

Faculty of Engineering & Technology  
 KAKATIYA UNIVERSITY, WARANGAL -506009  
 Department of Mining Engineering

**B. Tech (Mining) III SEMESTER**

Sl. No	Code	Name of the Subject	L	T	P	C
1.	BSC-105	Mathematics – III	3	0	0	3
2.	MIN-301	Mine Development	3	1	0	4
3.	MIN-302	Mine Surveying – I	3	1	0	4
4.	MIN-303	Mining Geology – I	3	0	0	3
5.	ECE-300	Basic Electronics Engineering	3	0	0	3
6.	MIN304L	Elements of Mining Engineering Lab	0	0	3	1.5
7.	MIN305L	Mine Surveying - I Lab	0	0	3	1.5
8.	MC-210	Environmental Science	2	0	0	0
<b>TOTAL</b>			<b>17</b>	<b>3</b>	<b>6</b>	<b>20</b>

[L= Lectures, T= Tutorials, P= Practical, C= Credits]

Faculty of Engineering & Technology  
KAKATIYA UNIVERSITY, WARANGAL -506009  
Department of Mining Engineering

**B. Tech. (MINING) III SEMESTER**  
**BSC-105**  
**MATHEMATICS - III**  
**STATISTICS, PROBABILITY, AND NUMERICAL TECHNIQUES**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks: 70

**Module1: Statistical Methods**

Introduction, Collection of Data, Graphical Representation, Measures of Dispersion, Moments, Skewness, Kurtosis, Correlation, Coefficient of Correlation, Lines of Regression. (Sections 25.1, 25.2, 25.3, 25.6, 25.9, 25.10, 25.11, 25.12, 25.13, 25.14 of Text Book)

**Module2: Probability & Distributions**

Probability, Addition Law of Probability, Independent Events, Baye's Theorem, Random Variable, Continuous Probability Distribution, Expectation, Moment Generating Function, Binomial Distribution, Poisson Distribution, Normal Distribution, Exponential Distribution. (Sections 26.1, 26.4, 26.5, 26.6, 26.7, 26.9, 26.10, 26.11, 26.14, 26.15, 26.16, 26.19(6) of Text Book)

**Module3: Numerical Techniques-I**

Solution of Algebraic and Transcendental Equations, Principle of Least Squares, Method of Least Squares, Fitting of Other Curves, Finite Differences, Forward Differences, Backward Differences. (Sections 28.2, 24.4, 24.5, 24.6, 30.2, 30.2(1), 30.2(2) Of Text Book)

**Module4: Numerical Techniques-II**

Central Differences, Other Difference Operators, Newton's Interpolation Formulae, Gauss's Forward Interpolation Formula, Interpolation with Unequal Intervals, Numerical Differentiation. Sections 29.7, 29.4, 29.6, 29.7(1), 29.9, 30.1. of Text Book)

**Module5: Numerical Techniques-III**

Numerical Integration, Trapezoidal Rule, Simpson's one-third Rule, Simpson's three-eight Rule, Weddle's Rule, Solution of Simultaneous Linear Equations (Iterative Methods) (Sections 30.4, 30.6, 30.7, 30.8, 30.10, 28.5 of Text Book)

**Text Book:**

B.S Grewal, Higher Engineering Mathematics, 43<sup>rd</sup> Edition, Khanna Publications.

**References**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 8<sup>th</sup> Edition, John Wiley & Sons
2. S.C. Gupta, V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons
3. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Pvt. Ltd.

Faculty of Engineering & Technology  
KAKATIYA UNIVERSITY, WARANGAL -506009  
Department of Mining Engineering

**B. Tech. (MINING) III SEMESTER**

**MIN-301**

**MINE DEVELOPMENT**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks: 70

**UNIT-I**

**Introduction:** Mining is a basic industry. Contribution of mining to civilization and national economy. Indian mineral resources and world status. Mining and mineral based industries in India. Classification of mineral deposits. Mine entries: shafts, incline, adit and decline. Limitations and applications of entries. Definition of various terms associated with mining operations (coal and metal mining). Pit top and pit bottom layouts.

**UNIT – II**

**Shaft Sinking:** Location, shape and size of incline and vertical shafts. Surface arrangements for sinking shafts, tools and equipments, ordinary methods of sinking shaft, removal of debris and water, ventilation and lighting, temporary and permanent lining, widening and deepening of shafts.

**Special Methods of Shaft Sinking:** Pilling, Caisson, Freezing and Cementation methods. Modern techniques of shaft sinking. Design of shafts insets and pit bottoms.

**UNIT-III**

**Boring:** Various systems of boring, core recovery, single tube, double tube and wire line core barrels. Deflection of bore holes, fishing tools and their uses. Lithologs and interpretation of bore hole data.

**UNIT-IV**

**Explosives :** Classification of explosives, composition and functions of ingredients of principal types of commercial explosives used in mines, fuse detonators, exploders, storage, transport and handling of explosives, general applications and uses of explosives; safety considerations in manufacture, storage, transport and handling of explosives.

**Blasting:** Mechanics of blasting, blasting systems, electrical and non electric methods, delay blasting techniques, blasting in open pit mines, blasting in underground coal and metal mines. Accessories of blasting: Safety fuse, exploder, detonating fuse, shock tube, detonators.

**UNIT-V**

**Supports:** Objectives and limitations of mine supports, materials used for supports, treatment of timber, friction and hydraulic props, roof bars, chocks, arches, roof bolts, rope stitching and bamboo bolting.

**Text/Reference Books**

1. Deshmukh D.J. Elements of Mining Technology Volume I,II,III. Denett Publishers, Nagpur.
2. Singh R.D. Principles and Practices of Coal Mining. New Age International Publishers.
3. Pradhan G.K. Drilling and Blasting. Lovely Prakashan, Dhanbad
4. Das S K. Blasting Practices in Mines. Lovely Prakashan, Dhanbad.

Faculty of Engineering & Technology  
 KAKATIYA UNIVERSITY, WARANGAL -506009  
 Department of Mining Engineering

**B. Tech. (MINING) III SEMESTER**

**MIN-302**

**MINE SURVEYING-I**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks: 70

**UNIT - I**

**Introduction to surveying:** Importance of surveying, Basic principles of surveying, Definitions of plane and geodetic surveying, Measurement of distances by chain, tape and other methods; Chain surveying, Chain traversing, errors in measurement, field notes, record of data and its related problems.

**UNIT-II**

**Compass surveying:** Construction and principles of Compass, Compass Traversing, Leveling; principles of leveling, methods of leveling; rise and fall method, line of collimation method and Contouring; plotting of contour. Its related problems.

**UNIT-III**

**Theodolite surveying;** Construction and working principles of theodolite. Measurement of horizontal and vertical angles; Temporary and permanent adjustments; Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments. Triangulation.

**UNIT-IV**

**Tachometric surveying:** Definition and different systems of tachometric methods, Determinations of Tachometric constants, The stadia system, principle of stadia method. Fixed Hair method, Distance and elevation formulae. Movable hair method, Staff Normal, Staff Vertical. Subs tense Method, Principle of substance (or movable hair) method, the tangential system.

**UNIT – V**

**Curves:** Definitions and Notations, Designation of Curves, Elements of Simple Curves, Setting out simple curves - By ordinates from the long chord, By successive bisections of arcs and chords, By offsets from the tangents, By deflections distances, Rankin's method of tangential angles, Two theodolite method, Tachometric method. Transition curves.

**Text / Reference books**

1. Punimia BC. Surveying Vol I, II and III. Laxmi Publication, New Delhi, 1991.
2. Kenetkar TP. Surveying and Levelling Vol I and Vol II. United Book Corporation, Poona, 1991.
3. Ghatak. Mining Surveying. Lovely Prakashan, Dhanbad, 1990.

Faculty of Engineering & Technology  
 KAKATIYA UNIVERSITY, WARANGAL -506009  
 Department of Mining Engineering

**B. Tech. (MINING) III SEMESTER**

**MIN-303**

**MINING GEOLOGY-I**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks: 70

**UNIT-I**

**Physical Geology:** Origin and evolution of earth, Earth as a member of solar system, Age of earth, Interior structure of earth, Important physical features of the earth's surface: Mountains, River valleys, Oceans, Lakes and Volcanoes.

**UNIT-II**

**Mineralogy:** Definition of minerals and Rock forming minerals, Bowen's reaction series, Description of important rock forming minerals: Quartz, Orthoclase, Biotite, Hornblends, Augite and Olivine. Concepts of crystallography.

**UNIT-III**

**Petrology:** Definition of rock, elementary concepts of classification of rocks, basic principles of formation of Igneous, Sedimentary and Metamorphic rocks. Description of textural and mineralogical properties of important Igneous, Sedimentary and Metamorphic rocks: Granite, Dolerite, Basalt, Conglomerate, Sandstone, Limestone, Schist, Gneiss and Marble.

**UNIT-IV**

**Stratigraphy and Indian Geology:** Introduction, Principles of stratigraphy and correlations, geological time scale, physiographic divisions of India. Distribution, description and mineral wealth of the following stratigraphic divisions of India: Dharwarian system of Mysore, Cuddapah system, Vindhyan system, Kurnool system and Gondwana group.

**UNIT-V**

**Paleontology:** Definition and scope of paleontology, Preservation of fossil-index fossils – Stratigraphic Important and uses of fossils, description of a) Foraminifera b) Trilobite c) Lamellibranch and d) Gastropods Ltd. Significance and distribution of Gondwana Flora of India.

**Text / References Books**

1. Parbin Singh. Engineering and General Geology. Katson Educational Series.
2. Hommes A. Principles of Physical Geology. Nelson and Sons.
3. Dana E.S and Ford. WEA text books of Mineralogy. John Wiley and Sons.
4. Tyrrel G.W. The Principles of Petrology. Methuen.
5. Woods H. Palaontology Invertebrate. Cambridge University Press.
6. Krishnan M.S. Geology of India and Burma. Higgs Bothams.



Faculty of Engineering & Technology  
 KAKATIYA UNIVERSITY, WARANGAL -506009  
 Department of Mining Engineering

**B. Tech. (MINING) III SEMESTER**  
**ECE-300**  
**BASIC ELECTRONICS ENGINEERING**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks: 70

**UNIT – I**

P-N junction and V-I characteristics, static and dynamic resistance, diode capacitance, effect of temperature, Avalanche and zener breakdown, Zener diode

**Regulated power supply:** Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with capacitive and inductive Filters, Voltage regulator.

**UNIT - II**

**Bipolar Junction Transistor (BJT) and Junction Field Effect Transistor (FET):** Principle of Operation, Configurations and characteristics, Transistor as a switch and amplifier.

**DC Analysis:** Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Thermal runaway and stabilization, DC analysis of FET

**UNIT – III**

RC coupled amplifier and its frequency response, Feedback: effect of negative feedback on amplifier characteristics, positive feedback: RC and LC oscillators. Op-amp and its basic applications: adder, subtractor, integrator and differentiator.

**UNIT - IV**

Boolean algebra: postulates and theorems, basic and universal gates, Adders/subtractors- half adder, full adder, half subtractor, full subtractor, serial adder, parallel adder.

Flip flops- SR, JK, D and T, race around condition, master-slave JK Flip flop, and applications of Flip flops.

**UNIT – V**

Electronic Instrumentation: Physical measurement, forms and methods of measurements, CRO operation and CRT characteristics, Transducer & its classification. Strain gauge transducer, LVDT, variable gap capacitive transducer, thermistor and thermocouple, MEMS

**Text /Reference Books:**

1. Jacob Millman & Christos C. Halkias. Electronic Devices and Circuits. McGraw Hill Education.
2. Robert L. Boylestead, Louis Nashelsky. Electronic Devices and Circuits theory. 11th Edition, 2009, Pearson.
3. David A. Bel. Electronic Devices and Circuits. 5th Edition, Oxford.
4. Moris Mano. Digital Logic Design. Prentice Hall of India, New Delhi.
5. Jain RP. Modern Digital Electronics. Prentice Hall of India, New Delhi.
6. Roy Choudhary and Shail Jain. Linear Integrated Circuits. New Age International, New Delhi.

Faculty of Engineering & Technology  
KAKATIYA UNIVERSITY, WARANGAL -506009  
Department of Mining Engineering

---

---

**B. Tech. (MINING) III SEMESTER**  
**MIN-304L**  
**ELEMENTS OF MINING ENGINEERING LAB**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks:25
0	0	3	1.5	External Marks: 50

1. Study of core barrels.
2. Study of feeding mechanism in drills.
3. Study of fishing tools.
4. Determination of bore hole deflection.
5. Study of lithologs and interpretation of borehole data.
6. Study of detonators.
7. Study of exploders.
8. Study of friction and hydraulic props.
9. Study of arches, roof bolts and rope stitching.
10. Study of sylvester prop withdrawer.

Faculty of Engineering & Technology  
KAKATIYA UNIVERSITY, WARANGAL -506009  
Department of Mining Engineering

---

---

**B. Tech. (MINING) III SEMESTER**

**MIN-305L**

**MINE SURVEYING - I LAB**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks:25
0	0	3	1.5	External Marks: 50

1. Measurement of distance between two points.
2. Chain triangulation; booking, calculation of areas and plotting.
3. Traversing with compass.
4. Fly leveling and reduction of level.
5. Profile leveling and plotting the section.
6. Measurement of horizontal and vertical angles.
7. Theodolite traversing.
8. Finding distance between two in accessible points.
9. Curve ranging offsets by long chord.
10. Curve ranging by Rankin method.

Faculty of Engineering & Technology  
 KAKATIYA UNIVERSITY, WARANGAL -506009  
 Department of Mining Engineering

**B. Tech. (MINING) III SEMESTER**

**MC-210**

**ENVIRONMENTAL SCIENCES**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
2	0	0	0	External Marks: 70

**UNIT-I (8)**

**Introduction to Environmental Science:** Environment and society, major environmental issues: Ozone layer depletion, Acid rains, global climate change etc, sustainable development, Environmental impact assessment, environmental management

**Natural Resources Utilization and its Impacts:** Energy, minerals, water and land resources, Resource consumption, population dynamics, urbanization.

**UNIT-II (8)**

**Ecology and Biodiversity:** Energy flow in ecosystem, food chain, nutrient cycles, eutrofication value of biodiversity, biodiversity at global, national and local levels, threats for biodiversity, conservation of biodiversity.

**UNIT-III (8)**

**Water Pollution:** Sources, types of pollutants and their effects, water quality issues, contaminant transport, self-purification capacity of streams and water bodies, water quality standards, principles of water and wastewater treatment.

**UNIT-IV (8)**

**Air Pollution:** Sources, classification and their effects, Air quality standards, dispersion of pollutants, control of air pollution, automobile pollution and its control.

**UNIT-V (8)**

**Solid Waste Management:** Sources and characteristics of solid waste, effects, Collection and transfer system, disposal methods.

**Text Books:**

1. M. Chandrasekhar, Environmental science, Hi Tech Publishers, 2009.
2. P.N. Modi (2006), Water supply Engineering – Environmental Engineering (Vol. I) – Standard Book House.
3. Gerard Kiely, Environmental Engineering, McGraw Hill Education Pvt Ltd, Special Indian Edition, 2007.

**References:**

1. W P Cunningham, M A Cunningham, Principles of Environmental Science, Inquiry and Applications, Tata McGraw Hill, Eighth Edition, 2016.

Faculty of Engineering & Technology  
 KAKATIYA UNIVERSITY, WARANGAL -506009  
 Department of Mining Engineering

**B. Tech. (MINING)**

**IV SEMESTER**

Sl.No	Code	Name of the Subject	L	T	P	C
1	MIN-406	Mine Ventilation and Planning	3	1	0	4
2	MIN-407	Mine Surveying – II	3	1	0	4
3	MIN-408	Mining Geology – II	3	0	0	3
4	ME-400	Mechanical Technology	3	0	0	3
5	MIN-409	Drilling and Blasting	3	0	0	3
6	MC-220	Constitution of India	2	0	0	0
7	MIN-410L	Mine Ventilation and Planning Lab	0	0	3	1.5
8	MIN411L	Mining Geology Lab	0	0	3	1.5
9	MIN-412L	Mine Surveying Lab – II	0	0	3	1.5
10	MIN-413	Mine Visits	0	0	2	1
<b>TOTAL</b>			<b>17</b>	<b>2</b>	<b>9</b>	<b>22.5</b>

**Note:**

Practical Training is to be conducted after completion of SEMESTER – IV for 30 days duration and to be evaluated in the SEMESTER - V.

Faculty of Engineering & Technology  
 KAKATIYA UNIVERSITY, WARANGAL -506009  
 Department of Mining Engineering

**B. Tech. (MINING) IV SEMESTER**  
**MIN-406**  
**MINE VENTILATION AND PLANNING**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks: 70

**UNIT-I**

**Mine Gases:** Origin, occurrence, physical, chemical and physiological properties of mine gases, instruments used for spot detection of mine gases. Various dampers, methane drainage techniques. Gas chromatography.

**UNIT-II**

**Mine Climate and Control:** Sources of heat and humidity in mines and their effects, instruments used for measurement of temperature, humidity, pressure and velocity. Heat stress indices, Cooling power and method of improving cooling power.

**UNIT-III**

**Natural Ventilation and Laws of Air flow:** Natural ventilation, Factors effecting NVP, Direction of air flow, Derivation of NVP, Motive column, Atkinson law governing airflow in mine openings.

**UNIT-IV**

**Mechanical Ventilation:** Definition of Mechanical ventilation, Different types of fans and their characteristics, Operating point, Fan laws, installation. Ventilation appliances, economic size of roadways, determination of quantity and head requirements. Fan selection and evasee.  
**Ventilation networks:** simple and complex, solutions to simple ventilation network. Introduction to Hardy cross method for solving complex network. Introduction to ventilation software's.

**UNIT-V**

**Ventilation Planning:** Standards of ventilation, ascensional ventilation, descensional ventilation, ventilation planning for different mining methods: Bord and pillar, Longwall mining method and cut and fill, sub level caving and shrinkage stoping method.



**Text / Reference books:**

1. Mishra GB. Mine Environment and Ventilation. Oxford University Press, 1992.
2. Hartman HL. Mine Ventilation and Air Conditioning. Wiley Interscience publication, 1993.
3. Pherson Mc. Subsurface Ventilation and Environmental Engineering. Chapman and Hall Publication, London, 1993.
4. Vutukuri VS. Mine Environment Engineering. Trans Tech Publishers, 1986

Faculty of Engineering & Technology  
 KAKATIYA UNIVERSITY, WARANGAL -506009  
 Department of Mining Engineering

**B. Tech. (MINING) IV SEMESTER**

**MIN-407**

**MINE SURVEYING-II**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks: 70

**UNIT - I**

**Correlation:** Correlation by different methods; weisbach triangle method, weiss quadrilateral method measurement of depth of shaft. Correlation of mine survey to the national grid. Gyro theodolite survey. Its related calculations.

**UNIT – II**

**Photographic Surveying:** General principles, elements of Photogrametry, orientation of photographs, finding heights and distances of ground points from photographs.

**Field Astronomy:** Astronomical terms and definitions. Determination of the meridian, longitude and latitude of a place.

**UNIT – III**

**Advanced Surveying:** Electronic surveying; EDM-Components, base line measurement, setting out a work ,care and maintenance. GPS - Fundamentals, receivers, observers, transformation of GPS results. GIS, Total Station; Components, Traversing, care and maintenance.

**UNIT – IV**

**Subsidence Surveying:** Construction and layout of subsidence monitoring stations, Subsidence survey over the Bord and pillar panel, Longwall panel and other methods. Subsidence prediction by InSAR technology.

**UNIT – V**

**Stope Surveying:** Purpose; Methods of survey in moderately and steeply inclined ore bodies, flat and vertical ore bodies/seams.

**Application of Automation & IT in surveying:** Data acquisitions; Preparation of plans and sections; Calculation of earth works. Introduction to surveying softwares.

**Text /Reference books:**

1. Punimia BC. Surveying Vol I, II and III. Laxmi Publication, New Delhi, 1991.
2. Kenetkar TP. Surveying and Levelling Vol I and Vol II. United Book Corporation, Poona, 1991.
3. Ghatak. Mining Surveying. Lovely Prakashan, Dhanbad, 1990.

Faculty of Engineering & Technology  
KAKATIYA UNIVERSITY, WARANGAL -506009  
Department of Mining Engineering

**B. Tech. (MINING) IV SEMESTER**

**MIN-408**

**MINING GEOLOGY-II**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks: 70

**UNIT-I**

**Structural Geology:** Definition and Scope, Primary and Secondary Structure: Bedding, Lination, Foliation, Cleavage, Attitude of beds determination of strike and dip of formations; thickness of beds; structures of intrusive bodies.

Description and recognition of major structural elements

- Folds: Introduction, Nomenclature of folds, Anticline, Syncline, Symmetrical fold, Asymmetrical fold, Overturned fold, recumbent fold, Ion clinal fold, Homocline, Closed and Open folds and Drag folds.
- Joints: Introduction, Geometrical classification of Joints
- Faults: Introduction, General characteristics, Translational and rotational movements, relative movements, Types of faults, Norse and Graben.

**UNIT-II**

**Un-conformations:** Introduction, Types of unconformities, Recognition of unconformities.

**Ground Water:** Introduction, Scope, Utilization of ground water, Hydrological cycle, Origin and occurrence of ground water, Vertical distribution of ground water, Water table.

**Table Aquifers:** Types of aquifers, Confined aquifers, Unconfined aquifers, Perched aquifers.

Porosity, Void ratio and Permeability of rocks.

**UNIT-III**

**Economic Geology:** Aim and scope of economic geology, Definition of ore and gangue, Simple ore, Complex ore, Tenor and grade of ore. Processes and formation of ore deposits, Sygenetic deposits, Epigenetic deposits, Secondary mineral deposits: Oxidation and supergere enrichment deposits , Mechanical Concentration deposit, Residual/ Concentration deposits.

**UNIT-IV**

**Occurance and distribution of important metallic mineral deposits in India:** Iron, Copper, Lead and Zinc, Manganese, Aluminum, Chromium. Occurrence and distribution of important metallic deposits: Asbestos, Kyanite and Sillimanite.

**Coal:** Origin and formation of coal, Distribution of important coal fields in India.

**UNIT-V**

**Petroleum:** Origin, Migration and Accumulation of Petroleum, Reservoir and Cap rocks, Structural and stratigraphic traps, Distribution oil fields in India.

**Occurrence and distribution of radioactive minerals in India:** Uranium, Thorium and Beryllium.

**Text / References Books**

1. Parbin Singh. Engineering and General Geology.
2. Hommes A. Principles of Physical Geology.
3. Tyrrel G.W. The Principles of Petrology.
4. Woods H. Palaeontology Invertebrate.
5. Krishnan M.S. Geology of India and Burma.

Faculty of Engineering & Technology  
 KAKATIYA UNIVERSITY, WARANGAL -506009  
 Department of Mining Engineering

**B. Tech. (MINING) IV SEMESTER**  
**ME-400**  
**MECHANICAL TECHNOLOGY**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks: 70

**UNIT-I**

**Mechanical Power transmission :** Cams various types ,cam followers, working principles and application of the cams (design of cam profiles omitted ), nature of types of gears ,nomenclature for straight toothed spur , helical spur , bevel and skew ,gear trains , simple , compound , reverted and epicyclic. Simple problems on calculation of velocity ratios and number of teeth of gears in the above gear trains ( further details not required).

**UNIT-II**

**IC Engines:** IC Engine components and basic engine nomenclature – classification of IC engines, otto cycle, diesel cycle, two stroke and four stroke spark ignition and compression ignition engines. Application of IC engines, study of fuel supply systems in SI and CI engines. Study of fuel ignition, cooling and lubrication systems. Simple calculation of indicated power, brake power, mechanical efficiency, thermal efficiency and fuel consumption. Coal diesel, coal water, slurries as alternate diesel fuel. Simple maintenance techniques.

**UNIT-III**

**Compressed air generation and applications:** Types of air compressors, reciprocating and rotary air compressors, like roots blower, vane type, centrifugal axial flow, mixed flow, screw type. Equation for kg of air compressed with and without clearance volume in a reciprocating air compressor, two stage air compressor with inter cooling, simple problems, distribution of compressed air, application of compressed air, simple maintenance techniques. Effect of altitude on air compressors.

**UNIT-IV**

**Power Plant Engineering:** Introduction to Energy and Power, sources of energy, various conventional and non conventional energy sources, principal types of power plants, combustion of fuels, classification of Steam power plants, layout of steam power plant, coal handling systems, fluidized bed combustion, ash handling, dust collection, study of simple vertical boiler, impulse and reaction turbine, steam condenser.

**UNIT – V**

**Introduction to Machine Design:** General considerations in the design of engineering materials and their properties , selection, manufacturing consideration in design, tolerances and fits , BIS codes of steels.

**Shaft Couplings:** Rigid couplings , Muff, Split muff and Flange couplings. Flexible couplings and flange coupling (Modified).

**Text/Reference Books:**

1. Ballany P.L. Theory of Machines and Mechanisms.
2. Ballany P.L. Thermal Engineering.
3. Ganesham V. IC Engines
4. Rttan S.S. Theory of Machines

Faculty of Engineering & Technology  
 KAKATIYA UNIVERSITY, WARANGAL -506009  
 Department of Mining Engineering

**B. Tech. (MINING) IV SEMESTER**  
**MIN-409**  
**DRILLING AND BLASTING**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks: 70

**UNIT – I**

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

**UNIT – II**

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

**UNIT – III**

**Explosives, Accessories and Tools:** Explosives and Blasting Agents- ANFO, slurry, emulsion, LOX, permitted explosives, bulk explosives; Selection of explosives; Blasting accessories, Initiation systems, Testing of explosives; Storage, transportation and handling of explosives; Destruction of explosives and accessories. Theories of rock breakage; mechanics of rock fragmentation by explosive action, Instrumentation in blasting –V.O.D probe, vibration monitoring, high speed video camera, etc.

**UNIT – IV**

**Blasting in Underground Mines:** Design of blast for coal and metal underground mines – gallery, Solid blasting techniques, periphery blasting, drilling pattern for tunneling and shaft sinking, controlled blasting techniques, dangers associated with underground blasting and preventive measures; misfires, blown out shots, incomplete detonation – their causes and remedial measures.

**UNIT – V**

**Blasting in Surface Mines and Allied Engineering Fields:** Methods of blasting in surface mines, Blast design, Primary and secondary blasting, Rock fragmentation studies, Dangers associated with blasting in opencast mines and preventive measures, Environmental impacts



due to blasting, Controlled blasting techniques, Blasting in opencast coal mines of developed galleries, Blasting economics, Computer aided design of blasts. Blasting for road constructions, trench cutting, demolition of buildings etc; Blasting for Dimensional stones; Underwater blasting. Alternatives to blasting.

**Text/Reference Books:**

1. Hustrulid W A. Blasting Principles of Open Pit Mining, Vol. 1- General Design Concept. A.A. Balkema, Rotterdam, 1999.
2. Jimeno C L, Jimeno EL, Carcedo EJ. Drilling and Blasting of Rocks. A.A.Balkema, Rotterdam, 1995.
3. Clark G B. Principles of Rock fragmentation. Wiley Interscience Publication, 1987.
4. Konya C J and Walter E J. Surface Blast Design, New Jersey, 1990.
5. Sushil Bhandari. Engineering Rock Blasting Operations. A.A.Balkema, Rotterdam, 1997.

Faculty of Engineering & Technology  
KAKATIYA UNIVERSITY, WARANGAL -506009  
Department of Mining Engineering

**B. Tech. (MINING) IV SEMESTER**

**MC-220**

**CONSTITUTION OF INDIA**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
2	0	0	0	External Marks: 70

**UNIT -1**

1. Making of Indian Constitution - Constituent Assembly
2. Historical Perspective of the Constitution of India
3. Salient Features and characteristics of the Constitution of India

**UNIT -2**

1. The Fundamental Rights
2. The Fundamental Duties and their Legal Status
3. The Directive Principles of State Policy – Their Importance and Implementation

**UNIT -3**

1. Federal Structure and Distribution of Administrative, Legislative and Financial Powers between the Union and the States
2. Parliamentary Form of Government in India – The Constitutional Powers and Status of the President of India
3. Amendment of the Constitutional Provisions and Procedure

**UNIT -4**

1. The Judiciary
2. Constitutional and Legal Frame Work for Protection of Environmental in Global and National Level
3. Corporate Social Responsibility (CSR) International and National Scenario.

**Text books:**

1. D.D. Basu: An Introduction of Indian Constitution
2. Greanvile Austin: The Indian Constitution
3. Paras Diwan: Studies on Environmental cases

**References books:**

1. KhannaJustice.H.R: Making of India’s Constitution, Eastern Book Companies.
2. Rajani Kothari: Indian Politics
3. Ghosh Pratap Kumar: The Constitution of India. How it has been Formed, World Press.
4. A.Agrawal (Ed): Legal Control of Environmental Pollution.

KAKATIYA UNIVERSITY, WARANGAL -506009  
 Department of Mining Engineering

**B. Tech. (MINING) IV SEMESTER**  
**MIN-410L**  
**MINE VENTILATION AND PLANNING LAB**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks:25
0	0	3	1.5	External Marks: 50

1. Detection of mine gases using detectors.
2. Determination of relative humidity using Hygrometer.
3. Determination of cooling power using Kata thermometer.
4. Calibration of inclined manometer.
5. Determination of friction and drag coefficient of an obstruction in mine road way.
6. Determination of method factor and discharge coefficient for orifice plate
7. Determination of performance of evasee.
8. Measurement of air quantity by anemometer, velometer and smoke tube.
9. Study of fans in series and parallel connection.
10. Study of fan reversal system.

Faculty of Engineering & Technology  
KAKATIYA UNIVERSITY, WARANGAL -506009  
Department of Mining Engineering

---

---

**B. Tech. (MINING) IV SEMESTER**  
**MIN-411L**  
**MINING GEOLOGY LAB**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks:25
0	0	3	1.5	External Marks: 50

1. Identification of Physical properties of Minerals.
2. Identification and description of igneous, sedimentary and metamorphic rocks.
3. Determination of True thickness and Vertical thickness of beds.
4. Interpretation of structural maps.
5. Point problems.
6. Megascopic and identification of important metallic and industrial mineral deposits.
7. Geological mapping of igneous, sedimentary and metamorphic terrains.

Faculty of Engineering & Technology  
 KAKATIYA UNIVERSITY, WARANGAL -506009  
 Department of Mining Engineering

**B. Tech. (MINING) IV SEMESTER**  
**MIN-412L**  
**MINE SURVEYING – II -LAB**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks:25
0	0	3	1.5	External Marks: 50

1. Reading of mine plans.
2. Correlation by two shaft method S/T and U/T.
3. Correlation by two shaft co-planation method.
4. Correlation by single shaft weisbach method.
5. Correlation by single shaft Weiss quadrilateral method.
6. Finding horizontal & vertical distance by tachometry.
7. Finding the height of an in accessible object.
8. Traversing by Total station and GPS.
9. Finding of quantity of sand stowing yard.
10. Prediction of subsidence over panel.

**B. Tech (Mining) V SEMESTER**

S. No	Course Code	Course Title	Scheme of Instruction			Lecture hr/week	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
1	PC3101MN	Rock Mechanics	3	1	-	4	30	70	4
2	PC3102MN	Underground Mining Methods (Coal)	3	1	-	4	30	70	4
3	PC3103MN	Mine Hazards and Rescue	3	1	-	4	30	70	4
4	PC3104MN	Mining Machinery	3	-	-	3	30	70	3
5	PC3105MN	Mining Instrumentation and Automation	2	-	-	2	30	70	2
6	PC3106MN	Rock Mechanics Laboratory	-	-	3	3	25	50	1.5
7	PC3107MN	Mine Hazards and Rescue Laboratory	-	-	3	3	25	50	1.5
8	PC3108MN	Internship – I (Underground Coal Mining)	-	-	-	-	100	-	1
9	MC3101CE	Strength of Materials	-	-	-	-	-	-	-
<b>Total</b>			<b>14</b>	<b>3</b>	<b>6</b>	<b>23</b>	<b>300</b>	<b>450</b>	<b>21</b>

- The Internship – I taken during summer vacation after IV Semester
- The students have to complete MC3101CE using any one of the MOOC platform and produce the certificate.

**B Tech (Mining) V- Semester**

**PC3101MN**

**ROCK MECHANICS**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks : 70

**UNIT I**

**Physico-mechanical properties of rocks:**

Physical properties: Density, porosity, void ratio, moisture content, permeability. Mechanical Properties: Preparation of rock samples, determination of mechanical properties of rocks: compressive strength, tensile strength, shear strength, modulus of elasticity, poisson's ratio, cohesion, angle of internal friction, Protodyaknov's strength index, longitudinal wave velocity, rock burst ability index, Schmidt rebound hardness number, slake durability index.

**UNIT II**

**Rock mass classification:**

Core recovery, Rock quality designation, Rock mass rating, Indian- geo mechanics classification, Q System, Geological strength index, Slope mass rating, rippability classification, Coal mine roof rating,

**UNIT III**

**Stress strain analysis:**

Analysis of stress and strain in two and three dimensions, Principal stress, stress ellipsoid, Determination of principal stress and strain invariants; Differential equilibrium equations; compatibility equation of stress and strains, Stress and strain transformation, Mohr's circle of stress and strain, Plane stress and plane strain condition.

**UNIT IV**

**Rock mass behavior:**

Confining pressures, effect of water, time, temperature. Insitu stress and their estimation; flat jack method, over coring method and hydro fracturing method; Horizontal and vertical stress, intact rock strength and deformability; measuring devices for load, stress and strain. Dynamic loading of rocks Time dependent properties of rock, creep, mechanism of creep of rocks – different stages, rheological models

**UNIT V**

**Rock failure theories:**

Coulomb, Mohr's – Coulomb, Hoek and Brown, Griffiths and Drucker – Prager and Its related calculations

**Text / Reference books:**

1. Deb D and Verma AK, "Fundamental and application of rock mechanics", . PHI publication
2. Debasis Deb, "Finite element method: concepts and application in geo mechanics"
3. SP Timoshenko, JN. Goodier, "Theory of Elasticity"
4. V Singh and B P Khare, "Rock Mechanics and ground control"
5. Obert and Duvall, "Rock Mechanics and design of structures in rock"
6. Jumikis, "Rock Mechanics"
7. Goodman, "introduction to Rock Mechanics"
8. Binawiski ZT, "Engineering rock mass classification"
9. Singh & goel, " Rock mass classification"



**B Tech (Mining) V- Semester**

**PC3102MN**

**UNDERGROUND MINING METHODS (COAL)**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks : 70

**UNIT I**

**Introduction:**

Access to coal deposits; shafts, incline. Factors affecting choice of mining method; Classification of mining methods; Status of coal mining industry, grading and analysis of coal

**UNIT II**

**Development of Deposit:**

Division of the mining property into panels, working districts and working places. Development of panels for bord and pillar, Longwall, shortwall etc., with conventional and continuous mining techniques Factors affecting the selection of equipment

**UNIT III**

**Methods of Pillar Extraction:**

Preparatory arrangements for development & depillaring operation, principle and design of depillaring. Factors affecting choice of pillar extraction. Different methods of pillar extraction including continuous miner technology, Wongwalli, Shortwall and continuous seam working

**UNIT IV**

**Longwall Methods:**

Advance and retreat methods, continuous and cyclic systems, extraction with different machines – ploughs, shearers, design of Longwall workings, optimum length of face, size of panel, gates, support system, personnel, organization and safety measures, face equipment installation, salvaging operation.

**UNIT V**

**Special Mining Methods:**

Slice Mining, Sub Level caving, integrated sub level caving, blasting gallery method, Longwall mining with top coal caving (LTCC), Horizon mining, problems of working thick and thin seams liable to spontaneous heating, outburst and bumps, Highwall mining, punch entries.

**Text / Reference books:**

1. Mathur SP, "Coal Mining in India", Sahyog Prakashan, Chattisgarh
2. Singh JG, "Underground Coal Mining Method". Braj Kalpa Publishers, Varanasi
3. Samir kumar Das," Modern Coal Mining Technology". Lovely Prakashan, Dhanbad
4. Vorobjev BM & Deshmukh RT,, "Advance Coal mining Vol – I & II"
5. Woodroof CD, "Methods of working coal and metal mines" Vol - III

**B Tech (Mining) V- Semester**

**PC3103MN**

**MINE HAZARDS & RESCUE**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks : 70

**UNIT I**

**Mine fires:**

Classification, surface and underground fires, causes and effect of mine fires, spontaneous combustion, causes and nature of spontaneous combustion, its detection and prevention. Firefighting equipment: selection installation, operation and maintenance in mines. fire fighting organization, sealing of fire areas, re-opening of sealed off areas

**UNIT II**

**Explosions:**

Classification of explosions, causes of underground explosions, Fire damp explosions: causes and preventive measures, Coal dust explosions, Explosibility of coal dust, causes and preventive measures to be taken against coal dust explosions, water gas explosion.

**UNIT III**

**Inundation:**

Causes of mine inundations from surface and underground sources, precautionary and productive measures on surface and in underground, Approaching water logged areas and dewatering of water logged areas. Design of various water dams, sump and pumps.

**UNIT IV**

**Rescue and recovery work:**

Mine rescue and first aid equipment, short distance apparatus, self contained oxygen breathing apparatus, self rescuers, reviving apparatus, rescue stations, organization, rescue and recovery work in connection with fires, explosions and inundations. Basic principles of risk management. Dust in mine air: dust production in mines and its control, health hazards, sampling and assessment of airborne dust.

**UNIT V**

**Mine illumination:**

Standards of illumination, common types of flame safety lamps, their use and limitations, electric hand and cap lamp, their maintenance and examination, lamp room design and organization. Illumination arrangements of opencast and underground workings

**Text / Reference books:**

1. Ramulu MA, "Mine Fires explosions, rescue, recovery and illuminations",
2. Kaku, "Fires in coal mines".
3. DJ Deshmukh , " Elements of Mining Technology" Vol. -II

**B Tech (Mining) V- Semester**

**PC3104MN**

**MINING MACHINERY**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks : 70

**UNIT I**

**Introduction:**

Elements of mine transport and material handling system: Classification and techno- economic indices, types of motive power used in mines.

Wire Rope: classification, construction details , selection of rope , factor of safety, rope capping and splicing; deterioration of rope in use and its prevention; testing of ropes, selection and maintenance, rope calculations.

**UNIT II**

**Rope haulage:**

Construction of rope haulages–gravity, direct, balanced direct, main & tail, endless, reversible endless. Suitability of these haulages and their limitations. Dimension of ropes, drums and pulleys, care and maintenance of ropes, changing of haulage ropes, safety appliances in haulage road, statutory requirements of haulages.

**UNIT III**

**Winding:**

Winding systems, drum winders, drives, mechanical braking of winders, safety devices in winding, overwind and over speed protection, Koepe and multi-rope friction winding. Calculations relating to rope size & numbers, capacity & power requirement for cages, skips, drum and Koepe winding systems

**UNIT IV**

**Head gear & Mine Pumps:**

Head gear and their design, head sheave, cages and skips, suspension gear, shaft fittings and appliances guides, keps, etc., signalling systems.

Pump and sump design in opencast and underground mines, different types of pumps, their construction and application. Mine pump calculations. Safety boring apparatus

**UNIT V**

**Mine Signaling and Compressors:**

Methods, signaling system in winding system, haulage roads, Longwall faces, operation of underground and opencast mines telephone. Compressors: types of compressors, different stages in compression, compressors used for bolting, location of compressors, laying of air hose in the panel

---

**Text / Reference books:**

1. Karelin, "Mine Transport".
  2. DJ Deshmukh, " Elements of Mining Technology" Vol. -III
  3. Rakesh and Lele, " Selection and installation of mine pumps"
  4. Hartmen, " Introduction to Mining Engineering"
  5. Statham, " Coal Mining Practice"
-

**B Tech (Mining) V- Semester**

**PC3105MN**

**MINING INSTRUMENTATION AND AUTOMATION**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
2	0	0	2	External Marks : 70

**UNIT I**

Introduction to rock mechanics instrumentation. Various types of deformation devices, strain gauges, LVDT's. Load cells, convergence recorders, Telltale, borehole extensometers.

**UNIT II**

Introduction to Ultrasonic sensors and monitors, geophones, seismographs, electro-magnetic velocity meters, accelerometers, high speed video cameras, laser profilers.

**UNIT III**

Field instrumentation in bord& pillar, blasting gallery, longwall and highwall mining; Remote Convergence Monitoring Systems, Remote monitoring and operation of mining equipment using telemonitoring and modern devices

Automation in monitoring of environments in longwall and continuous mining system

**UNIT IV**

Rock slope monitoring instruments: incline meters, tilt meters. Crack meters, total station, LiDAR, Slope stability radar, Bore hole radars

Development of smart drilling machines and their utilization in drilling and exploration for improving performance

**UNIT V**

Automation and robotic: Development of robotic systems, different types and possible applications in mine safety.

IOT and Adaptive Wireless Sensor Networks (AWSN) and their applications in mineral industry

**Text / Reference books:**

1. Hustrulid, "Underground Mining Methods Handbook" SME NY, 1994
2. Society of Mining Engineering Handbooks –Vol. I and II
3. Peng, S.S., "Longwall Mining", John Wiley and Sons
4. Ervin, M.C., Insitu testing for geotechnical investigations, A. A. Balkema, 1983.
5. Hunt, R.E., "Geotechnical Engineering investigation manual", CRC Press, 2005
6. R. Ulusay, "The ISRM Suggested Methods for Rock Characterization, Testing and Monitoring", 2007-2014, Springer, 2016.
7. Ian F. Akyildiz, "Wireless Sensor Networks", A John Wiley and Sons, Ltd, Publication
8. David J. Daniels, "Ground penetrating radar", Institution of Engineering and Technology, 2004

**B Tech (Mining) V- Semester**

**PC3106MN**

**ROCK MECHANICS LABORATORY**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 25
0	0	3	1.5	External Marks : 50

1. Sample Collection and Specimen preparation
2. Determination of moisture content, density, void ratio and porosity of rocks
3. Determination of compressive strength, modulus of elasticity and poisson's ratio of rocks
4. Determination of tensile strength of rocks
5. Determination of shear strength, angle of internal friction and cohesion of rock
6. Determination of point load strength index of rocks
7. Determination of Protodyaknov strength index of rocks
8. Determination of slake durability index of rocks
9. Determination of hardness of rocks.
10. Determination of losangles index
11. study of convergence measuring instruments
12. Testing props, chocks etc.,

**B Tech (Mining) V- Semester**

**PC3107MN**

**MINE HAZARDS AND RESCUE LABORATORY**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 25
0	0	3	1.5	External Marks : 50

1. Study of fire extinguishers
2. Determination of ignition point and explosibility of coal dust
3. Determination of crossing point temperature
4. Study of stone dust and water barriers
5. Various types of stopings
6. Self contained breathing apparatus
7. Self rescuers, gas masks, smoke helmet
8. Reviving apparatus
9. Reopening of sealed off area
10. Konimeter, gravimetric dust sampler and personal dust sampler

**B. Tech (Mining) VI SEMISTER**

S. No	Course Code	Course Title	Scheme of Instruction			Lecture hr/week	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
1	PC3201MN	Mine Ground Control	3	1	-	4	30	70	4
2	PC3202MN	Under Ground Mining Method (Metal)	3	1	-	4	30	70	4
3	PC3203MN	Surface Mining Method	3	1	-	4	30	70	4
4	PC3204MN	Mine Mechanization	3	-	-	3	30	70	3
5	PC3205MN	Fundamentals of Artificial Intelligence	3	-	-	3	30	70	3
6	PE- I*	Professional Elective –I	3	-	-	3	30	70	3
7	PC3209MN	Mining Mechanization Lab	-	-	3	3	25	50	1.5
8	PC3210MN	Mining Camp	-	-	-	-	75	-	1
<b>Total</b>			<b>18</b>	<b>3</b>	<b>3</b>	<b>24</b>	<b>280</b>	<b>470</b>	<b>23.5</b>

**Professional Elective (PE-I)\***

PE3206MN      Mineral Exploration & Reserve Estimation  
PE3207MN      Mine Surface Environment Management  
PE3208MN      Rock Excavation Engineering

- The duration of Mining camp is between 7-10 days (under special conditions duration can be changed by HEAD, Mining)
- The Internship – II is to be conducted after completion of VI Semester for a duration of 30 days to be evaluated in VII Semester



**B Tech (Mining) VI- Semester**

**PC3201MN**

**MINE GROUND CONTROL**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks : 70

**UNIT I**

**Introduction:**

Definition and concept of ground control in mines, Ground control practices in mines, constraints on ground control design, characteristics of coal measure strata, Pre mining stresses. Theories of mechanics of strata behavior, Modern concept of strata pressure redistribution. Manifestation of strata pressure, Convergence, load on prop, creep, heave, insitu stress measurement.

**UNIT II**

**Roof Support:**

Various methods of roof examination, conventional support — timber and steel supports, friction and hydraulic prop arches, rock and cable bolting, roof stitching, power supports ; support of shaft bottom, galleries, freshly exposed roof, shotcreting, systematic support rules.

**UNIT III**

**Design of structures in rock:**

Strength of pillars, factor of safety, barrier and shaft pillar design, Design of pillars, Design of underground opening, design of stopes, Stress Distribution around circular and different shaped openings.

**UNIT IV**

**Subsidence:**

Theories of subsidence, factor and affecting subsidence, prediction and measurement of subsidence, Damage and prevention of damage due to subsidence, modern methods of subsidence measurement

**UNIT V**

**Rock burst and slope stability:**

Rock burst – causes, occurrence, prediction, monitoring and control  
Slope stability, slope parameters, different types of slope failures, factors affecting slope stability, various methods of failure and analysis, determination of factor of safety, different rock slope stabilization techniques.

**Text / Reference books:**

1. Obert and Duvall, "Rock Mechanics and design of structures in rock".
2. Peng , "Coal mining Ground control"
3. Jager and cook , "Fundamentals of rock mechanics "

**B Tech (Mining) VI- Semester**

**PC3202MN**

**UNDERGROUND MINING METHODS (METAL)**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks : 70

**UNIT I**

**Metal Deposits:**

Scope and limitation of underground mines, opening up of underground deposits, choice of mode of entry, shaft and combination and their applicability, number of entries in relation to extent of deposit along strike and dip, ventilation requirements, physic – mechanical properties of ore and wall.

**UNIT II**

**Raising Methods:**

Layout of drift, crosscut, raise and winzes in ore body, Factors influencing choice of level interval, different types of raising methods, merits and demerits

**UNIT III**

**Stopping Methods:**

Factors governing the choice of methods. The different underground stoping methods: breast stoping, under hand and overhand, room and pillar, sublevel, square set, shrinkage, cut and fill methods and other stoping methods.

**UNIT IV**

**Advanced Methods:**

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

**UNIT V**

**Deep Mining:**

Special problems of deep mines – rock pressure, heat, humidity, rock burst, noise and dust pollution, deep winding and transport, etc. ; solution mining, ore leaching, in situ leaching techniques

**Text / Reference books:**

1. Woodroof SC, " Methods of working coal and metal mines" Vol. III
2. Shevyakov, " Mining and mineral deposits"
3. DJ Deshmukh ," Elements of Mining Technology" Vol. -II
4. Peele, "Mining Engineers handbook". Vol. I & II
5. Popov, "Working of Mineral Deposits"

**B Tech (Mining) VI- Semester**

**PC3203MN**

**SURFACE MINING METHODS**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks : 70

**UNIT I**

**Introduction:**

Status of surface mining, types of surface mines, applicability and limitations, concept of stripping ratio, stripping economics, concept of ultimate pit limits, design of haul roads, elements of surface mine planning – selection of site for box cut, selection of operating parameters like bench height, width, slope, etc.,

**UNIT II**

**Layout and Design of Open Pit Mines:**

Selection of site for box cut, Working pit slope and ultimate pit slope, common modes of slope failure, factors influencing stability of slopes, development of open cast mine layouts for various shapes of deposits. stripping methods using different machinery. layout problems.

**UNIT III**

**Ground Preparation Techniques:**

Preparation of the site – Ripping, Drilling and blasting; Types, operation selection, application and limitation of ground preparation equipments - Rippers, Dozers, Graders, Loader. Blast hole drills and rock breakers, placer mining, Economics of drilling and blasting. Its related calculation

**UNIT IV**

**Excavation Techniques:**

Selection criteria for equipments used in surface mines. Classification, application and limitations of different types of equipments used in surface mining projects; Cycle time and productivity calculation for excavating and loading equipments. Drag line - calculation of required bucket capacity for a given handling requirement, method and cycle of operations of drag lines, front end loaders, scrapers, bucket wheel and bucket chain excavators, surface miners. Determining the capacity and number of shovels and dumpers for planned production

**UNIT V**

**Transportation Techniques:**

Application of Different modes of transportation system – Trucks, Conveyors (shifting and High angle), Aerial rope ways, Rail transport and pipeline transport systems. Inpit crushers and conveying system. Formation of dumps with spreaders; Types of waste dump- internal and external; dump formation methods and corresponding equipment; Dump stability and stabilization measures

**Text / Reference books:**

1. SK Das, "Surface Mining Technology"
  2. Mishra GB, "Surface Mining".
  3. Hustruid W and Kuchta M," Open Pit Mine Planning & Design". Vol.-I
  4. Hustruid W, McCarter MK and Van Zyl D, "Slope Stability in Surface Mining"
  5. Deshmukh RT & Khare BP, " Sciences & Technology of Opencast Mining"
-

**B Tech (Mining) VI- Semester**

**PC3204MN**

**MINING MECHANIZATION**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks : 70

**UNIT I**

**Locomotive Haulage:**

Types of locomotive; battery, diesel, electric, compressed air driven locomotives – construction, limitation, operational features, Hazard and their prevention, locomotive haulage calculation

**UNIT II**

**Conveyors:**

Different types, construction, details, application; operation maintenance, hazard and safety devices; AFC and their applications; belt and chain conveyors; calculations and recent developments  
Aerial ropeways: types, construction details, tension arrangements; calculations

**UNIT III**

**Face machinery:**

Continuous Miner, Shearer, plough: their construction and operation; powered supports, stage loaders, lump barkers; safety devices, Modern concepts in underground mine mechanization.  
Drills: Different types, construction, operation and maintenance

**UNIT IV**

**Surface Mine Machinery:**

Design and Constructional details of Front end loaders, Hydraulic excavators and Electric Rope shovel, Backhoe, Dragline, and Bucket Wheel Excavator. Bucket Chain Excavator and Surface Miners, Bull Dozers, Rock Breakers, Water Tankers.

**UNIT V**

**Electrical & Hydraulic Equipments:**

Electrical equipment and power distribution in underground and opencast mines; types of cables; industrial hydraulics, hydraulic and pneumatic power supply circuit in mine machinery; study of various elements of the circuit like valves, pumps, compressors, hydraulic motors, compressed air motors and all related equipment

**Text / Reference books:**

1. Karelin, "Mine Transport".
2. DJ Deshmukh, "Elements of Mining Technology" Vol. -III
3. Walker, "Mine winding and transport"
4. John Pipenger and Tyler Hicks, "Industrial Hydraulics"
5. Statham, "Coal Mining Practice"
6. Chang & Peng, "Longwall Mining"

**B Tech (Mining) VI- Semester**

**PC3205MN**

**FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks : 70

**UNIT – I**

**Introduction to Artificial Intelligence:**

Overview of rich history, Historical Backdrop of 1950, The AI problems, Turing test, Underlying assumption, what is Intelligence, The level of the model, Criteria for success

**Problems, Problem Spaces and Search:**

Defining the problem as a state space search, Introduction to search strategies, Issues in the design of search programs, additional problems.

**UNIT – II**

**AI Framework:**

Framework to work with data in an Ai project, step by step approach to putting together an AI project from beginning to deployment

**Heuristic Search Techniques:**

Generate-and-Test, Hill climbing; simple & steepest; simulated Annealing, Best-first-search

**UNIT – III**

**Knowledge Representation:**

Knowledge representations and mappings, Approaches to knowledge representation, Issues in knowledge representation

**Predicate Logic:**

Representing simple facts in logic, Representing Instance and Isa relationships, Computable functions and Predicates, Resolution, Natural Deduction.

**UNIT – IV**

**Representing Knowledge Using Rules:**

Procedural versus Declarative knowledge, Logic programming, Forward versus Backward Reasoning

**Symbolic Reasoning under Uncertainty:**

Introduction to Non-monotonic Reasoning, Logics for Non-monotonic Reasoning, Implementation issues

**UNIT-V**

**Natural Language Processing:**

Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural Language Processing, Spell Checking.

**Future of AI:**

Autonomous driving, Weaponization of AI, technological unemployment, drug discovery and regulation

**Text / Reference books:**

1. Elaine rich, Kevin knight and Shivashankar B Nair “Artificial Intelligence”, Third Edition, McGraw-Hill, ISBN No: 978-0-07-008770-5, 2015
  2. Deepak Khemani, “A First Course in Artificial Intelligence”, First Edition, McGraw Hill Education, ISBN No: 978-1259029981, 2013
  3. Patterson, “Introduction to Artificial Intelligence” First Edition, 2000, Pearson Education India, ISBN No: 978-8120307773, 2015.
  4. Russell, “Artificial Intelligence” Third Edition, Pearson Education India, ISBN No: 978-9332543515, 2015.
-

**B Tech (Mining) VI- Semester**

**PC3206MN**

**MINERAL EXPLORATION & RESERVE ESTIMATION**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks : 70

**UNIT - I**

**Introduction:**

Definition, objectives and criteria for mineral exploration, guides for ore search: Physiographic, stratigraphic, lithographical, structural mineralogical, geochemical, geobotanical and hydro geological

**UNIT - II**

**Reserve Estimation:**

Types of drilling, drill core sample logging, data compilation, preparation of litholog of the bore hole – isocore and isopatch maps preparation of geological cross sections, interpretation of the coalmining and exploration deposit reserve estimation.

**UNIT - III**

**Exploration:**

Introduction to important mineral resources in India and worldwide, surface and aerial prospecting, reconnaissance, application of exploration methods  
Preliminary and detailed exploration by boring, exploratory mining by shafts, drifts, cross-cuts, collection and compilation of data for computer processing

**UNIT - IV**

**Geological Exploration:**

Geochemistry, geochemical exploration; distribution of elements in igneous rocks and minerals, primary haloes and primary dispersion; chemical weathering, mobility in secondary environment, displaced anomalies, pathfinders and their application

**UNIT - V**

**Geo Physical Exploration:**

Basic concepts of geophysical exploration, Methods of geophysical exploration: Gravity, Seismic, electrical.

Remote Sensing, Application of remote sensing in mineral exploration, visual image & satellite data interpretation,

**Text / Reference books**

1. M S Krishnaswamy, "Mineral Deposits"
2. Arogyaswamy, "A Text book of Mining Geology"
3. William I Smith, "Remote sensing application in mineral exploration"



**B Tech (Mining) VI- Semester**

**PC3207MN**

**MINE SURFACE ENVIRONMENT MANAGEMENT**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks : 70

**UNIT – I**

**Introduction:**

Environmental Pollutants due to surface Mining – Air, Water, Noise; impact of men on the extent of environmental problem; Nature and extent of environmental problems due to mining.

**UNIT – II**

**Air Pollution:**

Sources and Classification of pollutants including dust and their effect on human health, Sources, hazards, sampling and analysis, standards, instrumentation and measurement of pollutants including dust. Control and preventive measures for air pollution including dust

**UNIT – III**

**Water & Noise Pollution:**

Environmental Pollution due to Water - Sources and Classification of pollutants and their effect on human health, hazards, sampling and analysis, Water pollution standards. Noise standards – Measurement – Noise Impact Index assessment, Control and preventive measures for water, noise pollution due to vibrations, their monitoring, prevention and control

**UNIT – IV**

**Land effects & EIA:**

Reclamation Planning, land use analysis, monitoring and maintenance, reclamation equipment and techniques, acid and alkaline drainage, control measures  
Framework for EIA, EIA methodologies and their applicability; Uncertainties in EIA

**UNIT - V**

**Environmental legislation:**

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

Frame work of EMP, Legislative requirements of EMP; Preparation and appraisal of EMP report.

**Text / Reference books:**

1. Hartman HL. Mine ventilation and air conditioning. Wiley, Newyork. 1999.
  2. Mishra GB. Mine environment and ventilation. Oxford University Press. 1992.
  3. Mackenthun KM. Basic concepts in environmental management. Lewis publications, London. 1998.
  4. Shyam D and Armin R. Environmental law and policy in India. Oxford University Press, New Delhi. 2001.
-

**B Tech (Mining) VI- Semester**

**PC3208MN**

**ROCK EXCAVATION ENGINEERING**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks : 70

**UNIT - I**

**Introduction:**

Concepts, historical developments in rock excavation, systems, factors affecting the rock fragmentation, mechanism of rock breakage and fracture; their application to rock fragmentation methods for rock fragmentation – explosive action, cutting, ripping and impacts. Scope and importance of rock excavation engineering in mining and construction industries; physico-mechanical and geotechnical properties of rocks vis-à-vis excavation method; selection of excavation method; Rock breaking processes: Primary, Secondary and Tertiary, Energy consumption computations.

**UNIT – II**

**Rock mechanics:**

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

**UNIT - III**

**Rock cutting technology:**

Mechanism of drilling – rotary, percussive, rotary, rotary percussive, mechanics of rock machining, theory of single tool rock cutting, crack initiation and propagation, breakage pattern, rock excavation by cutting action – picks, discs, roller cutters water jet cutting, methods of evaluation of drillability and cuttability of rocks. Advances in drilling equipment, pneumatic versus hydraulic, design and operating parameters of surface and underground drilling; evaluation of drill performance; mechanism of bit wear; bit selection; economics of drilling

**UNIT - IV**

**Rock cutting tools:**

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

Theories of rock tool interaction for surface excavation machinery rippers, dozers, scrapers, BWE, continuous surface miners, auger drills; theories of ploughs, shearers,–rock tool interaction for underground excavation machinery road headers, continuous miners and tunnel boring machines; selection criteria for high pressure water jet assisted–cutting tools; advanced rock cutting techniques cutting.

**UNIT - V**

**Rock excavating machines:**

Excavating machines, principles, operation, applicability and technical indices of road headers, TBM'S coalface machines and bucket wheel excavators. Recent Developments in rock excavation machinery

**Text / Reference books**

1. Cummings AB and Given IV. SME mining engg. vol. I and II, America. 1992.
  2. Hartman HL. Introductory mining engineering. John Wiley and Sons, New York. 1987.
  3. Chugh CP. Diamond drilling. Oxford-IBH. 1984.
  4. Clark GB. Principles of rock fragmentation. John Wiley and Sons, New York. 1987.
-

**B Tech (Mining) VI- Semester**

**PC3209MN**

**MINING MECHANIZATION LABORATORY**

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 25
0	0	3	1.5	External Marks : 50

1. Different types of ropes, rope capping and rope splicing
2. Different types of rope haulage
3. Haulage clips
4. Haulage tracks and rolling stocks
5. Head gear frame, suspension gear for cage/skip, guider ropes, safety hooks
6. Winding drums, safety device and braking system
7. Various types of pumps
8. Conveyor constructional details
9. Various types of locomotives
10. Drills construction
11. Power distribution in underground and OC mines.