analysis, standards, instrumentation and measurement of pollutants including dust, Control and preventive measures for air pollution including for dust, 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, Dispersion of air pollutants,

UNIT III ENVIRONMENTAL POLLUTION - II 9

Environmental Pollution due to Water - Sources and Classification of pollutants and their effect on human health, hazards, sampling and analysis, Water pollution standards, Noise standards – Measurement – Noise Impact Index assessment, Control and preventive measures for water, noise pollution. Pollution due to vibrations their monitoring, prevention and control, Land pollution, land for alternation dealing with mind out land , re-vegetation, tailing management, tailing dams, method and construction, land use plan, Mine closure

planning. Textural classification and properties of soil. Impact of pollution on human health, miner's diseases and their social impact.

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 plans, Environmental impact assessment, 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

OUTCOME:

The students will have knowledge on mechanical ventilators, influencing parameters and various methods of data collection. They will also know about illumination, pollution and ecological systems.

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.
4. Manahan S.E. Environmental Science and Technology.

5. Mackenthun, K.M. Basic Concepts in Environmental Management, Lewis Publications, London, 1998.
6. 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. Roger Perman, Yue Ma and James McGilvray. Natural Resources and Environmental Economics, Second edition, Addision Wesley Longman Ltd, Singapore, 1997.
6. Christopher Sheldon and Mark Yoxon, Installing Environmental Management System – a step by step guide, Earthsecan Publications Ltd, London, 1999.
7. Lee Kuhre, ISO 14001 Certification –Environmental Management Systems, Prentice Hall, USA, 1995.

MI8502 MINE SURVEYING L T P C

3 0 0 3

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 SURVEY AND MODERN SURVEYING METHODS 14

Special features of Underground Mining surveying; Correlation of Surface and underground mine workings; operational details and applicable errors in each; methods of transferring levels to different landings/ levels/ horizon; Illustrative examples: Measurement of shaft depth

Application of Remote sensing and photogrammetry in exploration and mining; EDM; Electronic theodalite, Electronic Tachometer (Total station); Laser Theodalite; GPS; GIS; DTM Applicability and limitations.

UNIT II ADJUSTMENT OF SURVEY MEASUREMENT 10

Most probable value, laws of weights; principle of least square; uncorrelated values of unequal precision; Adjustment of figures – Simple triangle, two connected triangles, crossed quadric lateral, hubangle correction (polygon); errors and adjustment in steep sights; striding level; Application of top eccentric and side eccentric telescopes Illustrative examples:

UNIT III ALIGNMENT SURVEY AND TACHOMETRY 10

Alignment / Gradient control of vertical and inclined shafts; gradient control in development openings; Holing surveys; Application of appropriate methods, equipment, operational control; Alignment in Headgears, machinery foundation etc Illustrative examples:

UNIT IV STOPE & SUBSIDENCE SURVEYS AND .MINE PLANS 9

Stope survey – objectives, methods, preparation of stope plan, preparation of mine plan subsidence survey – Subsidence trough, factors influencing subsidence, protective pillars, guidelines subsidence in laying out monitoring stations, methods of survey, statutory provisions and circulars.

Preparation of Mine plans and sections; stepped plan; Allay plan; Duties and responsibilities of mine surveyor under mines act and connected legislations.

UNIT V CONTOURING AND CURVE SETTING MISCELLANEOUS SURVEY APPLCIATIONS 17

Methods of Contouring; contour gradient; uses of contours; Reservoir / Catchment area calculations Illustrative examples: setting out underground / curves; need for curves; types of curves; methods of curve setting

Dip/ Strike / Fault interpretation from inclined angle vertical borehole data in dipping and plunging formations; interpretations of borehole maps; borehole deviation; calculation of plunge in folded terrain.

TOTAL: 45 PERIODS

OUTCOME:

- The students will have knowledge on methods of underground traversing, alignment of survey, methods of stope and subsidence surveys. They will have a confident about preparation of mine plans and section and also contouring and curve setting.

TEXT BOOKS:

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 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., Pratical 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., Mining Surveying, Lovely Prakashan,Dhanbad,1990

MI 8503 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 AND 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.

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

OUTCOME:

- The students will have knowledge on processing of minerals/ores, transportation of ore, comminution, sampling, industrial sizing, different techniques for separation/concentration and special methods to process the minerals.

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.

MI 8504 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 over speed 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 relating to rope size & numbers, capacity & power requirement for cage, skip, drum and Koepe winding systems.

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, modern concepts in underground mine mechanisation.

UNIT V FACE HAULAGE AND CONVEYORS 9

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

Note: All the above are to be studied with emphasis on CMR, MMR and the relevant circulars

TOTAL : 45 PERIODS

OUTCOME:

- The students will have knowledge on function of winding engines, winding accessories, pit-top and bottom mine circuits. They will also know about working of various coal face machinery, face haulage systems and conveyors.

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. Deshmukh, D.J., Elements of Mining Technology, Vol. I, II and III, EMDEEE Publishers, Nagpur, 1979.
5. Alemgren G., Kumar U., and Vagenas N., Mine Mechanisation and Automation, A.A., Balkema Publication, 1993.
6. Walker, S.C., Mine Winding and Transport, Elsevier, 1988.

MI8505 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 METHODS 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. Design of systematic support rules for B & P Development, depillaring LW gate readings and extraction.

TOTAL : 45 PERIODS

OUTCOME:

- The students will have fundamental knowledge on application of rock mechanics, physico-mechanical properties of rocks and different types of underground supports.

TEXT BOOK:

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.

REFERENCES:

1. Brady, B.H.G. and Brown, S.T., Rock Mechanics, Wiley Interscience, 1985.
2. Hoek, E., and Brown, S.T., Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980.

MI 8506 UNDERGROUND MINING METHODS - 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, organisation 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.

Note: All the above are to be studied with emphasis on CMR and the relevant circulars

TOTAL: 45 PERIODS

OUTCOME:

- The students will have knowledge on development and depillaring of coal in Bord and Pillar and advancing and retreating in Longwall methods. They will also know about novel methods of winning of coal.

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. Internet: www.miningindia.com

AG8511 GEOLOGY LABORATORY II AND FIELD WORK L T P C

0 0 2 1

AIM:

To study the identification of ores, reserve estimation and geological mapping of minerals and ores.

OBJECTIVE:

To practice the determination of engineering properties of rocks, preparation of weathering profiles, RMR, RQD, preparation of geological and structural maps and recognisition of geological structures in the field.

UNIT I ORE GEOLOGY 6

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 ESTIMATION & APPLIED GEOLOGY 6

Ore reserve estimation – ore assaying reserve calculation. Determination of engineering properties of rocks, determination of porosity of rocks. Preparation of weathering profile,

RMR, RQD.

UNIT III REMOTE SENSING & GEOPHYSICS 6

Study of aerial photographs and satellite imageries. Preparation of geological and structural maps. Electrical resistivity survey, seismic survey – 2 and 3 layer problems. Preparation of panel diagrams.

UNIT IV GEOLOGICAL FIELD WORK 6

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: 30 PERIODS

OUTCOME:

- The students will have knowledge about ore reserve estimation, ore assaying, remote sensing, geological mapping and identification of geological structures in the field.

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.

EE8514 INSTRUMENTATION ENGINEERING LABORATORY L T P C

0 0 2 1

OBJECTIVES

- To familiar with different measurement equipments and use of this industry

1. Familiarization of Basic measuring instruments
2. Analysis of various Bridge circuits
3. Characteristics of amplifiers, A/D converters
4. Characteristics of active filters
5. Characteristics of strain gauge circuits.
6. Characteristics of LVDT
7. Characteristics of RTD and vibrating wire instruments
8. Characteristics of Thermo couple and LDR
9. Characteristics of Pressure to current converters.

OUTCOMES

- Ability to handle different measurement tools and perform measurements

MI 8511 **PRACTICAL TRAINING - II** **L T P C**
0 0 0 1

AIM:

To provide training in mines for gaining thorough understanding of all the theoretical knowledge.

Gaining practical experience is an important aspect of the mining engineering programme having many characteristic features of its own.

The students have to undergo training in mines during the summer vacation at the end of the IV Semester for a period of 4 weeks and obtain a valid certificate from the competent authority of the organisation provide training. 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 faculties 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 the practical training. In case of any 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 before proceeding to VII Semester The decision of the competent authority is final.

CE8514 **SURVEY LABORATORY – I** **L T P C**
0 0 4 2

OBJECTIVE:

- To provide the practice exercises on pantograph, correlation survey, mine plan preparation with use of stereoscope.

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.

OUTCOME:

The students will have practical knowledge about survey instruments and its workings.

ME8652 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 – 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 – Selection and training – Placement – Performance appraisal – Controlling – Process of Controlling – Controlling techniques – Preventive control, industrial safety.

UNIT III ORGANIZATIONAL BEHAVIOUR 9

Definition – Organization – Managerial Role and functions – Organizational approaches, individual behavior – Causes – Environmental effect – Behaviour and Performance, Perception – Organizational implications. Personality – Contributing factors – Theories of motivation – Job satisfaction – Learning Curves, Work Design and approaches.

UNIT IV GROUP DYNAMICS 9

Group behavior – Groups – Contributing factors – Group norms – Communication – Process – Barriers to communication – Effective communication leadership – 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 – Change Process – Resistance to change – Culture and Ethics.

UNIT V MODERN CONCEPTS 9

Management by objectives (MBO) – Management by Exception (MBE) – Developing strategies, information technology in management – Decision support system – Business Process Re-engineering (BPR) – Enterprises Resource Planning (ERP) – Supply Chain Management (SCM) – Activity based management (ABM) – Globalization.

TOTAL: 45 PERIODS

OUTCOMES :

- Students gain knowledge on the basic management principles to become management(s) professional.

TEXT BOOK

1. Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India Pvt. Ltd., Ninth edition, 2008.

REFERENCES

1. Herald Knottz and Heinz Weihrich. Essentials of Management, McGraw Hill Publishing Company, Singapore International Edition, 1980.
2. Chandran, S. Organizational Behaviour, Vikas Publishing House Pvt. Ltd., 1994.
3. Ties, A.F. Stoner and R. Edward Freeman, Management, Prenticie Hall of India Pvt. Ltd. New Delhi 110 011, 1992.
4. Joseph J. Massie, Essentials of Management, Prentice Hall of India Pvt. Ltd., 1985.

MI8601 COMPUTER APPLICATIONS IN MINING L T P C

3 0 0 3

AIM:

To impart skills on designing and development of mining software and appreciate the scope of Computer application in Mining

OBJECTIVES:

1. To impart knowledge on hardware and software issues concerned with computers in mining industry.
2. To develop algorithms and programs on various mining related problems
3. To impart knowledge on high-end simulation methodologies
4. To study modern techniques on solving mining problems.

UNIT I INTRODUTION TO COMPUTERS 8

Hardware concepts – CPU architecture and developments – Overview on input, output and memory devices – interfacing concepts; evolution of operating systems; operating systems functions, characteristics – distributed operating system – Cloud computing / grid computing in mining.

UNIT II SOFTWARE 8

Application of structured and object oriented programming languages to mining problems like pillar design, blast design, subsidence etc., - modular programming – Top down and bottom approach for mine design and planning.

UNIT III DATABASE MANAGEMENT SYSTEMS 7

Database and Relational database - development of software packages for mining companies – forms, queries and reports - management information system – enterprise resource planning for production machineries, manpower, finance , and other mining operations.

UNIT IV PROBLEM SOLVING – APPLICATIONS IN MINING 14

Ventilation network analysis; online and offline monitoring and control. MINOS, FIDOS. CAD in mining – geostatistics, reserve estimation, krigging, block modeling and orebody modeling, pit design and optimization, mine scheduling, TDS, blast design etc., digitization and scanning of mine maps - GIS in mining.

UNIT V MODERN TRENDS 8

Computer graphics and virtual reality, artificial intelligence, expert system, neural networks, simulated annealing, robotics and their applications in mining.

TOTAL : 45 PERIODS

OUTCOME:

The students will have basic programming knowledge and its applications on various mining related problems and familiarity with hardware and software issues during development of programs. They will also have a perspective on high-end simulation methodologies and modern techniques to solve mining problems.

REFERENCES:

1. R.V.Ramani – Editor, APCOM Proceedings Application of Computers and Operations

Research in the Mineral Industry, The Society of Mining, Metallurgy and Exploration, Inc.,1996

2. Kadri Dagdelen, Editor, Computer Applications in the Minerals Industries, Colorado School of Mines, 1999.
3. Ramani R.V., et al. Computers in Mineral Industry, Oxford and IBH Publishers, 1994.
4. Fytas, K. and Singhal, R.K. Computers Applications in Mineral Industry, A.A.Balkema Publication, 1988.
5. E Balagurusamy , Fundamentals of Computers , Mc Graw Hills Publication, 2009
6. Basandra S K, Computers Today Fourth Edition, Galgotia Publications Pvt. Ltd, 2004

MI 8602 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 open pit and underground designs.

UNIT I ROCK MECHANICS INSTRUMENTATION 6

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.

UNIT II PIT SLOPE STABILITY & SUBSIDENCE 10

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.

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

UNIT III THEORIES OF FAILURE OF ROCKS & PILLAR DESIGN AND ROCK BURST 12

Different theories of failure of rocks, modes of failure - Griffith, Coulumb, Navier, Mohr's,

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

UNIT IV 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 V STOWING/FILLING 8

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

TOTAL : 45 PERIODS

OUTCOME:

- The students will have knowledge on rock mechanics instrumentation, approach to pit slope stability, theories of subsidence and failure of rocks. They will also know about design of underground opening and methods of stowing.

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, Wiley Interscience, 1985.
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 8603 UNDERGROUND MINING METHODS - METAL L T P C

3 0 0 3

AIM:

To impart detailed knowledge about metal mining methods and technology.

OBJECTIVE:

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 9

Metal Mining Terminology; Typical modern metal mine features; typical pre stoping ore block constructional features; classification of methods; Techno economic characteristics impacting on choice of method; Typical unit cost parameters; optimum size of mine and stope.

UNIT II GENERAL MINE DESIGN 9

Mode of mine and stope entry; Layouts; optimum production; Basic design – Level Intervals, ore pass, common ore pass, size of blocks ore handling in stope and other openings, overview of constructional features – X cuts, Raises, Winzes etc.

UNIT III STOPING – GENERAL DESCRIPTION 9

Unsupported methods – Room and pillar, shrinkage, sublevel stoping etc. Supported stopes – Cut and fill, square set etc. Caving methods – Top slicing, sublevel caving, block caving.

UNIT IV STOPE PLANNING AND LAYOUT 9

Preparing a stoping block; sequence of stoping; organization; production cycle; unit cost calculation; comparison of methods and costs

UNIT V NOVEL INNOVATIVE TECHNIQUES & SPECIAL APPLICATIONS 9

Rapid excavation; Hydraulic mining; slurry mining; solution mining; Radial – axial splitter; Thermal fragmentation; shock wave breaking; Nuclear mining. Deep mining; narrow contiguous veins; shaft and remnant pillars; VCR; Ring drilling; Large Blast hole stoping. Cast studies of Indian and foreign underground metal mines.

Note: All the above are to be studied with emphasis on MMR and the relevant circulars

TOTAL: 45 PERIODS

OUTCOME:

- The students will have basic concept on metal mining methods, mine design, development and operations of metal mines. They will also know about novel methods of metal mining and its applications.

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.

HS8561 **EMPLOYABILITY SKILLS** **L T P C**
(LAB / PRACTICAL COURSE) **0 0 2 1**

(Common to all branches of Fifth or Sixth Semester
B.E / B.Tech programmes)

Objectives

- To enhance the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills
- To help them improve their soft skills, including report writing, necessary for the workplace situations

1. Making presentations – introducing oneself – introducing a topic – answering questions – individual presentation practice
2. Creating effective PPTs – presenting the visuals effectively
3. Using appropriate body language in professional contexts – gestures, facial expressions, etc.
4. Preparing job applications - writing covering letter and résumé
5. Applying for jobs online - email etiquette
6. Participating in group discussions – understanding group dynamics - brainstorming the topic
7. Training in soft skills - persuasive skills – People skills - questioning and clarifying skills – mock GD
8. Writing Project proposals – collecting, analyzing and interpreting data / drafting the final report
9. Attending job interviews – answering questions confidently
10. Interview etiquette – dress code – body language – mock interview

TOTAL: 30 PERIODS

OUTCOME

- The students will have enough confidence to present themselves well using proper oral and written communication skills to any interview (or) discussion (or) presentation.

REFERENCE BOOKS

1. Dhanavel, S.P. 2010. English and Soft Skills. Hyderabad: Orient BlackSwan Ltd.
2. Corneilssen, Joep. How to Prepare for Group Discussion and Interview. New Delhi: Tata-McGraw-Hill, 2009.
3. D'Abreo, Desmond A. Group Discussion and Team Building. Mumbai: Better Yourself Books, 2004.
4. Ramesh, Gopalswamy, and Mahadevan Ramesh. The ACE of Soft Skills. New Delhi: Pearson, 2010.

5. Gulati, Sarvesh. Corporate Soft Skills. New Delhi: Rupa and Co. 2006.
6. Van Emden, Joan, and Lucinda Becker. Presentation Skills for Students. New York: Palgrave Macmillan, 2004.

Extensive Readers

1. Covey, Stephen R. The 7 Habits of Highly Effective People. New York: Free Press, 1989.
2. Bagchi, Subroto. The Professional. New Delhi: Penguin Books India, 2009.

Web Resources

1. www.humanresources.about.com
2. www.careerride.com

MI 8611 MINERAL PROCESSING LABORATORY L T P C
0 0 2 1

AIM:
To study the mineral processing procedure and instruments.

OBJECTIVE:
To study the sampling techniques, coal washing, crushing, grinding and sedimentation characteristics of samples.

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

OUTCOME

- Students will be abel to solve some engineering problems with the help of FEA simulation problems etc.

MI8612 MINING MACHINERY LABORATORY L T P C
0 0 2 1

AIM:

To study the different machineries deployed in mines.

OBJECTIVE:

To study the various machineries, ropes, conveyors and different types of loading machines.

1. Study of construction of different types of wire ropes and Types of rope chapels used for rope haulages & winding, safety hooks used in winding.
2. Construction and operation of compressed air operated drills
3. Study of different types of haulage systems – tensioning arrangement in endless haulage and different types of haulage clips and other meance of attachment of tubs to the rope.
4. Study of haulage track, curves, diamond crossing, construction of Mine tubs and cars along with their couplings.
5. Study of safety devices provided of haulage roads and locomotives - Exhaust conditioning and flame traps & underground Battery charging station layout
6. Electrical power distribution in mines, electrical layout for rope haulages and pumps, Electrical and hydraulic layouts for longwall faces
7. Study of aerial rope ways – driving/tensioning/loading/unloading and angle stations
8. Study of various types of head gear-fleet angle, Study of shaft fittings-signal systems, guides, safety dogs and protective roofing, study of guides– methods of support and tensioning arrangements.
9. Study of fittings of winding engines- drums, brakes, and depth indicators.
10. Study of different types of conveyors like armoured face conveyors, belt conveyors, gate belt conveyors, shaker & vibrating conveyors, high angle conveyors
11. Study of coal drill and its electrical panel/gate end box
12. Study of coal ploughs and shearers
13. Study of continuous minors and road headers
14. Study of pit top & pit bottom layouts in shaft and incline under various conditions.
15. Study of different types of loading machines

TOTAL: 45 PERIODS

OUTCOME:

- The students will have practical knowledge about underground machineries, ropes,

pit-top and pit-bottom layouts.

MI8613 ROCK MECHANICS AND GROUND CONTROL LABORATORY - I L T P C
DETERMINATION OF 0 0 2 1

AIM:

- To give hands-on skills to the students in determining the hardness, porosity, RQD, compressive, tensile and shear strength of rocks using various methods.

OBJECTIVE:

To study the various of methods to determine the strength of rock.

1. RQD of rocks.
2. Protodyaknov index of rock.
3. Point load index strength of rock
4. Porosity of rocks.
5. Hardness of rocks by different methods.
6. Uni-axial compressive strength of rock.
7. Tensile strength of rock using Brazilian method.
8. Tensile strength of steel rod.
9. Shear strength of rocks.
10. Deformation characteristics of rocks using.
11. Tri-axial strength of rock and drawing of Mohr's envelope.
12. Slake durability of rocks.
13. Impact strength index.

OUTCOME:

- The students will have knowledge on strength and deformation characteristics of rock using different methods

CE8613 SURVEY LABORATORY- II L T P C
0 0 4 2

AIM:

- To familiarize the students with the recent methods of surveying and its instruments.

OBJECTIVE:

- To provide the practice exercises on pantograph, correlation survey, mine plan preparation with use of stereoscope.

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 alitudes, extra-meridian observation of the Sun for the calculation of azimuth.
7. Heights and distances using tacheometric surveying - tangential, subtense, stadia methods.
8. Correlation surveys carried at different levels and transfer of survey points from one level to another through vertical shafts.
9. Use of modern surveying equipment including experience in using application software.
10. Transfer of base line from one level to other by correlation.
11. Visit to Remote Sensing Centre for getting conversant with use of stereoscope for mine plan preparation.

OUTCOME:

The students will have practical knowledge about recent development of surveying and mine planning.

MI 8701 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-statistica l 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

OUTCOME:

- The students will have knowledge on estimation and valuation of mineral deposits. They will possess about project appraisal, finance and accounting.

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.

MI8702 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 AND FIRES 12

Causes, detection, incubation period, precautions against spontaneous heating in underground and surface coalmines including coal benches, surface coal stocks, and dumps. 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 II EXPLOSIONS 12

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 III MINE RESCUE AND FIRST AID 9

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.

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 ILLUMINATION 6

Electric safety lamps, their maintenance and examination, lamp room design and organisation, lighting from mains, lighting on mechanised longwall faces and gassy mines, photometry and illumination survey, legislations related to illumination survey.

Note: All the above are to be studied with emphasis on CMR and the relevant circulars

TOTAL: 45 PERIODS

OUTCOME:

- The students will have knowledge on spontaneous heating, mine fires, inundation and explosions. They will also know about mine rescue and first aid.

TEXT BOOKS:

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. Cummings A.B., and Given, I.V., SME Mining Engg. Hand Book Vol. I and II, New York, 1994.
4. Sarkar, S.K. and Sarkar, S., State of Environment and Development in Indian Coalfields, Oxford and IBH, 1996.
5. Classified Circulars by D.G.M.S., Dhanbad.
6. Ghatak, S., Mine Management, Legislation & General Safety.
7. Kaku, L.C. Fires in Coal Mines.

MI 8703 MINE PLANNING AND 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

OUTCOME:

The students will have knowledge on planning of opencast mining, underground mining and equipment utilization. They will also know about project implementation and monitoring methods.

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.

MI 8711 COMPREHENSION L T P C
0 0 2 1

AIM:

To sharpen the knowledge and clarify the ideas acquired by the students during the degree programme

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.

MI 8712 COMPUTER APPLICATIONS IN MINING LABORATORY L T P C
0 0 4 2

AIM:

To develop algorithms and programs on various mining related problems in basic programming languages.

OBJECTIVE:

To study the computer programming for mining problems, mine ventilation network analysis, modeling of surface and underground workings using various software.

1. Computer programming for mining problems like design of pillars / blast design / subsidence prediction.
2. Mine ventilation network analysis.
3. Database systems and analysis
4. Digitisation and scanning of mine plans
5. Ore body modeling.
6. Pit optimization.

7. Truck dispatch system optimization.
8. Production Scheduling for grade control
9. Digital Terrain modeling and Wire-frame modeling
10. Mine modeling
11. Slope stability analysis
12. Modelling of airflow through underground workings using finite element method.

TOTAL: 60 PERIODS

OUTCOME:

The students will have knowledge on design and planning of surface and underground mining methods using mining software

MI8713 MINE ENVIRONMENTAL ENGINEERING LABORATORY L T P C
0 0 2 1

OBJECTIVE:

To demonstrate the various methods and instrumentation involved in analysing an underground mine atmosphere.

1. To determine the psychrometric properties, gas percentage in atmosphere.
2. To study the principles and characteristics governing mine fans.
3. To understand lamp design and perform underground illumination surveys.
1. Study of mine flame safety lamp, gas testing with flame safety lamp, electric cap lamps, lamp room layouts and illumination survey.
2. Mine air sampling and detection of various mine gasses, like, methane, carbon monoxide (CO), by conventional methods and by gas chromatograph, etc.
3. Determination of psychrometric properties of air, measurement of cooling power by Kata thermometer.
4. Study of air-reversal arrangement in mine fans.
5. Study of pressure survey and quantity survey in mines using velometer, anemometer and barometer.
6. Determination of air born dust by gravimetric dust sampler, personal dust sampler and by high volume sampler.
7. Noise survey.
8. Determination of crossing point temperature and index of inflammability.
9. Study of self rescuers of different types.
10. Study of self contained breathing apparatus

11. Proximate analysis of coal
12. Measurement of vibrations due to various sources.
13. Determination of pH, TDS, TSS, dissolved oxygen and chemical oxygen demand of water.
14. Determination of organic carbon of soil sample

OUTCOME:

- The students will get practical knowledge about underground mine ventilation methods and planning.

MI 8715 PRACTICAL TRAINING - III L T P C
0 0 0 1

AIM:

To provide training in mines for gaining thorough understanding of all the theoretical knowledge.

Gaining practical experience is an important aspect of the mining engineering programme having many characteristic features of its own.

The students have to undergo training in mines during the summer vacation at the end of the VI Semester for a period of 4 weeks and obtain a valid certificate from the competent authority of the organisation provide training. 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 faculties 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 the practical training. In case of any 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-III before proceeding to VIII Semester. The decision of the competent authority is final.

MI8716 ROCK MECHANICS AND GROUND CONTROL LABORATORY – II L T P C
0 0 2 1

AIM:

- To give hands-on skills to the students in determining the physic-mechanical properties of rock; providing insight into the geotechnical parameters governing the

strength of rocks.

OBJECTIVE:

- To study the physico-mechanical properties of rock, ground vibration monitoring, stowing characteristics, etc.

1. Time dependent properties of rocks
2. Drillability index of rocks.
3. Stress and fracture patterns around underground model openings
4. Design of mine pillars.
5. Prediction of Subsidence.
6. Young's Modulus of Elasticity and Poisson's ratio.
7. Rock anchorage capacity of a rock bolt
8. Roof convergence and other ground control instruments
9. Post Failure Behaviour of Rocks
10. Angle of Internal Friction
11. Ground Vibration Monitoring
12. Stowing Characteristics
13. Permeability

TOTAL : 30 PERIODS

OUTCOME:

- The students will have knowledge on time dependent properties of rock, subsidence, ground vibration monitoring, stowing characteristics and permeability.

MI 8717	**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 and surveying practice 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. This carries one credit.

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.

MI 8714 MINI PROJECT L T P C

0 0 4 2

Students have to undertake a Mini Project work. The aim of the project is to stimulate creative and innovative aspects of their technological learning. The project may consist of design and fabrication, working models, demonstration models, software development, field study in the Mines, Industrial plants, application of software development of feasibility and detail project report of mines environmental project etc. The students have to carry out the projects consisting of a group of students by forming a team of students whose two to three students and have to carry out work for full semester. The students should submit a report and compassing their design results etc.

TOTAL : 60 PERIODS

MI 8801 MINE LEGISLATION AND SAFETY L T P C

3 0 0 3

AIM:

To study about the various legislations relating to mineral industries

OBJECTIVES:

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

UNIT I INTRODUCTION TO MINING LAWS AND LEGISLATION 2

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

UNIT II ACTS, RULES AND REGULATIONS – I 15

Mines Act, Mines Rules, Coal and metalliferous mines Regulations, Bye-laws, Circulars, and standing orders (Except the ones which are collected in course Drilling & Blasting, Surface Mining, Mining Machinery I & II, Mine Environmental Engineering I, II & III, Underground Mining methods (Coal & Metal))

UNIT III ACTS RULES AND REGULATIONS – II 15

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 8

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 : 45 PERIODS

OUTCOME:

The students will have knowledge on various acts, rules and regulations relating to the mineral industry. They will also know about accidents, diseases and mine safety.

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.K., Safety in Mines, Gyan Khan Prakashan, Dhanbad, 1994.

MI 8811 PROJECT WORK L T P C

0 1 2 6

AIM:

To provide the students an opportunity to express their skills, academic knowledge, practical experience and ability to analyze problems and suggest solution.

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 8001 ADVANCED COAL MINING AND MECHANIZATION L T P C
3 0 0 3

AIM:
To understand the advanced methods of working and mechanization for winning Coal.

OBJECTIVES:
- To introduce the recent trends of level of mechanisation for coal face
- To understand the various advanced methods of coal mining

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.

OUTCOME:
- The students will have good exposure about the various advanced methods of coal mining with the knowledge about advanced coal face mechanization.

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. T.N. Singh, Underground Winning of Coal, Oxford IBH Publishers, 1999
6. R.D. Singh, Principles and Practices of Modern Coal Mining, New Age International, 1997

MI 8002 ADVANCED METAL MINING AND MECHANIZATION L T P C
3 0 0 3

AIM:
To understand the advanced methods of working and mechanization for metal mining.

OBJECTIVES:
- To introduce the recent advancement of metal mine development
- To understand the various advanced methods of metal mining

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

OUTCOME:

- The students will have good knowledge about the various advanced methods of metal mining and special mining techniques to overcome the field issues.

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. Underground Mining Methods Handbook, AMIE Publication, 1992
5. Karmakar, H., Mine Working, Vol. I and II, Lovely Prakashan, Dhanbad, 1995
6. Underground Mining Methods and Technology, Elsevier Science Publishers, 1990

MI 8003 ADVANCED SURFACE MINING L T P C

3 0 0 3

AIM:

To learn the advancement of surface mining method.

OBJECTIVES:

- To introduce the various techniques for mine planning, geotechnical investigation and equipment management.
- To appreciate the modern trends in opencast mines, safety and environment

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

OUTCOME:

- The students will have insight about the advanced techniques for mine planning, geotechnical investigation and equipment management and also will understand the modern trends in opencast mines, safety and environment.

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

MI8004 ENERGY CONSERVATION AND MANAGEMEN L T P C
3 0 0 3

OBJECTIVES:

At the end of the course, the student is expected to

- understand and analyse the energy data of industries
- carryout energy accounting and balancing
- conduct energy audit and suggest methodologies for energy savings and
- utilise the available resources in optimal ways

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, day lighting, 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

OUTCOMES:

Upon completion of this course, the students can able to analyse the energy data of industries.

- Can carryout energy accounting and balancing
- Can suggest methodologies for energy savings

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.

MI 8005 **LONGWALL MINING** **L T P C**

3 0 0 3

AIM:

To study the various operations and working methods of longwall mining.

OBJECTIVES:

- To pioneer the history of longwall mining and its development stages
- To understand the extraction, support and transport on a longwall face
- To learn ventilation methods and strata monitoring instruments

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 and thin 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 control and noise control, monitoring at longwall faces. Assessment of cost of ventilation. Electric and

hydraulic circuits. Surface and ground water effects. Strata monitoring with instruments.

TOTAL: 45 PERIODS

OUTCOME:

The students will have better understanding about mine planning, methods of working, development of longwall face, support systems, methods of ventilating longwall faces and transport system on a longwall face.

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.

MI 8006 MATERIAL HANDLING L T P C

3 0 0 3

AIM:

To study the various handling systems deployed in mineral industry.

OBJECTIVES:

- To introduce the basic principles in material handling and its equipment
- To study the conveyor system and its advancement

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 MINES, PLANTS AND WORKSHOPS 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

OUTCOME:

The students will get exposure towards the material handling methods and systems and its principle to convey the minerals or materials from mines, plants and workshops.

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.

MI 8007 MATERIAL MANAGEMENT L T P C

3 0 0 3

OBJECTIVE:

- To teach the basic principles of purchasing, warehousing and inventory management

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

OUTCOMES:

- The student would understand the framework and scope of material management and functions.

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.

MI 8008 MINE SAFETY ENGINEERING L T P C

3 0 0 3

AIM:

To study the mine accidents, health and mine safety.

OBJECTIVES:

- To learn the level of risk associated with mining, risk assessment and management
- To know the occupational diseases, mine disasters and mitigation

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

OUTCOME:

The students will have deep knowledge about the mine accidents, disaster, disease and mine safety with risk assessment, mitigation and management.

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.

MI8009 MINERAL EXPLORATION L T P C

3 0 0 3

AIM:

To learn the mineral resources, exploration strategy, preparation and evaluation of reports.

OBJECTIVES:

- To know the mineral resources and prospecting techniques
- To understand exploration techniques and strategy
- To study the prefeasibility and feasibility reports and its evaluation methods

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 pre-feasibility and feasibility reports.

TOTAL: 45 PERIODS

OUTCOME:

- The students will have knowledge about the available mineral resources, exploration techniques and its strategy. They will know about the methods of preparation of feasibility reports and its evaluation techniques.

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.

MI8010 NON-DESTRUCTIVE TESTING L T P C
3 0 0 3

AIM:
To learn the principle and instruments for non-destructive testing.

OBJECTIVE:
To study the various non-destructive testing techniques such as liquid penetrant, magnetic particle inspection, radiography, eddy current inspection, ultrasonic testing, etc.

UNIT I LIQUID PENETRANT AND MAGANETIC PARTICE 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.

MI 8011 NUMERICAL METHODS IN MINING ENGINEERING L T P C
3 0 0 3

AIM:

To introduce the concept of numerical methods in mining engineering.

OBJECTIVES:

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

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: 45PERIODS

OUTCOME:

- The students will get the concept about finite element models, methods and boundary elements method and its practical applications in mining and rock mechanics.

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 1972.
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.

MI8012 OBJECT ORIENTED PROGRAMMING L T P C

3 0 0 3

AIM:

To introduce the object oriented programming methodology and classes.

OBJECTIVE:

To study the various programming methodologies, classes, threads, packages and C++

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

OUTCOME:

The students will get basic knowledge about object oriented programming language.

REFERENCES

1. Deital, H.M. and Deital, P.J. 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. Deital, H.M. and Deital, P.J. C++ How to Program, Prentice Hall, 1998.

MI 8013 PETROLEUM ENGINEERING L T P C

3 0 0 3

AIM:

To study the methods for exploration, drilling operations and production in petroleum industry.

OBJECTIVES:

- To learn the exploration methods and reserve estimation in petroleum industry
- To know the drilling and production methods in petroleum industry

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 and economics.

TOTAL: 45 PERIODS

OUTCOME:

The students will get knowledge about exploration techniques, drilling operations, casing, cementation, well completion and production in petroleum industry.

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.

MI 8014 ROCK EXCAVATION ENGINEERING L T P C

3 0 0 3

AIM:

To study the rock mechanics, rock cutting technology and rock excavating machine.

OBJECTIVES:

- To understand the rock mechanics, rock cutting technology, rock cutting tools and rock excavating machine

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

OUTCOME:

The students will get familiarity about rock mechanics properties, rock cutting technology and excavating machines.

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.

MI 8015 ROCK REINFORCEMENT L T P C

3 0 0 3

AIM:

To study the rockmass classification, grouting and special methods of rock reinforcement.

OBJECTIVES:

- To introduce the rockmass classification and mechanism of rock reinforcement
- To learn the typical and special methods of rock reinforcement

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

OUTCOME:

The students will have the concept about the rockmass classification, mechanism of rock reinforcement, existing and special methods of rock reinforcement.

REFERENCES

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

MI8016 ROCK SLOPE ENGINEERING L T P C
3 0 0 3

AIM:
To understand the mechanism of rock slope failure and influencing parameters.

OBJECTIVES:
- To introduce the basic mechanics of rock slope failure
- To learn the types of rock failure and its influencing parameters

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

OUTCOME:

The students will know the fundamental mechanics of rock slope failure, types of failure and its influencing parameters.

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.

MI 8017 SMALL SCALE AND MARINE MINING L T P C

3 0 0 3

AIM:

To study the small scale and marine mining methods and its environment obligations.

OBJECTIVES:

- To introduce the small scale mining methods with case studies
- To introduce the marine geology and its exploitation techniques

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 & novel techniques, recent trends, processing, finishing, quality control, marketing & export of minerals. Case studies of mining of other minerals like sandstone, marble, beach sands, alluvial mining, mica, barytes, diamond and gemstones, etc.

UNIT III INTRODUCTION TO MARINE MINING 9

Introduction to marine environment, development & status of ocean resources of mining in

India and other parts of the world, Ocean profile, ocean floor topography, economic exclusive zone & fundamentals of law of the sea, coastal zone & 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

OUTCOME:

The students will have insight about small scale mining methods and marine techniques.

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.

MI 8018 SUBSIDENCE ENGINEERING L T P C

3 0 0 3

AIM:

To learn the subsidence mechanics, influencing parameters and its control measures.

OBJECTIVES:

- To know the basic subsidence mechanics and its influencing parameters
- To study the control measures of subsidence and its impact on structure

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

OUTCOME:

The students will have knowledge about the subsidence mechanism, prediction and influencing parameters. They will know about subsidence control, governing norms and regulations.

REFERENCES

1. Kratzsch, H., Mining Subsidence Engineering, Springer Verlag 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 Mudranalaya Publications, Dhanbad, 1982.
5. Peng, S., Surface Subsidence Engineering, SME, New York, 1992.

MI8019 **SYSTEMS ENGINEERING IN MINING** **L T P C**
3 0 0 3

AIM:

To study the application system engineering concept in mining industry.

OBJECTIVES:

- To know basic of system engineering concept and analysis
- To study the various techniques of operations research, simulation and network analysis

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

OUTCOME:

The students will learn the concept of system engineering and applicability in mining field.

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.

GE8071 FUNDAMENTALS OF NANOSCIENCES L T P C
3 0 0 3

OBJECTIVES

- To learn about basis of nanomaterial science, preparation method, types and application

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

OUTCOMES

- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials

- Will develop knowledge in characteristic nanomaterial

TEXT BOOKS

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

REFERENCES

1. G Timp, G. (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.

GE8751 ENGINEERING ETHICS AND HUMAN VALUES L T P C

3 0 0 3

OBJECTIVES:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES 10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time– Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality.

UNIT II 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 – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl Case Studies.

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 8

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Conduct.

TOTAL: 45 PERIODS

OUTCOMES :

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

TEXTBOOK

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.

REFERENCES:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Thompson Wadsworth, A Division of Thomson Learning Inc., United States, 2000.
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, “Fundametals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

MG8652 **MANAGEMENT SCIENCES** **L T P C**

3 0 0 3

OBJECTIVES:

The students should be made to:

- To make the students aware of the outline of managerial functions relating to manufacturing.

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

OUTCOMES:

At the end of the course, the student should be able to:

- The students would be able to understand the basic application of operational tools and manufacturing.

TEXT BOOK

1. Martand 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.

MG8654 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 product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Quality Gurus – Barriers to TQM – Cost of Quality.

UNIT II TQM PRINCIPLES 9

Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA 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 – Performance measures - BPR.

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 –Quality Council – Leadership, Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward.

TOTAL : 45 PERIODS

OUTCOMES:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

1. Dale H.Besterfiled, et al., “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.

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ME8076 ENTREPRENEURSHIP DEVELOPMENT L T P C

3 0 0 3

OBJECTIVE:

Study of this subject provides an understanding of the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc.

UNIT I ENTREPRENEURSHIP 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

UNIT II MOTIVATION 9

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS 9

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING 9

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/

CPM – Taxation – Income Tax, Excise Duty – Sales Tax.

UNIT V SUPPORT TO ENTREPRENEURS 9

Sickness in small Business – Concept, Magnitude, causes and consequences, Corrective Measures – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

TOTAL: 45 PERIODS

OUTCOMES :

- Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

TEXT BOOKS:

1. S.S.Khanka, "Entrepreneurial Development" S.Chand & Co. Ltd. Ram Nagar New Delhi, 1999.
2. Kuratko & Hodgetts, "Enterprenuership – Theory, process and practices", Thomson learning 6th edition.

REFERENCES:

1. Hisrich R D and Peters M P, "Entrepreneurship" 5th Edition Tata McGraw-Hill, 2002.
2. Mathew J Manimala," Enterprenuership theory at cross roads: paradigms and praxis" Dream Tech., 2nd Edition 2006.
3. Rabindra N. Kanungo, "Entrepreneurship and innovation", Sage Publications, New Delhi, 1998.
4. EDII " Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development" Institute of India, Ahmadabad, 1986.

ME8078 NEW AND RENEWABLE SOURCES OF ENERGY L T P C

3 0 0 3

OBJECTIVE:

At the end of the course, the students are expected to identify the new methodologies / technologies for effective utilization of renewable energy sources.

UNIT I INTRODUCTION 9

World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilisation – Renewable Energy Scenario in Tamilnadu, India and around the World - Potentials - Achievements / Applications – Economics of renewable energy systems.

UNIT II SOLAR ENERGY 9

Solar Radiation – Measurements of Solar Radiation - Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation - Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.

UNIT III WIND ENERGY **9**

Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance - Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects

UNIT IV BIO - ENERGY **9**

Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Bio diesel – Cogeneration - Biomass Applications

UNIT V OTHER RENEWABLE ENERGY SOURCES **9**

Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy – Hydrogen and Storage - Fuel Cell Systems – Hybrid Systems.

TOTAL : 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to identify the new methodologies / technologies for effective utilization of renewable energy sources.

TEXT BOOKS:

1. G.D. Rai, Non Conventional Energy Sources, Khanna Publishers, New Delhi, 2011.
2. Twidell, J.W. & Weir, A., Renewable Energy Sources, EFN Spon Ltd., UK, 2006.

REFERENCES:

1. S.P. Sukhatme, Solar Energy, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
2. Godfrey Boyle, Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K., 1996.
3. G.N. Tiwari, Solar Energy – Fundamentals Design, Modelling& Applications, Narosa Publishing House, New Delhi, 2002.
4. L.L. Freris, Wind Energy Conversion Systems, Prentice Hall, UK, 1990.
5. Johnson Gary, L., Wind Energy Systems, Prentice Hall, New York, 1985.
6. David M. Mousdale, Introduction to Biofuels, CRC Press, Taylor & Francis Group, USA 2010.
7. Chetan Singh Solanki, Solar Photovoltaics, Fundamentals, Technologies and Applications, PHI Learning Private Limited, New Delhi 2009.

ME8752 FINITE ELEMENT ANALYSIS **L T P C**

3 0 0 3

OBJECTIVES

- To introduce the concepts of Mathematical Modeling of Engineering Problems.

- To appreciate the use of FEM to a range of Engineering Problems.

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 ADVANCED TOPICS 9

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 – Introduction to Analysis Software.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to understand different mathematical Techniques used in FEM analysis and use of them in Structural and thermal problem

TEXT BOOK:

1. J.N.Reddy, “An Introduction to the Finite Element Method”, 3rd Edition, Tata McGraw-Hill, 2005.

REFERENCE BOOKS:

1. Seshu, P, “Text Book of Finite Element Analysis”, Prentice-Hall of India Pvt. Ltd., New Delhi, 2007.

2. Logan, D.L., “A first course in Finite Element Method”, Thomson Asia Pvt. Ltd., 2002
3. Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, “Concepts and Applications of Finite Element Analysis”, 4th Edition, Wiley Student Edition, 2002.
4. Rao, S.S., “The Finite Element Method in Engineering”, 3rd Edition, Butter worth Heinemann, 2004
5. Chandrupatla & Belagundu, “Introduction to Finite Elements in Engineering”, 3rd Edition, Prentice Hall College Div, 1990.

MF8078 QUALITY CONTROL AND RELIABILITY ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- Teach the essentiality of SQC, sampling and reliability engineering. Study on various types of control charts, six sigma and process capability to help the students understand various quality control techniques.
- Reliability engineering focuses on the dependability, failure mode analysis, reliability prediction and management of a system.

UNIT I STATISTICAL QUALITY CONTROL 9

Methods and Philosophy of Statistical Process Control - Control Charts for Variables and Attributes -Cumulative sum and Exponentially weighted moving average control charts - Other SPC Techniques – Process - Capability Analysis - Six sigma concept.

UNIT II ACCEPTANCE SAMPLING 9

Acceptance Sampling Problem - Single sampling plans for attributes – double sampling - multiple sampling - sequential sampling - Military standards - The Dodge Roming sampling plans – Random sampling.

UNIT III RELIABILITY ENGINEERING 9

Definition of reliability – Performance and reliability - Reliability requirements – System life cycle – Mean time between failures – Mean time to failure - Mortality Curve - Availability – Maintainability.

UNIT IV FAILURE DATA ANALYSIS 9

Statistical failures of components – failure distributions – Bath tub curve – Negative exponential distribution – Normal distribution - log normal distribution – Gamma distribution - Weibull distribution Life distribution measurements – Accelerated life tests - Data requirements for reliability.

UNIT V RELIABILITY PREDICTION AND MANAGEMENT 9

Failure rate estimates - Effect of environment and stress - Series and Parallel systems - RDB analysis – Standby Systems - Complex Systems - Reliability demonstration testing - Reliability growth testing - Duane curve - Risk assessment – FMEA and Fault tree analysis.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon successful completion of this course, the students can able to apply the concept of SQC in process control for reliable component production

TEXT BOOKS:

1. Khanna O.P., "Statistical Quality Control", Dhanpat Rai Publications (P) Ltd., 2001.
2. Lewis E.E., "Introduction to Reliability Engineering", John Wiley and Sons, 1987.

REFERENCES:

1. Zairi M., "Total Quality Management for Engineers", Woodhead Publishing Limited 1991.
2. Noori H. and Russell, "Production and Operations Management - Total Quality and Responsiveness", McGraw-Hill Inc, 1995.
3. Montgomery D.C., "Introduction to Statistical Quality Control", 2nd Edition, John Wiley and Sons, 1991.
4. Klaasssen H.B. and Peppen J.C.L, "System reliability concepts and applications", Edward Arnold, 1989.

GE8072 DISASTER MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community,

Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management.

TEXTBOOK:

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

GE8073 **HUMAN RIGHTS** **L T P C**
3 0 0 3

OBJECTIVES :

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I **9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II **9**

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV **9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V **9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS

OUTCOME :

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.