Faculty of Engineering & Technology

Study and Evaluation Scheme

Of

Bachelor of Technology

B.Tech. – Mining Engineering

II, III & IV Year

(Applicable w.e.f Academic Session 2013-16 till revised)

AKS UNIVERSITY, SATNA

Study and Evaluation Scheme

**** The University Authorities reserve all the rights to make any additions/ deletions or changes/ modifications to this syllabus as deemed necessary.**

AKS University, Satna

Sherganj, Panna Road, Satna (MP) 485001

Study & Evaluation Scheme
of
Bachelor of Technology (Mining Engineering)
SUMMARY

Programme :	**B.Tech (Mining)**		
Duration :	Four year full time (Eight Semesters)		
Medium :	English		
Minimum Required Attendance :	75 %		
Maximum Credits:	162+54 (First Year)= **216**		
Evaluation Assessment :	**Internal**	**External**	**Total**
	50	100	150

Internal Evaluation (Theory/ Practical Papers)

Sessional-I	**Sessional-II**	**Continuous Assessment & attendance**
10	10	10+20= 30

Duration of Examination :	**External**	**Internal**
	3 hrs.	2 hrs

To qualify the course a student is required to secure a minimum of 36% marks in aggregate including the semester end examination, internal assessment evaluation (Both theory & Practical Papers)

A candidate who secures less than 36% or Grade **'D**' of marks in a Subject/Paper(s) shall be deemed to have failed in that Subject/Paper(s). In case a student has secured less than 36% or Grade **'R'** in Subject/Paper(s), he/she shall be deemed to re-appear (ATKT Examination) in Subject/Paper(s) to achieve the required percentage (Min. 36%) or grade (Min. D) in the Subject/Paper(s).

Question Paper Structure

1. *The question paper shall consist of 26 questions in three Sections. Out of which Section-A shall be of Objective type 10 questions and will be compulsory. (weightage 2 marks each).*
2. *Section-B shall contain 10 Short answer type questions and students shall have to answer any eight (weightage 5marks each).*
3. *Out of the remaining six question s are long answer type questions, student shall be required to attempt any four questions. The weightage of Questions shall be 10 marks each.*

Faculty of Engineering & Technology
Department of Mining Engineering

B.Tech. & B.Tech+M.Tech (Integrated)

(Mining Engg.)

III Semester

TEACHING & EXAMINATION SCHEME

S.N.	Subject Code	Subject	Period			Credit
			L	T	P	
1	05GE301	Mining Geology-I	3			3
2	05MS302	Engineering Mathematics - III	4			4
3	05CE303	Mine Surveying-I	3			3
4	05EE304	Electrical & Energy Engineeing	3			3
5	05MI305	Introduction to Mining & Mineral Resources	4			4
6	05SD306	Soft Skills Development			2	1
7	05ME307	Strength of Materials	3			3
8	05GE351	Mining Geology - Lab			2	1
9	05MI352	Introduction to Mining & Mineral Resources (Lab)			2	1
10	05CE353	Mine Surveying - Lab			2	1
11	05EE354	Electrical Engineeing & Energy - Lab			2	1
12	05ME355	Strength of Materials -Lab			2	1
			20	0	12	26

Faculty of Engineering & Technology
Department of Mining Engineering

B.Tech. & B.Tech+M.Tech (Integrated)

(Mining Engg.)

IV Semester

TEACHING & EXAMINATION SCHEME

S.no.	Subject Code	Subject	L	T	P	Credit	Total Credit
1.	05GE401	Geology-II	3	1		4	30
2.	05MI402	Surface Mining	3	1		4	
3.	05MI403	Mining Machinery-I	3	1		4	
4.	05MI404	Mine Ventilation & Environment-I	3	1		4	
5.	05ME405	Fluid Mechanics	3	1		4	
6	05MS406	Statistics & Probability	3	1		4	
7.	05SD407	SSD			2	1	
1.	05GE451	Geology-II lab			2	1	
2.	05MI452	Surface Mining Lab			2	1	
3.	05MI453	Mining Machinery-I Lab			2	1	
4	05MI454	Mine Ventilation & Environment-I Lab			2	1	
5	05ME455	Fluid Mechanics Lab			2	1	

Faculty of Engineering & Technology
Department of Mining Engineering

B.Tech. & B.Tech+M.Tech (Integrated)

(Mining Engg.)

V Semester

TEACHING & EXAMINATION SCHEME

Sr. no.	Subject Code	Name of the Subject	Periods/ Week		Total Credit
			Theory + (Tutorial)	Practcals	
1.	05MI501	Metal Mining	3+1	-	4
2.	05MI502	Mining Machinery I	3+1	-	4
3.	05MI503	Mine Ventilation & Environment II	3+1	-	4
4.	05MI504	Advanced Mine Surveying	3+1	-	4
5.	05MI505	Rock Mechanics & Strata Control	3+1	-	4
6.	05SD506	SSD		2	1
7.	05MI551	Semester break Training	-	-	-
8.	05MI552	Rock Mechanics (Lab)	-	2	1
8.	05MI553	Mining Machinery (Lab)	_	2	1
9.	05MI554	Mine Surveying (Lab)	-	2	1
10.	05MI555	Metal Mining (Lab)	-	2	1
		Total			**25**

Faculty of Engineering & Technology
Department of Mining Engineering

B.Tech. (Mining Engg.)

VI Semester

TEACHING & EXAMINATION SCHEME

Sr. No.	Subject Code	Name of the Subject	Periods/Week		
			Theory + (Tutorial)	Practcals	Credits
1.	05CA601	Computer application in Mining	**3+1**	**-**	**4**
2.	05MI602	Advanced Mine Surveying	**3+1**	**-**	**4**
3.	05MI603	Advanced Rock Mechanics & Ground Control	**3+1**	**-**	**4**
4.	05GE604	Advanced Mining Geology	**3+1**	**-**	**4**
5.	05MI605	Coal & Non-Coal Mineral Processing	**3+1**		**4**
6.	05MI651	Advanced Rock Mechanics & Ground Control (Lab)	**-**	**2**	**1**
7.	05CA652	Computer application in Mining (Lab)	–	**2**	**1**
8.	05MI653	Coal & Non-Coal Mineral Processing (Lab)	**-**	**2**	**1**
9.	05GE654	Advanced Mining Geology (Lab)	**-**	**2**	**1**
10.	05MI655	Advanced Mine Surveying (Lab)	**-**	**4**	**2**
		Total			**26**

Faculty of Engineering & Technology
Department of Mining Engineering

B.Tech. (Mining Engg.)

VII Semester

TEACHING & EXAMINATION SCHEME

Sr.No.	Subject code	Name of the Subject	Periods/Week		
			Theory + (Tutorial)	Practcals	Credits
1.	05MI701	Mine Legislation & Safety	3+1	-	4
2.	05MT702	Mine Management	3+1	-	4
3.	05MI703	Mining Machinery III	3+1	-	4
4.	05MI704	Mine Economics & Financial Management	3+1	-	4
5.	05MI751	Project			4
6.	05MI752	Mine Practical Training during Semester break	-	-	4
7.	05MI753	Mining Machinery-III (Lab)	-	2	1
8.	05MI754	Seminar & Report Writing	-	6	3
		Total			**28**

Faculty of Engineering & Technology
Department of Mining Engineering

B.Tech. (Mining Engg.)

VIII Semester

TEACHING & EXAMINATION SCHEME

Sr. No.	Subject Code	Name of the Subject	Periods/Week		
			Theory + (Tutorial)	Practcals	Credits
1.	05MI801	Mine Planning & Design	3+1	-	4
Elective one to be selected					4
2.	05MI802-A	Rock Excavation Engineering	3+1	-	
	05MI802-B	Maintenance management & Reliability Engineering	3+1	-	
3.	05MI803	Numerical Methods in Mining Engineering Application	3+1	-	4
4.	05MI851	Project	7+1	-	8
5.	05MI852-A/B	Elective related Practical	-	4	2
6.	05MI853	Mine Planning & Design	_	2	1
7	05MI854	Seminar and Viva	-	-	4
		Total			**27**

B.TECH. (Mining Engineering)

III SEMESTER

INTRODUCTION TO MINING & MINERAL RESOURCES

UNIT I:

Mining Terms and Terminology, Mineral resources of MP. & Chhattisgarh, India and World; Mining of important economic minerals in India; Role of Mining on economic development, Introduction and comparison of underground and surface mining. Introduction to unit operations.

UNIT II: Mining Sector of India

Mineral administration of India (Min. of Coal, Min. of Mines, Min. of Earth Sciences, CSIR) and MP(undivided – Directorate of Mining & Geology, GSI set up, State Pollution Control Board), Indian Bureau of Mines, DGMS and its role, PESO and its role in Mining, Research institutions in India in Mining and their role, Mining professional institutions (FIMI, MGMI, MEAI, CII, Assoc hem) and their contribution to mining sector etc; Regulatory bodies in Mining.

UNIT III: Fundamentals of Prospecting and Exploration

Reconnaissance; principles and methods of prospecting - pit, shaft, trench and boreholes; Methods of Exploration, Selection of sites for boreholes; Surface layout of boring; Details of equipment, Borehole logging; Maintenance of records; Deflection of boreholes; Difficulties in boring; Fishing tools and their uses; Methods of exploratory drilling for oil; Interpretation of borehole data.

UNIT IV: Development of Deposits

Access to seated deposits by Adit/Drifts/Incline/Shafts; Shaft sinking operations- drilling and blasting, loading and transportation of muck, ventilation, lighting and drainage; Lining of shafts, special methods of shaft sinking. Stripping ratio.

UNIT V: Explosives & Blasting

Classification and comparative properties of explosive; Blasting devices; General application and uses; Blasting theory; Safety considerations. *Blasting system:* Electric and non-electric methods; Delay blasting techniques; Priming; Charge distribution; Mechanisms of rock blasting; Blasting with cut and solid blasting, Introduction to SMS, PMS, Emulsion and Heavy ANFO etc., Safety aspects of explosives. Substitute to drilling and blasting.

Text Books

1. D.J.Deshmukh, Elements oif Mining Technology, Vol. I, Denett & Co., Nagpur
2. Dr T.N.Singh, Surface Mining, Lovely Prakashan, Dhanbad
3. B.V.Gokhale, Blasthole drilling Technology, MultiFields, Bombay
4. Dr G.K.Pradhan, Explosives & Blasting Techniques, Mintech Publications, Bhubaneswar
5. Dr.Sushil Bhandari, Engineering Rock Blasting Operations. Pub: A.A.Balkema Publisher Old post Road, Brook field, TO5036, USA.
6. Dr S.K.Das, A Handbook on Surface Mining Technology, Lovely Prakashan, Dhanbad
7. R.D. Singh, Principles & Practices of Modern Coal Mining Pub:- New Age International Pvt.Ltd. New Delhi

References

1. Indian Bureau of Mines, Minerals Year Book & other publications
2. Dr C.M.Kole, Khuli Khan Ka Ayojan (Hindi), CMPDIL, Ranchi
3. Dr. Calvin Konya; "Rock Blasting and Overbreak Control" Precision Blasting Services, Montville, Ohio
4. C.P. Chugh, High Technology in Drilling and Exploration. Pub: Oxford & IBH Publishing Co. Pvt.Ltd. New Delhi.
5. C.P. Chugh, Diamond Drilling. Pub: Oxford & IBH Publisher. Howard, L.Hartman, Introductory Mining Engineering, Pub: John Willey & Sons
6. Web sites : mines.nic.in, GSI, CMPDI, Coal India, NMDC etc.

Reference Journals

1. Journal of Institution of Engineers(India)-Mining
2. Journal of Mines, Metals & Fuels, Kolkata
3. Indian Mining & Engineering Journal, Bhubaneswar
4. Journal of Mining Engineers, MEAI, Hyderabad
5. Minetech, CMPDIL(Quarterly)
6. CMTM(Coal Mining Technology) Journal, IIMC Publication, Ranchi
7. Minerals & Metals Review, Bombay

Field Visits

1. Limestone Mines
2. Coal Mines (UG) in Shahdol Dt.
3. Coal Mines (Opencast) in Sidhi Dt.

B.TECH. (Mining Engineering)

III SEMESTER

MINING GEOLOGY -I

Unit- I

Introduction of Geology

Branch of geology, Scope of geology, Origin of Earth, Age of Earth, Structure of Earth. Importance of Geology in Mining.

Unit- II

Mineralogy & Crystallography

Minerals – definition, formation and occurrences. Identification – physical, chemical and optical. Classification of minerals.
crystal systems. Polymorphism and isomorphism.

Unit- III

Economic Geology

Introduction and definition of Economic Geology.
Ores and gangue – genesis, classification, distribution in India and geological occurrences. Uses of importantance. metallic and non-metallic minerals.
Atomic mineral resources of India – genesis and occurrence.

Unit- IV

Structural Geology: Stratified rocks and their structures. Attitude of strata. Outcrop and incrop.
Folds – genesis, classification, identification in field, impact on landscape, mineral deposits, mining and tunnelling.
Faults – mechanism of faulting, classification, impact of faulting on topography, significance of faults in mining
engineering and tunnelling.
Joints – definition and characteristics, classification, occurrence of joints metamorphic rocks.

Unit- V

Petrology: Igneous, sedimentary and metamorphic rocks – origin, characteristics, classification, uses and mining importance. Significance of texture and structure of rocks on geomechanical properties of rock mass.

Text & Reference Books :-

1. Engineering and Genaral Geology:- Parbin Singh
2. Structure Geology :- M.P. Billings
3. A TEXT OF GEOLOGY :- G.B. MAHAPATRA
4. The Principles of Petrology :- G.W. Tyrell
5. ECONOMIC GEOLOGY:- Umeshwar Prasad
6. Rutley's Elements of Mineralogy:- H.H. Read
7. A Text Book of Geology:- P.K. Mukharjee
8. Engineering Geology : D.V. Reddy
9. Geology of India (Vol I&II) : R. Vaidyanadhan & M. Ramakrishnan

B.TECH. (Mining Engineering)

III SEMESTER

MINE SURVEYING – I

Unit-I : Chain Survey

Linear Measurements; Types of chains; Errors in chaining and corrections in linear measurements; Direct and indirect Ranging; Principles of chain surveying. Offsets, Limiting length of offsets; Booking field notes; Obstacles in chaining; Instruments for setting out right angle.

Unit-II :

Compass Survey (Traversing): Theory of Magnetism; Dip of Magnet needle; Prismatic Compass; Surveyor's Compass; Bearing; Designation of Bearing; Calculation of Included Angle; Local Attraction; Magnetic Declination. Construction, Use, Test and Adjustment of Miner's Dial.

Unit-III : Plane Table Surveying

Principle of Plane Tabling; Working operation; Methods of Plane Table Surveying; Radiation, Intersection, Resection, Traversing Method of Plane Table Surveying.

Unit-IV :

Definition of important term used in levelling; Development in levelling Instrument; Types and Constructional details of Dumpy Level, Auto Level; Temporary and Permanent Adjustments; Introduction and Different Method Of Leveling; Reciprocal Levelling; Longitudinal Sections; Trigonometric Levelling; Methods Of booking and reduction of levels; Plumbing measurement of depth of shaft and subsidence.

Unit-V :

Theodolite , classification, constructional features, Technical Term and Adjustment of Theodolite.

Text Books:

1. Mines Surveying by S.Ghatak
2. Surveying & Leveling by B.C. Punamia
3. Surveying & Leveling by Kanetkar & Kulkarni

Reference:

1. Agor, R. 1998. Surveying and Leveling, Khanna Publishers, New Delhi.
2. Kochher, C.L. 1986. A Text book of surveying. Vol-I and Vol-II. Katson Publishing House, Ludhiana.

Practicals:

1. To Determine the Pace Factor.

2. To study the Different types of chain used in Chain Surveying.

3. To Determine the Area by Cross Staff Survey.

4. To Study the Dumpy Level and Auto Level.

5. To Study the Theodolite.

6. To Study the various Survey Instruments used in chain surveying.

7. To Study the Prismatic Compass.

8. To Determine the fore bearing and back bearing by the use of Prismatics compass.

9. To Determine the area by Radiation method of plane table surveying.

10. To Determine the Height of an Object by using Theodolite.

B.TECH. (Mechanical Engineering)
III SEMESTER
ENGINEERING MATHEMATICS-III

Unit – I: Function of Complex variable

- Definition, derivatives of complex function, Analytic function.
- Cauchy-Riemann equations, in Cartesian form and polar form.
- Conjugate function, Harmonic function, Methods for finding the analytic function.
- Cauchy's integral theorem, Cauchy's integral formula for analytic function.
- Poles and singularities of analytic function, Residue theorem (without proof) and its application.

Unit – II: Numerical Techniques – I

- Finite differences: Difference table [Forwarded Difference operator, Backward Difference operators and central Difference operator]
- Interpolation**:** Newton-Gregory forward and backward interpolation formula for equal intervals, Gauss's forward and backward interpolation formula for equal intervals, Gauss's central difference formula for equal intervals.
- Stirling's formula, Bessel's formula, Everett's formula for equal intervals.

Unit – III: Numerical Techniques – II

- Numerical Differentiation : Newton's forward difference formula and Newton's backward difference formula for derivative, Gauss's forward difference formula for derivative, Newton's divide difference formula for derivative.
- Lagrange's interpolation formula for unequal intervals and Newton's divided difference interpolation for unequal intervals.
- Numerical integration: Trapezoidal rule, Simpson's one third rule, Simpson's three-eight rules, and Weddle's rule.

.**Unit – IV Numerical Techniques –III**

Numerical solution of algebraic and Transdantal equations: Bisection method, Secant method, Regular-falsi method, Newton-Raphson method and Graeffe's root squaring method.

- Numerical solution of ordinary differential equations: Taylor's series method, Euler's method, Euler's modified method, Picard's method, Runge- Kutta method.
- Solution of simultaneous algebraic equation: Gauss- Seidal method, Gauss elimination method, Guass-jordan method.

Unit – V Probability Distribution

- Binomial Distribution: Hypothesis, characteristics, mean, variance and standard deviation and moments.
- Poisson distribution: Hypothesis, characteristics, condition for Poisson distribution, mean, variance and standard deviation.

- Normal Distribution: Standard normal distribution, properties of normal curve.
- Curve fitting: Method of least squares, Fitting of straight lines, and parabola of second degree.

Text Books:

1. D.C. Agrawal, Engineering Mathematics-III, Sai prakasan
2. H.K.Das, Basic Engineering Mathematics-III, S.Chand & company Ltd.
3. D. K. Jain., Engineering Mathematics-III
4. Sonendra Gupta, Engineering Mathematics-III, Dhanpat Rai Publishing Company(P) Ltd.

Reference Books:-

1. B.S.Grewal, Engineering Mathematics, Khanna Publishers, 2004.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
3. Chandrika Prasad, Advanced Mathematic for Engineers, Prasad Mudranalaya,1996.
4. B.V.Ramana,Higher Engineering mathematics,Tata Mcgraw-Hills Publishing Company Limited.

B.TECH. (Mining Engineering)

III SEMESTER

STRENGTH OF MATERIALS

UNIT – I : Introduction

Basic of stress & strain, Elastic constant, Stress-strain diagram, Hooke's law, Stresses in the components subjected to multi-axial forces, Temperature stresses, Statically indeterminate system.

UNIT – II: Bending of beams

Bending of beams with symmetric section, boundary condition, Pure bending, Bending equation, traverse shear stress distribution in circular, hollow circular, I & T section.

UNIT – III: Deflection of Beam

Relation between slope deflection and radius of curvature, solution of beam deflection, problem by Macaulay's method, Direct integration method, Method of super position, Moment Area Method.

UNIT –IV: Torsion

Deformation in circular shaft due to torsion, Basic assumption, Torsion equation, Stresses in elastic range, Angular deflection, hollow and stepped circular shaft. Spring: Closed and open coil helical spring subjected to axial load, spring in parallel & series.

UNIT – V: Principle stresses and strain

Transformation of plane stresses, Principle stresses, Maximum shear stresses, Mohr's circle for plane stresses, Plain strain and its Mohr's circle representation, Principle strains, Maximum shear strain.Combined Loading: Components subjected to bending, torsion & axial loads.

Text Books:

1. Elements of strength of material – Timoshenko & young- EWP press
2. Mechanics of Solids – Beer & Johnson, Tata McGraw Hill Publications.

Reference Books:

1. Strength of material – Rider–ELBS
2. Introduction to Solid Mechanics – I.H.Shames–PHI
3. Strength of Materials – R.K. Rajput – Dhanpat Rai & Sons
4. Strength of Materials – Dr. Sadhu Singh – Khanna publication.

B.TECH. (Mining Engineering)

III SEMESTER

ELECTRICAL & ENERGY ENGINEERING

Unit-I : D.C. Machines

Characteristics curves of d. c. generators and motors. Application of motors for different uses, starting and speed control of motors.

Unit-II : Transformers

Phasor diagram and equivalent circuits, regulation efficiency and their determination, open circuit, short circuit and sumpeners's test.

Unit-III: Induction Motors

Poly phase induction motors- Starters, equivalent circuit, effect of rotor resistance, torque slip curves, speed control by rotor resistance, pole changing and cascading, use in industry; Single – phase induction motor- starting methods.

Unit-IV: Alternators

Elementary idea of armature winding- calculation of induced e. m. f. factors affecting generating e.m.f. open circuit, short circuit and load characteristics. Voltage regulation and its determinations by synchronous impedance methods, synchronizing. Synchronous Motors: Methods of starting, power angle characteristics of cylindrical rotor machine, operation of synchronizing motor as a condenser and as a reactor, Application in Industries.

Unit-V

Sources of Energy (Coal-Lignite, Oil, Nuclear), Global and Indian Energy scenario, Energy scenario in MP & CG, Conventional Energy (Thermal, Hydel, Nuclear etc), Non-Conventional Sources of Energy (Solar, Wind, Tidal etc), Energy Conservation efforts, Bureau of Energy Efficiency in India, Energy Audit.

Practicals :

The practicals will be as per the theory syllabus.

Text Books

1. Nagrath and Kothari. Electrical Machines
2. Ashfaq Hussain. Fundamentals of Electrical Engineering
3. Practical Guide to Energy Conservation : PCRA Publications (Unit V)
4. Electrical Engineering in Mines, by N.K.Datta

SSD- CSEP (Communication skills Enhancement Program)

3rd Semester

B.Tech (Engg.)/B.Tech (Ag.)/B.Tech (BT)/B.Sc.(Hons) Ag./B.Sc (BT)/B.Pharm/BBA/B.Com/B.com(Hons)/BCA(Hons)/B.Sc. (IT)/Diploma (Engg.)

CSEP PROGRAM: This programme is devised to give you all an exposure to the language used in various communication activities. The objective of the programme is to enhance our communication skills. Research says that the more you listen and speak a language the faster you learn. In these sessions, we are going to practice to speak sentences and words used in different situations. Once you have the command on the language, you can use it for any context; be it interviews, presentations, business, technology so on and so forth.

Learning through activities is more effective than learning through lectures and books. We are going to provide you with opportunities to make speeches, presentations, interact with various people etc.

Unit-1

Thematic structure: Money, Cricket, A trip to Gizmo world, Culture and Shopping

Assignment: Progress Test-1

Unit-2

Thematic structure: Festivals, Computers, Auto mania, Environment and studying abroad.

Assignment: Progress Test-2

Unit-3

Thematic structure: Internet, Fashion & Style, Globalization, all about jobs and Trends in Technology.

Assignment: Progress Test-3

Unit-4

Conversation Questions: College, Beauty and Physical attractiveness, Food and eating, Entertainment, Advertising, Films in your own language, Books & reading.

Activities: Reading newspaper and news analysis, Role plays, Extempore, JAM, Story creation, Picture description, Group Discussion and celebrity Interview.

Assignment: Post assessment Test

B.TECH. (Mining Engineering)

III SEMESTER

Mining Geology-I Lab

List of Experiments:

1. Megascopic Description of Rock Forming Minerals.
2. Megascopic Description of important Igneous, Sedimentary, Metamorphic Rocks.
3. Basic Concept of Contours, Attitude of Beds, Width of Outcrop, True and Apparent Dips, Rules of V's.
4. Study of Geological Maps and Preparation of Cross Sections.

Text Books:

1. Engineering And General Geology : Parbin Singh
2. Physical And Engineering Geology : S.K. Garg
3. Rutley's Elements of Mineralogy : H.H. Read
4. Principles Of Petrolog y : G.W. Tyrell

Reference Books:

1. Structural Geology : M.P. Billings
2. Geological Maps : G.W. Chiplonkar
3. Indian Stratigraphy, by R.Kumar

B.TECH. (Mining Engineering)

III SEMESTER

Introduction to Mining & Mineral Resources (LAB)

1. Mapping of different mineral resources of (i) MP & CG, (ii) India and (iii) World.
2. Illustration of Mining Terminology.3. Development lay out for Mines (UG, & Opencast)
4. Selection of various types of blasting accessories used in mines and designing of explosive magazines
5. Bulk explosive system (SME, ANFO Vans etc)
6. Study of portable magazine
7. Study of exploder

B.TECH. (Mining Engineering)
IV SEMESTER
Geology II

Unit I: Stratigraphy & Palaeontology
Introduction-Definitions and Basic Principles of Stratigraphy – Units of Stratigraphy-Criteria for Stratigraphic Classification and Coorelation-Standard Geological Time Scale. Definitions & basics of Palaeontology - Fossils –Elementary odea of their conditions-Modes of their preservation and uses-brief palaeontological study of Gondowana Fields. India examples.

Unit II: Indian Geology
Major Geomorphic Divisions of India – General Review of Indian Stratigraphy – Descriptions of important India Geological formations – Archeans, Cuddapahs, Vindhyans, Gondowanas and Tertieries.

Unit III: Economic Geology I
Introduction – definitions – brief review of the processes of mineral formation and genetic classification of mineral deposits – occurrences – origin and distribution of coal, lignite and petroleum deposits of India.

Unit IV: Economic Geology II
Mode of occurrence – origin – distribution association and industrial uses of important metallic (Au, Al, Cu, Fe, Mn, Sn, Pb and Zinc) and non-metallic minerals (Diamond, Mica, Radioactive minerals, beach sands, limestone, dolomite, gypsum, fire-clay, magnesite, talc, asbestos, graphite, kyanite, sillimanite, corundum, fluorite, phosphorite, precious and semi precious stones, building/dimensional stones, marble).

Unit V: Advanced Prospecting, geological exploration
Prospecting and exploration – application of geological, geophysical, geochemical prospecting for ore deposits; Case studies of important Indian discoveries; Composition of exploration programme, surveying, geological mapping, trenching, pit making, drilling-core logging, preparation of plans and sections; exploratory mining, sampling and sample analysis, preparation of grade control maps, mine layout plan and section preparation and study, UNFC classification of mineral deposits; study of Indian ore reserves on UNFC classification basis and Indian Bureau of Mines Mineral Inventory. Methods of reserve estimation, advanced geostatistical methgod of geological exploration, reserve estimation and technological assessment of the mineral deposits, Computer-aided deposit evaluation.

Text Books :

1. Ravindra Kumar, Fundamentals of Historical Geology and Stratigraphy of India
2. M.S.Krishnan, Geology of India and Burma
3. M.S.Krishnan & others, Economic Mineral Deposits

Reference Books :

1. Araogyaswamy : Courses in Mining
2. D.V.Reddy, Applied Geology
3. D.V.Reddy, Engineering Geology
4. R.Vaidyanandhan & M.Ramakrishnan, Geology of India (Vol. I & II)
5. Minerals Handbook of India, IBM, Nagpur

B.TECH. (Mining Engineering)
IV SEMESTER
SURFACE MINING

Unit – I

Applicability : Applicability and limitations of surface mining, Classification (for bedded, hilly, placer deposits), Surface Mine Design

Basic Parameters: Size of mine area ; Pit depth; Annual production and life of mine; Bench height, width and slope, Pit slope; Cut-off grade; Stripping ratio

Opening of Benches : Factors influencing in location of mine openings, Opening of deposits, Trench, Ramp; Width and slope of entry trenches; Driving of entry and opening trenches; Formation of benches.

Unit – II

Surface Mine Planning (both coal and non-coal minerals) : Role of geological investigation, ore reserve estimation, mining area delineation; Bench design (bench formation, height, width, slope), factors influencing in equipment selection, mine scheduling, production scheduling, operation scheduling, factors influencing in efficiency improvement during planning stage.

Overburden/waste removal – Equipment selection, bench parameter selection; Working with rippers, shovels, draglines, shovel-dragline combination; bucket wheel excavators, etc; Casting methods, Disposal of OB/waste material, Dump design,

Unit – III

Drilling/Blast hole drilling - Drilling mechanism, selection of drills for coal and other formations, drill maintenance and dust control, bit selection and bit life improvement etc.

Blasting - Explosives, Blasting accessories, Bulk explosives, Blasting Theory and Blast Design, Blast performance assessment, problems in blasting, environmental impact of blasting, Blasting safety & Accident analyses, Special techniques (for dragline bench blasting/casting, dimensional stone blasting, pre-splitting, smooth wall blasting), Computer assisted blasting and instrumentation in blast assessment.

Unit – IV

Methods of excavation & transportation – shovel-dumper combination, draglines, surface miner, bucket wheel excavator, Types of transport system – their selection, Deployment and application, Computerised truck dispatch system, Haul rod design and maintenance, etc.

Various surface mine layout study – Types of layouts in surface mines, layout problems and their solutions for six different layouts,

Unit – V

Special methods of mining – mining of coal from over developed galleries, placer mining, hydraulicking, dredging, leaching, steep angle conveying system, high angle conveying system, in-pit crushing and conveying, , highwall mining.

Mine production support systems : Mine lighting, dust control, drainage, slope management, manpower management in mines.

Text books

1. Surface Mining Technology, by Prof S.K.Das, Lovely Prakashan, Dhanbad
2. Surface Mining, by Dr T.N.Singh, Lovely Prakashan, Dhanbad
3. Surface Mining, by Prof G.B.Mishra, available at Lovely Prakashan, Dhanbad
4. Explosives & Blasting Techniques, by Prof G.K.Pradhan, Mintech Publication, Bhubaneswar.
5. Advanced Surface Mining, by Prof G.K.Pradhan & Manoj Pradhan, Mintech Publication, Bhubaneswar.

Practicals

1. Drawing of schematic diagram showing different types of surface mining methods adopted in Coal, Lignite and non-coal mineral mining.
2. Designing an approach road/ramp to open a deposit by surface mining.
3. Various techniques used in over cast from cost benefit point of view.
4. Designing various layouts for hilly deposits of vein and bedded formation.
5. Designing various types of layouts for deposits below the general ground level.
6. Designing of various types of layouts for placer deposits.
7. Designing a deposit by opencast mining, which has been partially excavated by underground mining.
8. Performance and choice of drilling equipment in surface mine working. (Mine visit to assess rate of drilling, blast hole drilling usage from drill movement to positioning and final hole completion stages).
9. Designing the blast hole charging, taking into consideration various parameters. (Field observation of a production mine blasting).
10. Measurement of blasting vibrations with Blastmate series III equipment and its analysis. Field observation and data recording.
11. Design of mine lighting and study of their illumination level.

B.TECH. (Mining Engineering)
IV SEMESTER
Mining Machinery I

Unit – I

Air Compressors; types, construction, installation & maintenance; Transmission and distribution of compressed air; Calculations of main parameters; Comparison of compressed air with other forms of power. Compressed Air: Wire ropes used in mines- types and their construction, installation, maintenance and tests; Rope splicing and change of ropes, rope capels and process of capping

UNIT - II

Introduction to drilling systems; Mechanics of percussive, rotary and rotary-percussive drilling; Different types of drills – compressed & hydraulic, diesel and electric drills; Selection of drills; Jack hammers, sinkers, stoppers, drill; jumbos, wagon drills and other blast hole drills; Drill accessories and their working; Types of drill steels, Drill Bits and their uses, maintenance for better drilling bit life etc.

UNIT - III

Machinery for underground mining: Loaders: SDL, LHD, LPDT; Cutter loaders: SERDS, DERDS, Coal Plough, Continuous miner, Road headers, Cable bolting machine.

UNIT - IV

Surface Mine Machinery (HEMM-Heavy Earth Moving Mining Machinery) – HEMMs required for development and production support system like dozers, motor graders, pavers, scrappers, rippers; HEMM required for production method- shovels (rope or hydraulic), draglines, BWE(Bucket Wheel Excavators), Dumpers, Coal haulers, Surface Miners, Spreaders, Reclaimers, Back hoes; Rock breakers. In-pit crushing and conveying system.

Practical

1. Transmission and distribution of compressed air for surface and underground mines with pressure losses and remedial measures.
2. Shearers used in coal mines.
3. Construction of Jack Hammers
4. Different types of drill bits used in coal mines underground and in surface mines.
5. Different types of loading machineries used in surface mines.
6. Dragline application
7. Application of Bucket Wheel Excavators
8. Construction feature of draglines.

Suggested Readings

1. Surface Mining, by Dr. G.B. Mishra, Pub:Dhanbad Publisher
2. Heavy Earth Moving Machinery, by Prof. Amitosh Dey, Available at Lovely Prakashan, Dhanbad
3. Mine Hoisting, by Prof M.A. Ramlu, Pub: Oxford & IBH Publishing Co. Pvt.Ltd. New Delhi.
4. Mine Transport. Karelin, Pub:- Orient Longmans Ltd. New Delhi.
5. High Technology in Drilling and Exploration, by C. P. Chug; Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
6. Principles & Practices of Modern Coal Mining, Prof R.D.Singh, New Age International Pvt.Ltd. New Delhi.
7. Mining Machinery Maintenance and Capacity Utilization, by Prof Khanindra Pathak, Published by Cygnus Publication, Kolkata

B.TECH. (Mining Engineering)
IV SEMESTER
MINE VENTILATION & ENVIROINMENT I

Unit-I

Introduction to underground mine ventilation. Why ventilation is required in underground Coal and Metal mines ?

Mine Gases: Occurrence, properties, detection, measurement and monitoring; Methane layering; Methane drainage. Influence of mine gases in general mine environment.

Heat and Humidity: Sources; Effect and control of heat and humidity in mines; Conditions of comfort; Cooling power of mine air; Air conditioning.

Unit-II

Air Flow in Mine Workings: Standards of ventilation; Reynold's number; Laminar and turbulent flow; Pressure losses due to friction and shock resistances; Pressure across the mine; Equivalent orifice of the mine; Resistances in series and parallel; Air quantity requirements; Leakages; Homotropal and Antitropal ventilation; Central and boundary ventilation. Network analysis.

Unit-III

Natural Ventilation: Mechanism; Estimation and measurement of natural ventilation pressure; Characteristic curves.

Mechanical Ventilation: Centrifugal and axial flow fans- Construction, pressure developed, characteristic curves, series and parallel operations; Installation and testing; Forcing and exhaust ventilation; Fan drifts and evasees; Reversal of air flow.

Auxiliary Ventilation: Longitudinal air curtains and brattices; Forcing, exhausting and forcing cum exhausting ventilation systems; Dust extraction; Auxiliary fans- Types, construction, characteristics, location and installation; Air ducts; Risk of re-circulation.

Unit-IV

Ventilation Devices: Stopping, doors, air locks, air crossings and regulators; Regulators and boosters for the regulation of air flow - Construction, location and installation and their effect on the air flow inthe panel and the entire mine; Risk of re-circulation; Controlled recirculation for ventilating extensive mine workings.

Ventilation Survey: Purpose, instruments, procedure, tabulation and calculation, Preparation and interpretation of ventilation plans.

Practical:

1. Different gases found in coalmines, metal mines and their permitted limits as per the mining regulations. Effect of these gases when found in excess.
2. Various types of Methanometers used in mines and their selection criteria.
3. Various types of CO-detectors used in mines and their selection criteria
4. Measurement of relative humidity with the help of various types of hygrometer.
5. To find the effect of heat, humidity and air velocity with the help of Kata-thermometer.
6. Various air circuits with resistance in series and parallel.
7. Calculation for the installation of main ventilation fan and its reversal arrangement.
8. Design the evasee of ventilation fan in different working conditions.
9. Designing auxiliary ventilation system and their comparative performance.

10. Measurement of air velocity with the help of anemometer,velometer etc, measurement of temperature, pressure etc.
11. To prepare complete ventilation plan and indicating air direction and other ventilation devices as per the regulation in various colour codes.
12. Air conditioning problem.
13. Ventilation survey problem.
14. Auxiliary fan problem.
15. Networking problems

Text Books/References

1. G.B. Mishra. Mine Environmental Engineering. Pub: Dhanbad Publisher, Dhanbad
2. L.C. Kaku. Numerical Problems on Mine Ventilation. Pub: Punam Publisher
3. Howard, L.Hartman. Introductory Mining Engineering, Pub: John Willey & Sons
4. Mutmansky & Weng. Mine ventilation & Air conditioning. Pub: John Willey & Sons
5. Prof. S. P. Banerjee. “Mine Ventilation” Lovely Prakashan, Dhanbad

B.TECH. (Mining Engineering)
IV SEMESTER
FLUID MECHANICS

UNIT-I

Properties of fluid: Fluid, ideal and real fluid, Properties of fluid: Mass density, Weight density, Specific volume, Specific gravity, Viscosity, Surface tension, Capillarity Vapour pressure, Compressibility and bulk modulus. Newtonian and non-Newtonian fluids.

Fluid statics : Pressure, Pascal's law, Hydrostatic law, Pressure measurement, Hydrostatic force on submerged plane and curved surface, Buoyancy and Flotation, Liquid in relative equilibrium.

UNIT-II

Fluid kinematics: Description of fluid motion, Langragian and Eulerian approach, Type of fluid flow, Type of flow lines-path line, S treak line, S tream line, S tream tube, Continuity equation, Acceleration of a fluid particle, Motion of fluid particle along curved path, Normal and tangential acceleration, Rotational flow, Rotation and Vorticity, Circulation, Stream and potential function, Flow net, Its characteristics and utilities, Vortex motion .

UNIT-III

Fluid dynamics: Euler's Equation, Bernoulli's equation and its practical application, Venturimeter, Orifice meter, Nozzle, Pitot tube, Impulse momentum equation, Momentum of Momentum equation, Kinetic energy and Momentum correction factor. Reynold's transport theorem.

UNIT-IV

Laminar & Turbulent flow: Reynold's experiment, Shear stress and pressure gradient relationship, Flow of viscous fluids in circular pipe and between two parallel plates, Coutte flow, Shear stress & velocity distribution for turbulent.

Flow through pipes: Loss of energy in pipes, Hydraulic gradient and total energy line, pipe in series and parallel, Equivalent pipe power transmission through pipe, Water hammer in pipes.

UNIT-V

Internal flows: Friction factor, Darcy-Weisbach friction factor, Moody's diagram, Boundary Layer theory, Boundary layer equation, Laminar and turbulent boundary layer and its growth over flat plat. Momentum boundary layer and its solutions, separation of boundary layer and its control.

Dimensional analysis: Methods of dimensional analysis, Rayleigh's method, Buckingham's theorem,

Limitations, Model analysis, Dimensionless number and their significance, model laws, Reynolod's model law, Fraude's model law, Euler's model law, Weber's model law, Mach's Model law.

REFERENCE BOOKS

1. Fluid Machines by M. Manohar
2. Hydraulics & Hydraulic Machines by Dr. Jagdish lal (Metropolitan)
3. Hydraulics & Hydraulic Machines by Priyani.
4. Fluid Machines With Engineering Applications by R.L. Draught lery & A.C. Jugersoll. (McGraw Hills)
5. Journal of experiments in Hydraulic Laboratory by V. N. Rao & Husan New Heights.

TEXT BOOKS

1. Fluid Mechanics by Dr. M.L. Mathur (Std. Publications).

2. Taral Yantriki Avum Machinery (Hindi) by G.B. Bamanker. (Deepak Prakashan, Gwalior).

3. A text Book of Hydraulics, Fluid Mechanics and Hydraulic Machines. By Khurmi (S. Chand & Co.)

EXPERIMENTS TO BE PERFORMED (MINIMUM TEN NUMBERS)

1. To determine the meta-centric height of a ship model.
2. To verify Bernoulli's Theorem.
3. To verify Impulse Momentum Principle.
4. To calibrate a Venturimeter and study the variation of coefficient of discharge.
5. To calibrate an orifice-meter.
6. Experimental determination of critical velocity in pipe.
7. To determine of head loss in various pipe fittings.
8. Flow measurement using Pitot tube.
9. To study the transition from laminar to turbulent flow and to determine the lower critical Reynold's number.
10. To determine the hydraulic coefficients (Cc, Cd and Cv) of an orifice.
11. To determine the coefficient of discharge of a mouth piece.
12. To obtain the surface profile and the total head distribution of a forced vortex.
13. To study the velocity distribution in pipe and to compute the discharge by integrating velocity profile.
14. To study the variation of friction factor for pipe flow.
15. To determine the roughness coefficient of an open channel.

B.TECH. (Mining Engineering)
IV SEMESTER
Engineering Statistics and Probability

UNIT-1

Measures of Central Tendency: Arithmetic mean ,methods of calculating Arithmetic mean, properties, Median, Computation of median, properties of median, mode, methods of computing mode, properties of mode. Relationship between mean, median and mode.

UNIT-2

Measures of Dispersion: Measures of dispersion, Range, quartile deviation, Percentile, mean deviation, properties of Mean Deviation, standard deviation, properties of standard deviation, variation, properties of variation**.**

UNIT-3

Random Variable: Discrete random variable, Continuous random variable, Probability function of a discrete random variable, Probability distribution of a discrete random variable.

Sampling : Introduction ,Types of sampling , random sampling, simple sampling, sample mean, Sampling distribution, Sampling distribution of mean .

UNIT-4

Probability: Elementary probability theory, Mathematical definition of probability, Various types of events, Additive law of probability, Multiplicative law of probability, Compound probability, conditional probability**.**

Unit-5

Correlation: Introduction**,** Karl Pearson's coefficient of correlation. Short-cut method, Step deviation method for coefficient of correlation.

Regression: Coefficient of Regression, equation to the lines of regression, properties of regression Coefficient, angle between two regression lines.

Reference Books:

- H.L.Sharma, Agrotech Publishing Academy, Udaipur.
- Fundamental of Applied Statistics,S.C. Gupta,V.K.Kapoor,Sultan Chand &sons,1996
- Mathematical Statistics ,M.Ray and Har Swarup Sharma, Ram Prasad & Sons.

SSD- (Soft Skills Development)

4th Semester

B.Tech (Engg.)/ B.Tech (Ag.)/ B.Tech (BT)/ B.Sc.-Ag(Hons)/ B.Sc (BT)/ B.Pharm/ BBA (Hons) / B.Com/B.com(Hons)/ BCA(Hons)/ B.Sc.(IT) Hons./ Diploma (Engg.)

What is soft Skills?

The bundle of Skills which helps a person to perform a task better in a more satisfying way for both the performer and spectator (In personal, Professional and social life).

Why it is required?

To make a person to perform a task with better understanding of who, where, when, what, how and with whom a job can be executed to deliver the best expected result in perfect timing.

Learning Outcome: On completion of the course (SSD), the student should be able:

- Understand the Importance of various skills involved in developing enriching Interpersonal relationship.
- Be more aware of his/her own self- Confidence and values.
- Learn how to go about being a good team player and form an effective team.
- Understand the skills tested and participate effectively in Group discussion.
- Learn the basics of how to make an effective Presentation and have numerous practice Presentation in small groups and larger audiences.

Unit-1

Conceptual Sessions: Soft skills – a general overview, Industry Expectations, SWOT & STAR, Self Discovery, Leap to success- 7 Orientations,

Activity: Castle Plan.
Assignment : Sentence fluency assignment

Unit-2

Conceptual Sessions: Attitude, Time Management, Goal setting, Team building and leadership,

Activity: Early Bird and second mouse and Lost at Sea.

Assignment : Goal setting Assignment (Pre and Post)

Unit-3

Conceptual Sessions: Telephone etiquettes- Preparing for business calls/Making business calls/Telephonic phrases, Dining etiquettes, Email etiquettes, Corporate grooming and dressing

Activity: Role play in different scenarios/ Socialization and networking.

Assignment : Progress test on general etiquettes.

Unit-4

Conceptual Sessions: Group discussion: Introduction and definition of a GD, Purpose of a GD, Types and strategies in a GD, Do's and Don'ts in GD, Speak to Impress (Presentation skill), Anchoring in formal setting, Reading Comprehension

Activity: GD Practice and Presentation on Company profile.

Assignment : Reading Comprehension assignment.

B.TECH. (Mining Engineering)
V SEMESTER

MINE SURVEYING – II

Unit - I

Correlation: Methods of correlation of surface and underground surveys- Through mine openings; Correlation by magnetic needle; Precautions and accuracy. Surveying for tunnels and open pits.

Unit - II

Triangulation Surveying: Definition; Reconnaissance; Selection of signals and stations; Triangulation system with primary, secondary and tertiary orders;; Measurement of base line and angles; Booking of
observations; Auxiliary stations; Satellite stations; Computation; Calculation of coordinates; Errors and their distribution and plotting.

Unit - III

Stope and face surveying: Theodolite in stope surveying; Tape triangulation; Traversing; Radiation and other methods. Plans and Sections: Legal requirements as to mine plans in India and symbols used; Preparation and preservation of plans and section; Enlargement of plans; Use of ediograph, pantograph and planimeter. Errors: Sources, classification, propagation and growth; Treatment of nonsystematic errors by the method of least squares; Probable errors; Most probable value; Probable error and weight; Limits of errors in drift surveys.

Unit - IV

Photogrammetry and Aerial Surveying: Terrestrial photogrammetry; Photo-theodolite & its construction; Method of field work and plotting from horizontal photographs with determination of elevations; Elementary perspective as applied to aerial photographic surveying. Field Astronomy: Important definitions; Determination of Azimuth by observation of star. Application of laser in surveying; Electronic distance measuring equipment; Total station. GPS.

Practical

1. Various methods of correlation and its practical applicability assuming the underground mining conditions.
2. Gyroscope and its use in correlation.
3. Measurement of Base-line for triangulation survey in difficult ground conditions.
4. Triangulation of a hilly terrain.
5. Various stope surveying methods.
6. Planimeter and calculation of areas with its help.
7. Determination of elevation from aerial photographs.

8. Determination of azimuth by observation star at equal altitude.
9. Problems on dip-strike, bore-hole, faults & drifts.
10. Exercise with the help of EDM, Total station.
11. Exercise with the help of GPS, and other latest instruments
12. Exercise of triangulation in flat & large area.
13. Study and problem with Pentograph.
14. Preparation and preservation of plans
15. Problems related to errors.

Suggested Readings

1. Dr. B.C.Punmia, Surveying Vol. I,II & III, Pub: Laxmi Publication New-Delhi.
2. Kanetkar, Surveying & Levelling, Vol I & II, Geeta Book Store Dhanbad.
3. D.K. Jain, Mine Surveyors Competency Examination,Geeta Book Store, Dhanbad.
4. Winiberg, Metalliferous Mine Surveying.

B.TECH. (Mining Engineering)
V SEMESTER

ROCK MECHANICS – I

Unit - I

Status of Rock Mechanics: Role and status of rock mechanics in mining engineering; Definitions & terms used in Rock Mechanics. Stresses and Strains: Stresses in two and three dimensions; Stress tensors; Principal stresses; Stress invariants; Displacements and strains; Stress- Strain relations; Equilibrium and compatibility equations.

Unit -II

Geological Investigation of Rock mass: Classification, identification and survey of joints; Basic geological description of rock mass; Graphical representation of joint systems; Geophysical investigation of rock mass; Rock mass classification- RQD, RSR, RMR, Q-system Rock Indices: Specific gravity, hardness, porosity, moisture content, permeability, swell index, slake durability, thermal conductivity, point load strength index, protodyakonov strength index, impact strength index.

Unit – III

Mechanical Properties of Rocks: Compressive, tensile and shear strengths; Modulus of elasticity; Poisson's ratio and tri-axial strength; Field and laboratory determination. Determination of in-situ strength and in situ stresses – methods and instrumentation.

Unit – IV

Theories of rock failure. Elastic and time dependent properties of rocks, Dynamic properties, Post-failure phenomenon; Soil Mechanics: Classification of soils; Strength, consolidation and seepage of soils; Stability of waste dumps, factors affecting, monitoring and control measures.

Practical

1. Preparation of core samples as per ISRM standards.
2. Determination of compressive strength and point load index of given rock samples.
3. Measurement of Schmidt rebound hardness and its application.
4. Determination of slake durability index of given rock samples.
5. Determination of elastic properties of given rock samples.
6. Determination of tensile strength of given rock samples of by Brazilian test
7. Determination of shear strength and triaxial properties of rock
8. Measurement of core recovery and RQD from the various data collected.
9. Determination of RMR of given field data
10. Determination of Protodykonov index of given rocks
11. Determination of imapct strength index
12. Determination of Schmidt hammer rebound number of various rocks.

13. Determination of moisture contents of various rocks.
14. Measurement of insitu stress with Flatjack
15. Determination of triaxial properties of various compositions of spoil dumps.

Suggested Readings

1. Obert & Duall, Rock Mechanics and design of structures in rock., Pub: John Willey & Sons
2. Railey & Dalley, Experimental stress analysis. Pub: McGraw Hill Book Company
3. B.S. Verma, Elements of Mechanics of Mining Ground. Pub., Tuhin & Co., E-1898(MIG) Rajajipuram, Lucknow, U.P.
4. Vutukuri & lama, Handbook of Mechanical properties of rock, Vol.I&II. Pub: Transtech, Germany
5. Syd.S.Peng, Coal Mine Ground Control. Pub: John Willey & Sons
6. J.C. Jeager & NGW Cook, Fundamentals of Rock Mechanics, Pub: Chapman & hall, Londaon
7. Charles Jaeger, Rock Mechanics & Engineering. Pub: Cambridge University Press, Cambridge London
8. Manual on Rock Mechanics, Prepared by Central Soil & Materials, Research Station, New Delhi, Add: Central Board of Irrigation and Power Malcha Marg, Chanakyapuri, New-Delhi- 110021
9. Vail, CO; "Rock Mechanics for Industry"Proceeding of the 37th Symposium on Rock Mechanics Vol. 1-2, ISEE Publication, Cleveland, Ohio

B.TECH. (Mining Engineering)
V SEMESTER

MINE VENTILATION & ENVIROINMENT II

Unit – I

Fires: Classification of fires; Causes, detection, monitoring and control of surface and underground fires; Preventive measures; Fire fighting and inertization; Monitoring of atmosphere behind sealed- off areas; Reopening of sealed- off areas; Case histories. Spontaneous Heating: Mechanism, causes, detection, monitoring and control of spontaneous heating in underground mines, on surface and in coal stacks and dumps; Incubation period; Preventive measures.

Unit – II

Explosions: Types, causes and mechanism of firedamp and coal dust explosions; Preventive measures; Water spraying- Stone dusting, stonedust and water barriers; Investigations after an explosion; Case histories.

Unit – III

Mine Rescue and Recovery work: Different types of rescue equipment; Test on rescue apparatus; Rescue stations; Recovery and first-aid appliances; Training of personnel and organization of rescue station; Rescue and recovery work in connection with mine fire, explosions and other conditions. Safety chamber

Unit – IV

Mine Inundation: Causes; Precautionary measures; Precautions to be taken while approaching old workings; Burnside boring apparatus; Design and construction of water dams; Recovery of flooded mines; Dewatering of old working; Water blast: dangers and precautions.

Practical

1. Monitoring of sealed off areas and goaf fires.
2. Soda ash fire extinguishers and its application
3. Co2 snow fire extinguishers and its application
4. Dry chemical fire extinguishers and its application
5. Reasons of spontaneous heating, its preventive measures etc in underground and at surface.
6. Designing of stone dust barrier & water barrier in underground mines
7. Study of flame safety lamp
8. Testing of methane with the flame safety lamp and estimation of the percentage.
9. Design of lamp room layout for a mine of 5000 tonnes production per day.
10. Maintenance of mine camp lamp in the laboratory.
11. Exercise with self contained breathing apparatus

12. Exercise with Filter type breathing apparatus
13. Designing of rescue stations for different conditions
14. Exercise on Illumination survey.
15. Exercise on rescuecitation.

Suggested Readings

1. G.B. Mishra, Mine Environmental Engineering. Pub: Dhanbad Publisher, Dhanbad
2. Donald Mitchell; "Mine Fires, Prevention, Detection fighting" ISEE Publication Cleveland, Ohio
3. Ramlu M. R.; "Mine Fires, Explosion, Recovery & Innundation", Dhnbad Publisher, Dhanbad
4. David Stone; "Minefill 2001" Proceedings of the International Symposium on Mining with Backfill" SME Publication 2001

B.TECH. (Mining Engineering)
V SEMESTER

UNDERGROUND METALLIFEROUS MINING

Unit-I

Metalliferous Mining in India and World - Historical development; Trend of mining non-coal deposit in India during the last ten years; Geographical distribution of important economic non-coal mineral in India. Undergound metal mining for Gold, Uranium, Chromite, Manganese, Pb & Zinc, Copper etc in India and their status.

Overview of various stoping Methods: Factors influencing selection of stoping methods; Classification of different stoping methods. Stope layouts and stope preparation work for different stoping methods.

Unit-II

Open stoping methods: Stull mining; Breast stoping; Room and Pillar; Sub-level; Shrinkage; Blast hole; VCR stoping and their variations.

Unit-III

Supported stoping methods: Post pillar; Cut and fill and their variations; Square set; Different types of support used.

Unit-IV

Caving stoping methods: Top slicing; Sub-level caving; Block caving and their variations. Stoping of superimposed veins and parallel ore bodies; Combined methods; Extraction of underground pillar. Special method of mining for deep deposit and difficult mining conditions. Ore mining by Leaching.

Practicals

1. Various terms, factors influencing selection of method of work and classification of underground methods.
2. Designing sub-level stoping for a ore body width varying 10-15 mts.
3. Application of blast hole stoping and its comparison with sub-level open stoping.
4. Cut and fill methods used in different Indian deposits.
5. Application of Vertical crater retreat method of mining in moderate strength of wall rocks.
6. Sub-level caving and block caving methods for deeper deposits.
7. Square-set stoping for excavation of manganese ore deposit.
8. Application of leaching technique in ore mining.
9. Stoping techniques used in excavation of gold deposit at deeper depth.
10. Designing an under ground metalliferous mine on given geological physico-mechanical properties of rock.

11. Design of Post pillar method
12. Design of Shrinkage method.
13. Problem for mining for greater depth.
14. Design of block caving.
15. Design Sub level top slicing
16. Visit to Underground Metal Mines in Rajastshan, Odisha and MP

Text Books/References

1. Howard, L.Hartman. Introductory Mining Engineering, Pub: John Willey & Sons.
2. Cummins & Givens. SME Mining Engineering Handbook, Vol. I & II, Pub: A.I.M.M. New-York.
3. Ramlu et al, Computer in mineral industry. Pub: Oxford & IBH, New-Delhi.
4. W.A. Hustrulid. Underground mining methods handbook, Pub: Society of mining engineers of the American Institute of Mining Metallurgical and Petroleum Engineers, Inc. New-York.

B.TECH. (Mining Engineering)
V SEMESTER

MINE MACHINERY – II

Unit–I

Underground Mining : Winding: Winding system-Drum & friction winding; Mechanical and electrical braking; Ward Leonard control; Automatic winding; Winding drums- types, their construction and duty cycles; Detaching hooks, cages, skips, suspension gear, rigid and rope guides; Methods of counterbalancing loads; Multi rope winding, Winding from different horizons. Shaft fittings and head gear design;

Unit-II

Underground Mining - Design calculation for different types of winding systems; Safety devices- depth indicators, over speed and overwind preventors, slow banking and other safety devices.
Rope Haulage: Different types- their construction, operation, maintenance and design calculations. Slushers, scrapers etc.

UNIT - III

Machinery for underground mining: Loaders: SDL, LHD, LPDT; Cutter loaders: SERDS, DERDS, Coal Plough, Continuous miner, Road headers, Cable bolting machine **-** Transport: Track and trackless; Mine cars; Haulage track-its laying and maintenance; Gauge selection; Mine tubs and cars-their constructional details and attachment. Low profile dumpers and shuttle cars, their construction, operation and maintenance

Underground Mine Locomotives: Diesel, battery and electric trolley wire types-their construction, operation and application; Calculations for locomotive haulage; Man riding systems in underground coal and metal mines mines; Mono rails; Underground loco shed layout.

Unit-IV

Conveyor Haulage: different types, their construction, installation, maintenance and design calculations; Steep angle belt conveyor, Armoured face conveyor

Aerial Ropeway - different types, their construction, installation, operation and maintenance, their layouts including rope tensioning arrangement; Loading, unloading and angle stations.

Unit V

Study of Underground Coal Mining machinery deployed at Narwapahar Uranium Mines of UCIL, one Chromite Mines of Sukinda Valley(Odisha), One

Manganese mine of MP, and one Copper or Lead/Zinc mine of Rajasthan. Case studies will be discussed alongwith visit to some of the mines.

Practicals

1. Process of changing of winding rope and its requirement as per regulation.
2. Designing direct rope haulage system in moderately dipping coal seam.
3. Endless rope haulage and its designing aspects.
4. Application of Mono cable and Bi-cable rope way & its designing parameters.
5. Diesel locomotives and comparative application.
6. Battery locomotives and comparative application.
7. Trolley wire locomotives and comparative application.
8. Suspension gear arrangement of the shaft.
9. Different types of winding system and their comparative application.
10. Application of various types of detaching hooks.
11. Various types of guides in winding.
12. Belt conveyors with their design parameters used in mines.
13. Scraper chain conveyors with their design parameters used in mines.
14. Shaker conveyors with their design parameters used in mines.
15. Exhaust conditioner

Text Books/References

1. M.A. Ramlu. Mine Hoisting. Pub: Oxford & IBH Publishing Co. Pvt.Ltd. New Delhi.
2. Kerelin. Mine Transport. Pub:- Orient Longmans Ltd. New Delhi.

SSD- CPP (Campus Placement Program)

5th Semester

B.Tech (Engg.)/B.Tech (Ag.)/B.Tech (BT)/B.Sc.(Hons) Ag./B.Sc (BT)/B.Pharm/BBA/B.Com/B.com(Hons)/BCA(Hons)/Diploma (Engg.)

Introduction to CPP Program: 'Soft skills' are a framework of desirable qualities which gives a candidate an edge over his peers during the selection process of a company. We, at AKS University, have designed the Campus Placement Program (CPP) to help out our students who are sitting for their placement process in various Companies.

Objective of The Program:

- Develop effective communication and Presentation skills.
- Develop all-round personality with a mature outlook to function effectively in different circumstances.
- Take part effectively in various selection procedures adopted by the recruiters.
- Develop broad career plans, evaluate the employment market, identify the organizations to get good placement, match the job requirements and skill sets.

UNIT-1

Talking about Present, Past and Future, Describing Processes and operations, Expressing Opinion: Agreement & Disagreement, Pronunciation and neutral accent, Group Discussion: Concept and Practice, Resume Writing.

UNIT-2

Public Speaking:A presentation about the company will be made by the students throughout the Unit. Each and every student is required to go through at least 10 Companies Profile related to their domain expertise. Basically the presentation includes the information like selection procedure, company's milestones, organizational achievements, candidate scope of improvement within the organization if selected, salary, employment benefits. Usually this presentation will end up with question and answer session, students given chance to ask questions about company.

UNIT-3

Mastering Personal Interviews: Paper Interview, Personal Interview, FAQs, Interview Practice, Domain Specific Interview Preparation, Peer review- Pair interview, Interview model (Vocabulary for an effective Interview).

UNIT-4

Communication Skills and Reading Comprehension Test Preparation: Interpersonal Communication Assignment, Sentence Fluency Assignment, A way with words Assignment, Vocabulary Assignment, Communication skills placement paper Test, Reading Comprehension Assignment, Communication Assignment: Presentation Skills and Group discussion.

B.TECH. (Mining Engineering)
VI SEMESTER

COMPUTER APPLICATION IN MINING

Unit - I

Importance of computer application in mining, Different areas of application. Introduction to Computers and hardware for application in mining industry. Programming with 'C' computer language for mining related problems.

Unit - II

Basic Introduction for application of Computers in areas of : Exploration- Data generation, collection and analysis through computers for exploration and reserve estimation Surface Mining- Bench geometry design, Haul road design, Drainage, Waste dump design and monitoring.

Mine Planning & Design- Introduction of mine planning concept through mining software. Introduction to numerical methods in Mining.

Unit - III

Basic Introduction for application of Computers in areas of : Environmental Engineering Basic concept of data generation, collection and analysis through computers for environment management. Relevant software application

Mine Surveying : Introduction to mapping, Estimation of area and volume, Preparation of plans & sections, Tonnage/ Volume calculation for contractual billing and relevant software application.

Project Monitoring : Systems & tools of monitoring of different mining operations, data collection, analysis and online monitoring. Inventory control and management.

Unit - IV
Mining Software

Mine Planning Software : Basic introduction, salient features, planning by different mining software like DATAMINE, SURPAC Software for various applications : Basic introduction, salient features and application of software like BLASTWARE, FRAGLYST, GALENA,
FLAC, VENTetc.

Practical

1. Computer programming for mining problem with C++.
2. Introduction to different hardware application related to mining.

3. Introduction to Mine planning by DATAMINE
4. Introduction to Mine planning SURPAC
5. Introduction to BLASTWARE software.
6. Calculation of production tonnage of an opencast mine for
contractual billing with Total station & Datamine
7. Introduction of "VENT" software of simulation of ventilation network of a mine.
8. Introduction to "FRAGLYST 2.0" software.
9. Introduction to "SINET" software of design of U/g mine ventilation system.
10. Introduction to “PSYCHRO” software.
11. Introduction to “AWQEFA” software.
12. Introduction to "FLAC/ FLAC 3D software
13. Introduction to “N-Fold” software.
14. Introduction to “GALENA” software related to slope stability.
15. Introduction to “Solid works” software

Text Books/References

1. Sukumar Bandopadhyay; “Application of the Computers and Operation Research in the Mineral Industry” Proceedings of the 30th international Symposium SME Publication 2002

2. Manuals of different softwares

B.TECH. (Mining Engineering)
VI SEMESTER

ADVANCED MINE SURVEYING

Unit - I

Correlation: Methods of correlation of surface and underground surveys- Through mine openings; Correlation by magnetic needle; Precautions and accuracy. Surveying for tunnels and open pits.

Unit - II

Triangulation Surveying: Definition; Reconnaissance; Selection of signals and stations; Triangulation system with primary, secondary and tertiary orders;; Measurement of base line and angles; Booking of observations; Auxiliary stations; Satellite stations; Computation; Calculation of coordinates; Errors and their distribution and plotting.

Unit - III

Stope and face surveying: Theodolite in stope surveying; Tape triangulation; Traversing; Radiation and other methods.

Plans and Sections: Legal requirements as to mine plans in India and symbols used; Preparation and preservation of plans and section; Enlargement of plans; Use of ediograph, pantograph and planimeter.

Errors: Sources, classification, propagation and growth; Treatment of nonsystematic errors by the method of least squares; Probable errors; Most probable value; Probable error and weight; Limits of errors in drift surveys.

Unit - IV

Photogrammetry and Aerial Surveying: Terrestrial photogrammetry; Photo-theodolite & its construction; Method of field work and plotting from horizontal photographs with determination of elevations; Elementary perspective as applied to aerial photographic surveying.
Field Astronomy: Important definitions; Determination of Azimuth by observation of star.
Application of laser in surveying; Electronic distance measuring equipment; Total station. GPS.

Practical

1. Various methods of correlation and its practical applicability assuming the underground mining conditions.
2. Gyroscope and its use in correlation.
3. Measurement of Base-line for triangulation survey in difficult ground conditions.

4. Triangulation of a hilly terrain.
5. Various stope surveying methods.
6. Planimeter and calculation of areas with its help.
7. Determination of elevation from aerial photographs.
8. Determination of azimuth by observation star at equal altitude.
9. Problems on dip-strike, bore-hole, faults & drifts.
10. Exercise with the help of EDM, Total station.
11. Exercise with the help of GPS, and other latest instruments
12. Exercise of triangulation in flat & large area.
13. Study and problem with Pentograph.
14. Preparation and preservation of plans
15. Problems related to errors.

Text Books/References

1. Dr. B.C.Punmia, Surveying Vol. I,II & III, Pub: Laxmi Publication New-Delhi.
2. Kanetkar, Surveying & Levelling, Vol I & II, Geeta book store Dhanbad.
3. D.K. Jain, Mine Surveyors Competency Examination, Geeta book store, Dhanbad.
4. Winiberg, Metalliferous Mine Surveying.

B.TECH. (Mining Engineering)
VI SEMESTER

ADVANCED MINING GEOLOGY

Unit I

Geological Mapping: Definition of map, scale of map, types, map symbols; Surface and underground geological mapping. Computer based geological data plotting and preparation of map.
Assaying: Wet and dry methods, spectro-photometry, flame photometry and atomic absorption spectro-photometry.

Unit-II

Sampling and reserves estimation: Definition of sampling, methods and importance in mining; Mine sample reduction; Quality control; Total Quality. Definition of reserve, classification and estimation by conventional and geo-statistical techniques. Role of geological parameters for physical scale and mathematical modeling for maintaining the slope.

Unit-III

Prospecting and Exploration: Definition, kind and degree of exploration; Geological, geophysical, geo-chemical and remote sensing methods. Geological factors consider for excavation viz rock related factors, structures, seismicity, special effects of faults i.e fault act as a ground water barrier, ground water conduit, sub surface drains and influence of ground water flow systems on rock excavations.

Unit-IV

Study of important metallic, nonmetallic and fuel minerals of India. Their geographical distribution, mode of occurrence, economic importance giving emphasis on occurrences in Chattisgharh & M.P.. Metallic minerals.

Copper, Iron, Nickel, Gold, Aluminum, Manganese, Tungsten,etc. Lead, Zinc, Tungsten, Uranium; Limestone, Talc, Rock-Phosphate, Gypsum, Kyanite, Marble, Granite, Sandstone, Garnet, Corundum, Diamond, Fluorite, Quartz, Feldspar, Calcite, Topaz, Kyanite, Olivine; Fuel minerals i.e. Coal, lignite and Petroleum. Definition, composition, properties, origin, theories of migration of petroleum, structural features of coal seams; Fuel mineral resources of Chattisgarh & MP.

Practicals

1. Find the width of ore body with the help of outcrop observations in the following topographic conditions:

a. On horizontal ground
b. Slope of ground opposite to the dip of the ore body.
c. Ground slopping in the same direction as dip of the ore body.
2. Find out inclination and slope of ore body with the help of three point method.
3. Determination of apparent dip of ore body from true-dip with the help of stereo-net.
4. Ore body outcrop in given geologic map.
5. Minerals under microscope
6. Rocks under microscope.
7. Determination of resistivity of ground/ sub surface rocks with the help of resistivity meter.
8. Determination of magnetism of ground/ sub surface rocks with the help of magnetometer.
9. Interpretation of Ariel photographs with the help of stereoscope.
10. Analysis of major oxide percentage with spectro-photometric.
11. Plotting of symbols in geologic map.

Text Books/References

1. T. Bolton. Geological Maps, their solution and Interpretations, Cambrige Uni.Press
2. S. Sinha Roy. Geology of Rajasthan, Geological Society of India, Bangalore.
3. Krishnaswamy. Indias mineral resources, Oxford Pub.
4. Dobrin Geophysical exploration.
5. Mckinstry. Mining Geology, Prentice Hall.

B.TECH. (Mining Engineering)
VI SEMESTER

ADVANCED ROCK MECHANICS & GROUND CONTROL

Unit – I

Stress State: Stress distribution around narrow and wide openings (single and multiple).

Rock reinforcement: Introduction to local and mass support system, Design of support systems in shafts, systematic supports in headings, junctions, depillaring areas, gates, long wall faces and stopes; bolting; Shot-creating & guiniting. Cable bolting, filling & pillar as mass support
system, pressure on supports.

Unit – II

Deformation and related instrumentation: Measurement of rock movements and interpretation of data; Load cells, convergence recorders, bore hole extensometers and borehole cameras. Insitu and induced stresses and their measurement. Basics of numerical methods in geomechanics with applications.

Unit – III

Subsidence: Mechanics of surface subsidence; Factors affecting subsidence; Sub-critical, critical and super-critical widths of extraction; Discontinuous and continuous subsidence; monitoring, prediction, control and management of subsidence.

Rock Bursts: Rock bursts and bumps; Mechanism of occurrence, prediction and control.
Design of shaft pillar, Tunnels and Caverns.

Unit – IV

Caving: Mechanics of caving; Cavability of rocks; Caving height
Slopes in Excavations and in Dumps/Waste: Types of slope failure; Analysis of slope failure; Factors affecting slope stability; Drainage and reinforcement of slopes; Monitoring of slopes, Slope stability radar.

Practical

1. Bore hole extensometer and measurement of displacement with its help.
2. Measurement of strain by tape extensometer.
3. Load cell and measurement of convergence.
4. Flat jack method and measurement of in situ stress.
5. Determination of ground vibrations with seismograph, and its effect on designing slopes.

6. Factors influencing the stability of slope. Design for maintaining of slope in adverse conditions.
7. Mechanism of rock burst and bumps and factors influencing it
8. Shotcreting method of support - principle, application etc.
9. Design of support system.
10. Application of numerical methods in geomechanics
11. Study of Slope Stability Radar

Suggested Readings

1. Obert & Duall, Rock Mechanics and design of structures in rock. Pub: John Willey & Sons
2. Railey & Dalley, Experimental stress analysis. Pub: McGraw Hill Book Company
3. B.S. Verma, Elements of Mechanics of Mining Ground. Pub. Tuhin & Co., E-1898(MIG) Rajajipuram, Lucknow, U.P.
4. Vutukuri & lama, Handbook of Mechanical properties of rock Vol.I&II. Pub: Transtech, Germany
5. S.S.Peng, Coal Mine Ground Control. Pub: John Willey & Sons 6. J.C. Jeager & NGW Cook, Fundamentals of Rock Mechanics. Pub: Chapman & hall, London
7. Charles Jaeger, Rock Mechanics & Engineering. Pub: Cambridge University Press, Cambridge London
8. B. Singh, Mine Subsidence.
9. Z.T. Bieniawski, Rock Mechanics Design in Mining and Tunneling, Pub: A.A. Balkema, P.O. Box 1675, 3000 BR Rotterdam, Netherlands.
10. Hoek E. and Brown, E.T. Underground excavations in Rock, Institutions of Mining and Metallurgy, London
11. Brown, E.T., Rock characterization, testing and monitoring – ISRM suggested method, Pergamon Press, Oxford.
12. William A. Hustrulid (Editor), Slope Stability in Surface Mining
13. Hoek and Bray, Rock slope Engineering, Taylor & Francis

B.TECH. (Mining Engineering)
VI SEMESTER

COAL & NON-COAL MINERAL PROCESSING

Unit-I

Scope, object and limitations of Mineral Dressing; Role of microscopic study.

Communition and Liberation: Theory and practice of crushing & grinding; Conventional units used-their fields of application and limitation.

Sizing and Classification: Laws of setting of solids in fluid; Laboratory methods of sizing and interpretation of sizing data; Industrial sizing by screens; Types of classifiers; Classification as means of sizing by screens.

Unit-II

Gravity concentration Methods- Jigging, Flowing film concentration like spirals and shaking table, Heavy Media separation; Theory, applications and limitations of each method; Introductory Froth Flotation, physicochemical, principles underlying flotation-reagents, flotation machines; Flotation of sulphides, oxides and non-metals.

Unit-III

Electrical Methods of Concentration: Electrostatic and magnetic methods, their principles of operation, fields of application and limitations.
Dewatering and drying: Thickening, filtration and drying.

Coal Processing : Dry and Wet processing of coal, Coal washing for coking and non-coking coal coal, coal washability, crushing, sizing and cleaning of coal.

Unit-IV

Sampling: Importance and methods used in ore-dressing.

Simplified Flow Sheets: Beneficiation of coal and simple ores of copper, lead, zinc, Iron and manganese with reference to Indian deposits.

Practicals

1.Study of schematic diagram of Jaw crushers and their comparison.
2. Study of specifications & function of Roll crushers.
3. Study of Gyratory crushers and their application.
4. Study of the ball mill and its application.
5. Study of various types of classifiers.
6. Determination of various sized product with sieve shaker.
7. Concept and apparatus of froth flotation.

8. Process of thickening & filtration.
9. Study of Wilfrey table its specifications and application.
10. Study of Filter press its specifications and application
11. Study of Flowsheet of lead-zinc ore (Zawar).
12. Study of Flowsheet of copper ore (Malanjkhand).
13. Study of Flowsheet of Gold, Iron ore, Mangnese ore,
14. Study of Flowsheet of coal washing.

Text Books/References

1. M.A. Gaudin. Mineral Dressing.
2. S.K. Jain. Mineral Dressing.
3. T.C.Rao. Mineral Dressing.
4. H.G. Vijendra. Hand book on mineral dressing. Pub: Vikas Publishing House, 576, Masjid Road, Jangpura New-Delhi 110014

B.TECH. (Mining Engineering)
VII SEMESTER

MINE LEGISLATION AND SAFETY

Unit–I

General Principles of Mining Laws. Post Independence trend of changes. Principal provisions of Mines and Minerals (Development and Regulation) Act & Mineral Concession and Development Rules.

Unit–II

Mines Act 1952 with upto date amendments Mines Rules 1955 with upto date amendments

Coal Mines Regulation 1957 with upto date amendments Metalliferous Mines Regulations 1961 with upto date amendments, Mine Vocational & Training Rules,Conferences of Safety in Mines, ILO (International Labour Organization) and its role in Mines Safety. OHSH and other relevant systems for safety evaluation, Safety Audit etc.

Unit–III

Principal provisions of rescue rules, pit head and bath rules, crèche rules , mine vocational training rules, explosive rules(related to mines);

Electricity Rules applicable to mines and oil fields.

Principal provisions of Industrial Dispute Act, workmen's compensation act, trade union act, payment of wages act and minimum wages act. Important technical circulars issued by DGMS.

Unit–IV

Accident, Health and Safety: Classification of accidents- statistics causes and prevention of accidents; Costs of accidents; Major accidents enquiry reports; Health of workmen Comfort conditions; Occupational diseases-their causes, nature and prevention.

Rescue Rules; Legal requirements.

Text Books/References

1. P. Seshagiri Rao. Law of Mines & Minerals. Pub: Asia Law House, Hyderabad.
2. Rakesh & Prasad. Legislation in Indian Mines Vol. I & II. Pub: Mrs. Asha Lata Varanasi
3. Classified Mine Circulars Issued by DGMS (Compiled)
4. Relevant Act. Rules and Regulations, Published by Govt. of India

B.TECH. (Mining Engineering)
VII SEMESTER

MINE MANAGEMENT

Unit – I

Management: Principles of Scientific Management; Organization, Planning and control. Forms of Business Organization: Private and public enterprises with special reference to mining of minerals. Basic
Principles of Trade unionism, Trade union activities vis-a-vis. mining in India, Major trade union bodies
Disputes: Types of disputes between contractors and owners, between workers and owners; Methods of avoiding and resolving disputes.

Unit – II

Network Analysis: CPM, PERT and Work scheduling. Work Study: Time and motion study; Methods of improving productivity; Improving productivity; Improving working environment, welfare measures, incentives and penalties.

Unit – III

Inventory: Systems of inventory control; Methods of minimizing inventory.
Purchasing and Tendering: Purchase procedures in public sector; Preparation of tender documents; Tender completion formalities; Consideration of bids and finalization of purchase order.
Project Monitoring: Monitoring techniques; Management Information Systems (MIS).

Unit – IV

Introduction to system concept: System design; System analysis; Planning sub systems; Production sub-systems; Decision making process; Mining system and sub system; Perspective planning for a mineral community; Salvaging and transfer of equipment; Reallocation of manpower.

Text Books/References

1. Banga & Sharma: Engineering Economics and Industrial Organisation. Pub: Khana Publishers, New-Delhi
2. V.L. Mote, Samuel Paul and G.S. Gupta. Managerial Economics, Concepts and Cases,
3 Khana, O.P., A text book of Work Study. Pub: M/S Dhanpatrai & Sons, Delhi.
4. Jain, S.P. Industrial & Labour laws. Pub: M/S M/S Dhanpatrai & Sons, Delhi

B.TECH. (Mining Engineering)
VII SEMESTER

MINING MACHINERY – III

Unit – I

Pumps and Pumping: Principal types, construction, operation and characteristics; Calculation of size and efficiency; Installation, operation care and maintenance; Frictional resistance; Installation in shafts and roadways; Damage due to corrosion and abrasion, and precaution; Cleaning and replacement of pipes; location and design of mine sumps.

Unit – II

Mineral Handling: Layouts of pit-top and pit-bottom; Details of banking; Mineral handling and screening equipment; Creepers; Tipplers; Layouts of railway siding of mines; Storage bunker. Pit bottom installations and circuit with cage and skip systems.

Unit – III

Maintenance: Preventative and predictive maintenance; Condition monitoring; Workshops. Automation and remote control of mining equipment. Signaling: Safety regulations and different signaling systems in mines.

Unit – IV

Advances in Mining Machineries – Robotics,

Energy Conservation efforts in Mining Machinery : including Air Compressors, Pumps, Conveyors, High HP engines, etc for underground and surface mine applications. Methods of assessing efficiency of HEMM and other machineries, standards laid by CMPDI and other organizations for availability and utilization.

Practical

1. Turbine pump with constructional details and characteristic curves.
2. Design of mine pump with its installation, care and maintenance.
3. Types of signaling systems used in mines for modern system of hoisting.
4. Pit-top layout with shaft for handling 2000 tonnes production per day.
5. Pit-top layout with direct rope haulage.
6. Designing of various pit-bottom layouts.
7. Application of creeper and tippler in mineral handling.
8. Design of mine sumps and their selection of site in mines.
9. Planning and scheduling of maintenance of machinery used in mines.
10. Layout of muck movement through ore passes bunkers, u/g crusher and shaft.
11. Railway siding layout.

12. Automation in mineral handling.
13. Exercise on Illumination survey.
14. Study of flame safety lamp and Testing of methane
15. Design of lamp room layout for a mine of 2000 tonnes production per day.

Text Books/References

1. Rakesh & Lele, Water problem in mines. Pub: Dhanbad Publisher.
2. Rakesh & Lele, Selection, Installation and Maintenance of mine pumps. Pub: Dhanbad Publisher
3 M.A. Ramlu, Mine Hoisting. Pub: Oxford & IBH Publishing Co. Pvt.Ltd. New Delhi
4. R.C.Mishra & K.Pathak, Maintenance Engineering and Management, PHI Learning {rivate Ltd, New Delhi.
5. PCRA Handbook & other published literature
6. Web sites of Bureau of Energy Efficiency(BEE) & PCRA

B.TECH. (Mining Engineering)
VII SEMESTER

MINE ECONOMICS AND FINANCIAL MANAGEMENT

Unit – I

Introduction: Economic importance of the mining industry; mining economy; risky nature of the mining industry; the state and the mining industry; Marketing and export of minerals; National mineral policy;

Loss of mineral in Mining: Classification and incorporation of losses, coefficient of recovery of mineral extraction; Dilution and recovery.

Unit – II

Mine examination and Valuation: Examination and report on mines/mineral properties; valuation of mines/mineral properties; present value and its computation; ore value and profitability of mining; recoverable value.

Cost of Mining: Capital and operating cost, factor affecting operating cost, method of estimating future costs; computation of cost of development and stoping operation.

Unit – III

Financial Management: Finance function and objectives of a firm. Generally accepted accounting principles (GAAP); Scope of financial management.

Financial Statements: Nature and limitations of financial statements. Interpretation of financial statements. Uni-variate and multivariate ratio analysis. Limitation of ratio analysis.

Cost analysis: Various cost concept; Cost-Volume-Profit analysis; Break-even analysis; Cost indifference point. Decision making with the cost data. Cost and budgetary control.

Unit – IV

Financial Analysis: Revenue and mining costs; Taxes and royalties; Net Present Value (NPV); Internal Rate of Return (IRR); Effect of inflation on NPV of a project; Sensitivity analysis.

Capital-its importance, various forms, formation and processes of formation; Raising capital. Mine accountancy and book keeping

International investment and trade in mineral materials and products. Role of Metal exchanges in pricing of ores/minerals in India and abroad.

Text Books/References

1. Park , A text book of Mine Valuation..
2. W.A. Hustrulid, Underground Mining Methods Handbook.
3. Rendu, An Introduction to Geostatical Methods of Mineral Evaluation.
4. R.T. Deshmukh, Mine Economics.

B.TECH. (Mining Engineering)
VII SEMESTER

PROJECT WORK

COURSE CONTENTS

Identification of the Project- Collection of data- Organisation of the data- Design of Project elements - Preparation of drawings- Schedules and sequence of operations- Preparation of charts and models- Preparation of report

Note :

OBJECTIVES

- Identify different works to be carried out in the project.
- Collect data relevant to the project.
- Arrive at efficient method from the available choices based on preliminary investigation.
- Design the required elements of the project as per standard practices.
- Prepare working drawing for the project.
- Prepare schedule of time and sequence of operations.
- Prepare charts or models for each project.
- Prepare project report.
- Students shall be divided into groups of three and each group shall be assigned a problem that calls for application of the knowledge. Project work will be allotted by the concerned Head of the department and assign a faculty member (from within or from Civil or Cement Technology or Mechanical Engineering) as guide at the beginning of VII semester. The students are exposed to the mine workings for collecting information or relevant data from respective areas during the entire VII semester, to collect information after the institutional working hours or during holidays – second Saturdays / Sundays/ Winter/ holidays and prepare project report under the supervision of the guide.

- Project Report will be assessed at the end of VIII Semester for final examination.

Project may be selected from among the following suggested topics or any other topics recommended by the proposed Guide and approved by the HoD-Mining.

Underground mining(coal)

Bord and pillar mining method
Longwall mining method.
Blasting gallery method.
Stoping methods for non-coal mining
Mechanised stoping methods for non-coal mining

Opencast mining
Pillars extracting by open cast method(coal)
Mechanised opencast mining.
In Pit crushing technology
Surface mining technology
Blasting technology

Other topics
Blast-Free Mining
Energy Conservation in Mining

B.TECH. (Mining Engineering)
VIII SEMESTER

MINE PLANNING AND DESIGN

Unit – I

Feasibility study: Its function and preparation of feasibility report for metallic and non-metallic minerals. Minerals inventory and ore reserves;

Unit – II

Different types of underground mining methods as per the organizational and technical parameters; Determination of size of mine, life of mine and production rates. Design for mining the mineral deposits by open-pit mining, under ground mining and the combination of both; The ultimate open pit profile based on physical and economical parameters; Optimum pit design.

Unit – III

Division of underground mine into parts, levels and panels; Determination of level interval; Size of long wall faces. Stope design-the basic concepts, Different planning stages- micro and macro planning, Project scheduling.

Unit IV

Computer applications; Information systems; Information technology Design for mining mineral deposits by underground mining.
Production planning: Selection of machines; Haul road design; Optimum load haul system; Optimum blast design.

Practical

Each practical is computer based.
1. Estimation of ore reserve based on bore hole data of limestone deposit.
2. Estimation of ore reserve based on bore hole data of Iron ore deposit
3. Estimation of ore reserve based on bore hole data of Bauxite deposit
4. Estimation of ore reserve based on bore hole data of Lead zinc deposit
5. Design of drive in a lead zinc mine.
6. Design of Raise/ winge in a metal mine.
7. Design of shaft in a lead zinc mine.
8. Design of box cut in an o/c mine.
9. Design of haul road.
10. Problem related to ultimate slope in o/c mine.
11. Problem for shovel dumper combination.
12. Design of length of long wall face.
13. Problem related to scheduling
14. Optimum blast design for o/c mine.
15. Optimum blast design for u/g mine.

Text Books/References

1. W.Hustrulid & Kuchta, Open Pit Mine Planning and Design Vol & I. Pub: A.A. Balkema
2. W.A. Hustrulid, Underground Mining Methods Handbook
3. Cummins and Gievens; SME Handbook.Pub: Society of Mining Engineers of the American Institute of Mining , Metallurgical, and Petroleum Engineers, Inc New York
4. Bhattacharya, A., Principles of Mine Planning, Allied Publishers.
5. S.P.Mathur, Mine Planning

B.TECH. (Mining Engineering)
VIII SEMESTER

ROCK EXCAVATION ENGINEERING

Unit – I

Present status of rock excavation in engineering. Rock excavation with and without blasting – classification, selection, case studies etc.

Unit – II

Rock Excavation with drilling & blasting : Methods of drilling; Different types of machines; Hydraulic drills; Long hole drilling; Novel methods of drilling; Choice of drills. Variables in drilling; Machines of drilling; Drillability of rocks. Study of bit life, cost of drilling, hole diameter, pull down weight, joints etc. in relation to BHD and rock characteristic; Trouble shooting; Diagnosis of problems in drilling.

Unit - III

Blast round design & influence of controllable and non controllable parameters on blasting, Fragmentation assessment and monitoring, Instrumentation and software application for design of blast round, monitoring and assessment of rock fragmentation. Deep hole blasting, Hot hole blasting, Stemming plug.

Unit – IV

Blasting damages –Micro and macro level damages due to blasting; Wall control, Blast casting; Demolition blasting, Nuclear blasting; De-stress blasting; Safety & Accident analysis for blasting, Environmental issues in Blasting - Blast induced ground vibration, its measurement, prediction and control, Noise, its measurements and control, Fly rock its causes and control, Controlled Blasting Techniques.

Unit – V

Rock Excavation engineering without drilling & blasting. Blast-free Mining – Definition-Why required ?, Continuous Surface Miner, Hydraulic Rock Breaker, Highwall Miner, etc. Other methods in mining and civil engineering applications like, Tunnel Boring Machine – selection, use and case study.

Practicals

1. Measurement of ground vibration by seismograph
2. Development of predictor equation from the recorded data
3. Measurement of VOD by VOD mate and its analysis
4. Study of various fragmentation assessment techniques
5. Handling of WIPFRAG software
6. Study of Surface Miners

7. Field visit to Highwall Mining working face at Sharda Mines, Sohagpur Area, SECL. Or Write brief description on Highwall Miners use in coal mining.
8. Design of blast for bench blasting
9. Study of various blasting tools
10. Study of working of Hydraulic Rock Breaker.

Text Books/References

1. Dr. Sushil Bhandari, Engineering Rock Blasting Operations. Pub: A.A.Balkema Publisher USA.
2. C.P. Chugh, High Technology in Drilling and Exploration, Pub: Oxford & IBH, New Delhi.
3. C.J. Konya. Surface Blast Design
4. Dr G.K. Pradhan , Explosives and Blasting Techniques, Mintech Publications.
5. U. Langefors and B. Kihlstrom, Modern Techniques of Rock Blasting
6. Indian Explosive Act and Rules.
8. Dr N. R. Thote & G.K. Pradhan, Surface Blast Evaluation, Mintech Publications
9. Dr P. Pal Roy, Rock Blasting : Effects & Operations, Oxford & IBH, New Delhi.

B.TECH. (Mining Engineering)
VIII SEMESTER

Elective – II

MAINTENANCE MANAGEMENT & RELIABILITY ENGINEERING

Unit-I

Introduction: General objectives, Functions; Organization and administration of maintenance systems; Requirements, Concepts and structure of suitable organizations for maintenance systems.
Failure Analysis: Analysis for source identification, classification land selectivity of failure; Statistical and reliability concepts and models for failure analysis.

Unit-II

Classification of maintenance systems; Basis and models for various maintenance systems. Cost management for maintenance: cost estimates- recording, summarizing and distributing cost data, maintenance budget.

Unit-III

Decision models for maintenance planning; Operation and control, optimum level of maintenance; replacement aspects of breakdown and preventive types, group and individual types, obsolete facility, deteriorating and completely failing facilities, replacement vs. reconditioning, economics of overhaul, addition replacement model additive damage case, zero memory case, partially observed situation, planning horizon procedure. Spare planning and control: static spares, insurance spares with and without salvage value, low moving spares; man power planning-crew size , allocation etc. stand by machines; economical and operational aspects; scheduling planning of activities, monitoring and updating, resource allocation, Assigning priorities.

Unit-IV

Other relevant topics: work measurement for maintenance, maintenance control indices, maintenance service contract, preventive maintenance management-guidelines, procedure, general management of lubrication system, organizing preventive maintenance program using vibration signature analysis-some basic ideas, management of records for maintenance, computerization of maintenance activities, major plant shut-down procedures.

Unit-V

RELIABILITY ENGINEERING & ITS APPLICATION IN MINING
Introduction-Classification-Application-Application in Mining-Role in Productivity improvement-Case studies related to application of Reliability Engineering.

Text Books/References

1. L.T. Higging, L.C. Morrow. Maintenance Engineering Handbook, McGraw Hill (1977).
2. B.T. Newbrought. Effective maintenance management, McGraw Hill (1967).
3. R.C.Mishra & K.Pathak, Maintenance Engineering and Management, PHI Learning Private Limited, New Delhi.
4. Reliability Engineering related papers authored by Prof Uday Kumar (can be down loaded from web site of University of Lulea Technical University, Sweden).

B.TECH. (Mining Engineering)
VIII SEMESTER

Numerical Methods in Mining Engineering Application

Unit – I

Introduction to elastic and plastic models, Fundamentals, elastic, plastic, homogeneous iso-tropic and non-linear elasto-plastic models.

UNIT-II

FINITE DIFFERENCE METHODS

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

UNIT-III

FINITE ELEMENT METHODS

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

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

UNIT-V

PRACTICAL APPLICATIONS IN MINING AND ROCK MECHANICS

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

Introduction to ANN- ANN has capability of learning, evoking and generalizing from the given patterns . Its high performance in solving complicated problems has made this technique popular in mining applications. Various applications of the ANN method in rock engineering

Reference Books:

1. Desai, C.S. and Abel, J.F. Introduction to the finite Element Method, Van Nostrand
Riehokl Co., New York, 1983
2. Zienkiewicz, O.C. The Finite Element Method in Engineering Science, Tata McGraw Hill.
3. Segerlind, L.J., Applied Finite Element Analysis, John Wiley and Sons, New York, 1987

4. Mukhopadyay, M. Matrix Finite Element – Computer and Structural Analysis, Oxford and IBH Publishing co., 1984
5. Brown, E.T. (Ed) Analytical and Computational Methods in Engineering and Rock Mechanics, Allen and Unwin, London, 1987.
6. Kenji Suzuki (Editor), Artificial Neural Networks, Methodological Advances &BiomedicalApplications,(http://www.ltfe.org/wpcontent/uploads/2011/04/Artificial_Neural_Networks_Methodological_Advances_and_Biomedical_Applications.pdf) Published by InTech, Janeza Trdine 9, 51000 Rijeka, Croatia.