JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.TECH. MINING ENGINEERING
III YEAR COURSE STRUCTURE & SYLLABUS (R16)

Applicable From 2016-17 Admitted Batch

III YEAR I SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	MN501PC	Mine Environmental Engineering - II	4	1	0	4
2	MN502PC	Underground Mining Technology	4	1	0	4
3	MN503PC	Mine Mechanization - II	4	1	0	4
4	SM504MS	Fundamentals of Management	3	0	0	3
5		Open Elective – I	3	0	0	3
6	MN505PC	Mine Environmental Engineering - II Lab	0	0	3	2
7	MN506PC	Mine Mechanization - II Lab	0	0	3	2
8	MN507PC	Mine Surveying - II Lab	0	0	3	2
9	*MC500HS	Professional Ethics	3	0	0	0
		Total Credits	**21**	**3**	**9**	**24**

III YEAR II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	MN601PC	Surface Mining Technology	4	1	0	4
2	MN602PC	Mineral Process Engineering	4	1	0	4
3	MN603PC	Rock Mechanics	4	1	0	4
4		Open Elective - II	3	0	0	3
5		Professional Elective - I	3	0	0	3
6	MN604PC	Rock Mechanics Lab	0	0	3	2
7	MN605PC	Mineral Processing Engineering Lab	0	0	3	2
8	EN606HS	Advanced English Communication skills Lab	0	0	3	2
		Total Credits	**18**	**3**	**9**	**24**

During Summer Vacation between III and IV Years: Industry Oriented Mini Project

Professional Elective - I

MN611PE	Mine Systems Engineering
MN612PE	Remote Sensing and GIS in Mining
MN613PE	Dimensional Stone Technology
MN614PE	Mineral Exploration

***Open Elective** subjects' syllabus is provided in a separate document.

***Open Elective** – Students should take Open Electives from the List of Open Electives Offered by Other Departments/Branches Only.

Ex: - A Student of Mechanical Engineering can take Open Electives from all other departments/branches except Open Electives offered by Mechanical Engineering Dept.

MINE ENVIRONMENTAL ENGINEERING - II

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: MN501PC	**4**	**1**	**0**	**4**

Course Objectives: To introduce causes of mine fires, advances in more lighten technology, explosion causes of, mine inundation etc.

Course Outcomes: Student can get through knowledge on various issues of mine environmental engineering including assessment and control of hazard due to mine fires, inundations, mine dust etc and can be able to apply the concepts of hazard control measures in the real world mining problems in future**.**

UNIT-I

Spontaneous Combustion: Various theories, factors, various indices for determination of susceptive of coal to spontaneous heating, control measures.

Mine Fires: Survey of various causes of mine fires with statistical data of Indian mines, various methods adopted to combat fires and the its advantages and disadvantages.

UNIT-II

Advances in fire fighting techniques and equipments, rescue operations in fire zones. Reopening of Selected off areas; Factors to be considered, methods, precautions. Reopening of sealed-off areas: Factors to be considered, methods, precautions. Mine Explosions: Causes of firedamp explosion with statistical data of Indian mines, preventive measures against firedamp explosion.

UNIT-III

Production, assessment and control of mine dust and associated hazards. Causes of coal dust explosion with statistical data of Indian mines, preventive measures against coal dust explosion.

UNIT-IV

Mine Inundation: Causes of inundation with statistical data of Indian mines. Precaution to be taken while approaching old workings, preventive measures of inundation. Noise and Vibrations: Causes and measurement of noise levels. Precautions, prevention and reduction of noise levels. Environmental aspects of blast induced vibration and noise.

UNIT-V

Mine illumination: Its effects on safety and efficiency, illumination standard, 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 arrangement of opencast and underground working.

Rescue and recovery work, equipment, short distance apparatus. Self contained oxygen-breathing apparatus. Rescue stations, principles of risk management.

TEXT / REFERENCE BOOKS:

1. Mine Fires, Explosion, Rescue, Recovery and Inundation – M.A. Ramulu.
2. Fires in Coal Mines – Kaku
3. Mine Environment & Ventilation – G.B. Misra.

UNDERGROUND MINING TECHNOLOGY

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: MN502PC	**4**	**1**	**0**	**4**

Course Objectives

- Describes various methods of underground mining of coal and metal deposits
- Introduces the basic knowledge on selection of suitable mining techniques vis a vis geo-mining conditions

Course Outcomes

- Students can understand the methods of development and extraction of coal and metal mining
- Emphasis is also made on the performance of various mining techniques

UNIT-I

Development of coal mining deposits: In seam mining, horizon mining, division into levels and districts, Board and pillar development with mechanized system.

UNIT-II

Mine development for working veins, loads and tabular deposits. Layout of drifts, cross cuts, raises and winzes in ore body. Different types of raising methods.

UNIT-III

Extraction of coal mining deposits: Pillar extraction – Factors affecting choice, depillaring with caving, stowing, mechanized depillaring operation.
Longwall mining: Choice, suitability, advantages and disadvantages. Longwall advancing and retreating. Method of mining for steeply inclined seams and thick seams.

UNIT-IV

Extraction of metal mining deposits: Classification of stoping methods, factors of affecting choice, stoping methods- Room & pillar, sub level, cut & fill, block caving.

UNIT-V

Case studies of various underground coal and metal mining Techniques. Production, productivity and cost of different mining methods, design of development and extraction panel. Statutory provisions related to underground coal and metal mining methods.

TEXT BOOKS:

1. R. D. Singh : Principles and Practices of Modern coal mining
2. Y. P. Chacharkar: A study of metaleferrous mining methods. Lovely Prakash, Dhanbad, 1994

REFERENCE BOOK:

1. B.C. Arthur. SME mining Engineering hand book. American Institute of mining metallurgical & Petroleum Engineering, New York.

MINE MECHANIZATION - II

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: MN503PC	**4**	**1**	**0**	**4**

Course Objectives: This is the second paper in the mine mechanization course. In the previous paper a few machinery working in the mining industry were introduced to the student. In this paper some more machines like winders in deep mines, opencast mine machinery and mine pumps are introduced.

Course outcomes: After going through this course the student will have basic knowledge of installation, commissioning, operation, maintenance and safety aspects of the mining machinery viz., different types of mine winders, man riding systems in underground mines, face machinery like SDL, LHD, Continuous miners, mine pumps and open cast mine machinery like Blast hole drills, shovels, dragline machine, BWE, dumpers etc.,

UNIT-I

Mine Winders: Koepe and Drum winders and their applications, head gear, head gear pulley, shaft fitting – Keps, rope guides, shaft sinking and bells, capping and recapping, cage and suspension gear.

UNIT-II

Winding Drum-types and construction, Safety devices in winders-over speed and over wind preventers, slow braking, depth indicator, Methods of counter balancing rope. Duty cycle. Mechanical and electrical braking. Winding from different levels in shaft.

UNIT-III

Man riding system in underground mines. Face Machinery: SDL & LHD – their constructions, operation, applications, capacity and maintenance.

Cutter loaders – Shearers, Coal plough and Continuous Miners – their constructional features, applications, capacity and maintenance; Hydraulic power pack.

UNIT-IV

Power loader (Mechanical loader), Shuttle cars: their constructions, operation, applications, capacity and maintenance.

Pumps: Types, Construction, operation, characteristics and application, Calculation of size, efficiencies and capacities. Layout of drainage system.

UNIT-V

Opencast Machinery: Blast Hole Drill, Ripper, Shovel, Dragline, Dumper, Bucket Wheel Excavator, Continuous Miners – their basic construction, applications and operation.

TEXT BOOKS

1. Deshmukh D.J., Vol. I & II Elements of Mining Technology
2. Cherkasky B.M., Pumps & Compressors
3. Walkar winding & Transport

REFERENCE BOOKS:

1. Alemgren, G. Kumar – Mine Mechanisation and Automation.
2. Mason – Coal Mining Series.

FUNDAMENTALS OF MANAGEMENT

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: SM504MS	**3**	**0**	**0**	**3**

Course Objective: To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills.

Course Outcome: The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.

UNIT-I

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT-II

Planning and Decision Making: General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

UNIT-III

Organization and HRM: Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change.

Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT-IV

Leading and Motivation: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team Leadership.

Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT-V

Controlling: Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non- Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods.

TEXT BOOKS:

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCES:

1. Essentials of Management, Koontz Kleihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.

MINE ENVIRONMENTAL ENGINEERING - II LAB

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: MN505PC	**0**	**0**	**3**	**2**

List of Experiments:

1. Study of Constructional features of a flame safety lamp and cap lamp.
2. Study of Layout of lamp room.
3. Study of MSA type gas mask i) Filter type apparatus ii) Self Rescue
4. Assessing spontaneous heating susceptibility of coal using DTA/Wet oxidation Apparatus
5. Study of self contained breathing apparatus i) Drager BG-174 ii) By Travox -120
6. Study of Drager pulmotor (Model: PT-60)
7. Estimation of SPM concentration in air using high volume sampler.
8. Study of construction and working of explosion proof fire stopping.
9. Determination of susceptibility of coal by chemical method or by puff Temperature method.
10. Determination of water quality parameters using water analyzer kit.
11. Determination of flammability temperature of coal by using inflammability index apparatus.
12. Determination of nutrient status in soil using soil test kit.
13. Measurement of Noise level by integrated sound level meter.
14. Measurement of Lux by light meter.

MINE MECHANIZATION - II LAB

B.Tech. III Year I Sem.	L	T	P	C
Course Code: MN506PC	0	0	3	2

List of Experiments:

1. Study of Gate end box
2. Study of Drill Panel
3. Study of mining type electric cable.
4. Study of Pillar Switch.
5. To develop different hydraulic circuits in hydraulic trainer.
6. To study the construction and operation of hydraulic pumps, motors and valves.
7. To study the construction and operation of hydraulic fittings and hoses.
8. Performance investigation of hydrostatic transmission systems with different motors.
9. To develop different pneumatic logic circuits in pneumatic trainer.
10. Performance test of centrifugal pumps.
11. Performance test on Reciprocating pump
12. Dismantling and assembly of Jack Hammer Drill Machines.
13. Determination of Fatigue Strength of Steel Wires.
14. Determination of Breaking Strength of Steel Wire Ropes.

MINE SURVEYING - II LAB

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: MN507PC	**0**	**0**	**3**	**2**

List of Experiments:

1. Determination of constants k and C by tachemometric surveying.
2. Tachemometric surveying by stadia method- distance and elevation formulae for staff vertical.
3. Tachemometric surveying by stadia method- distance and elevation formulae for staff normal.
4. Tachemometric surveying by tangential method- when both angles are angles of elevation.
5. Tachemometric surveying by tangential method when both angles are angle of depression.
6. Tachemometric surveying by tangential method when one angle is elevation and other depression.
7. Curve ranging by offsets/ordinates from the long chord.
8. Curve ranging by Rankine's method of tangential (or deflection) angle.
9. Correlation in single shaft by co-plantation method.
10. Correlation in single shaft by Weisbach triangle method.
11. Correlation in two shafts by weiss quadrilateral method
12. Finding the height of an in accessible object.
13. Reading mine plans and sections.

Suggested Text Books/Reference Books

1. Surveying- Vol. II by Punimia
2. Surveying and Levelling by kanetkar.
3. Mine Surveying and Levelling by Ghatak.

PROFESSIONAL ETHICS

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: MC500HS	**3**	**0**	**0**	**0**

Course Objective: To enable the students to imbibe and internalize the Values and Ethical Behaviour in the personal and Professional lives.

Course Outcome: The students will understand the importance of Values and Ethics in their personal lives and professional careers. The students will learn the rights and responsibilities as an employee, team member and a global citizen.

UNIT-I

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT-II

Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

UNIT-III

Professional Practices in Engineering: Professions and Norms of Professional Conduct, Norms of Professional Conduct vs Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession.

Central Responsibilities of Engineers - The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT-IV

Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation.

Ethics in changing domains of research - The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.

UNIT-V

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

REFERENCES

1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e , Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

SURFACE MINING TECHNOLOGY

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: MN601PC	**4**	**1**	**0**	**4**

Course Objectives: To introduce the basic concepts of surface mining, working principles of excavation and transportation equipment such as shovel, dumper, bucket wheel excavator etc. and design of opencast mine. Placer and sea bed mining are added objectives of the course

Course Outcomes: At present 80% of the coal production and significant proportion of other mineral output is coming from surface mines and hence students get a benefit of detailed understanding of various techniques of surface mining including operation and maintenance of associated machinery as outcome of this course.

UNIT-I

Basic concept of Surface Mining: Status of surface mining in India. Selection between surface mining and underground mining, Preliminary evaluation of surface mining prospects; stripping ratio – concepts and significance, mine life. Opening up of deposits with Box Cut: Factors affecting selection of site of box-cut, Production benches – formation parameters and factors affecting their selection

UNIT-II

Preparation for Excavation: Working principle of ripper and Scraper—their cycle of operation, application and limitation. Drilling: types of blast hole drills, performance parameters of drills, estimation of number of drills for a given mine production. Problems associated with drilling and blasting.

UNIT-III

Excavation and Transportation: Cyclic methods—shovel-dumper, pay-loader, dragline. Continuous methods – bucket wheel excavator, bucket chain excavator, continuous surface miner, conveyors. Principle and operation of these machines, their advantages and limitations, capacity calculations, maintenance. Other equipments-dozer, grader, loader, scraper, dumper crusher, maintenance of open pit equipment.

UNIT-IV

Design and organization: Basic design principle of large opencast mines and their organizational structure. Mechanized quarries over underground developed zones.

UNIT-V

Placer Mining and Sea bed Mining: Ground sluicing, Hydra licking and Dredging Exploitation systems of ocean mineral resources. Relevant provisions of coal mines and metalliferous mines regulation; Environmental problems due to surface mining and their remedial measures. Recent developments in the deployment of heavy earth moving machineries in the surface mines.

TEXT BOOKS:

1. S. K. Das - Surface Mining Technology
2. G.B. Misra - Surface Mining

REFERENCE BOOKS:

1. R.D. Singh– Principles and Practices of Modern Coal Mining
2. H.L. Hartman - Introductory Mining Engineering.

MINERAL PROCESS ENGINEERING

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: MN602PC	**4**	**1**	**0**	**4**

Course Objectives: Expose the mining engineer to various aspects of beneficiation of ores and industrial minerals for value addition. To introduce mineral processing characteristics of minerals, "concentrations, physico-chemical principles, flow sheets for beneficiation of various minerals.

Course Outcomes: Mining Engineering student would be exposed to the practices of beneficiation ores and coal which is important for value upgradation for main product and for byproduct recovery for the societal use. Student can get the opportunity to know various techniques of mineral processing including theory, application and their limitations and environmental implications.

UNIT-I

Introduction: Scope, objectives and limitations of mineral processing, liberation and beneficiation characteristics of minerals and coal. Comminution: Theory and practices of crushing and grinding; different types of crushing an grinding equipment's – their applications and limitations.

UNIT-II

Liberation- importance and determination of liberation size, Crushing- fundamentals, construction and operational features of primary and secondary crushers. Jaw, Gyratory, cone and roll crushers. Grinding- theory and practice, Ball & Rod Mills- construction and operation. Laboratory sizing and industrial screening including screen efficiency.

UNIT-III

Size Separation: Laboratory size analysis and interpretation; settling of solids in fluids; industrial screens, mechanical classifiers and hydro cyclones. Gravity Concentration Methods: Jigging, Heavy media separation, flowing film concentrators – theory, applications and limitations.

UNIT-IV

Froth Floatation: Physico-chemical principles, reagents, machines, floatation of sulphides, oxides and coal. Electrical Methods of Concentration: Principles, fields of applications and limitations.

UNIT-V

Magnetic methods of concentration Principles, Fields of Application and Limitation
Flow Sheets: Simplified flow sheets for coal, copper, zinc, lead, gold, chromite, iron, and manganese ores.

TEXT BOOKS:

1. Introduction to Mineral Processing – V. Malleswar Rao
2. Mineral Processing – B A Wills
3. Ore Deposits of India – Their distribution and processing. Rao, T C and Gokhale, KVG.

REFERENCE BOOKS:

1. Mineral Processing – S.K. Jain.
2. Principles of Mineral Processing- Maurice C. Fuerstenau and Kenneth N. Han

ROCK MECHANICS

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: MN603PC	**4**	**1**	**0**	**4**

Course Objectives: To give details of Mechanics of rock failure and other aspects of stability of underground and open cost workings including mechanics of subsidence, design of supports etc.

Course Outcomes: This professional course contents encourage the students to study various aspects of ground control problems in underground and open cost mines with a better understandings of scope for application of various numerical methods and model studies in geo-mechanics.

UNIT-I

Physico-mechanical properties of rocks, Elastic and time dependent behavior, Rock mass classification.

UNIT-II

Theories of rock failure, Stress analysis, Insitu stress and stress distribution around mine openings. Ground failure and pressure on supports, Stability of wide openings, Design of supports in mine workings.

UNIT-III

Subsidence: Causes and impacts of subsidence, Mechanics of surface subsidence, discontinuous and continuous subsidence. Monitoring, prediction, control and management of subsidence.

UNIT-IV

Mechanics of rock burst and bumps, Stability of slopes. Instrumentation and measurement of insitu stresses and rock strength, Photolasticity and scale model studies.

UNIT-V

Basics of numerical methods in geo-mechanics with applications.

TEXT BOOKS:

1. Jager. J C & Cook NGW Fundamentals of Rock Mechanics, Blackwell Publishers
2. Jumikis Alfreds. R, Rock Mechanics , Trans Tech Publishers

REFERENCE BOOKS:

1. Peng. Syd. S. Coal Mining Ground Control West Virginia University
2 Brady, BHG& Brown.ET, Rock mechanics for underground mining, George Allen & Unwio Ltd, 1992

MINE SYSTEMS ENGINEERING
(Professional Elective-I)

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: MN611PE	**3**	**0**	**0**	**3**

Pre-Requisites: Nil

Course Objectives:
T o make students familiar with scientific/Mathematical methods that are applicable to mining industry for optimizing objectives.

Course Outcomes:
The student should be able to identify some technical/economical issues where mathematical methods can be applied to find solutions

UNIT-I
Development –Definition-Characteristics and Phases-Types of models-Operations Research models – applications.
Allocation: Linear Programming Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method.

UNIT-II
Transportation Problem – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.
Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem-Traveling Salesman problem.

UNIT-III
Sequencing – Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines
Replacement: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT-IV
Theory of Games: Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games – dominance principle – m x 2 & 2 x n games -graphical method.
Inventory: Introduction – Single item, Deterministic models – Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand may be discrete variable or continuous variable – Single Period model and no setup cost.

UNIT-V

Waiting Lines: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

CPM and PERT

Introduction to and importance of CPM. Determination of Early start time, Latest start time, Total float, Independent float, critical path, project duration. Crashing of networks

Introduction to PERT, importance of PERT, expected time of completion of a project, probability of completion Application of CPM and PERT in mining industry.

Simulation: Introduction, Definition, types of simulation models, Steps involved in the simulation process- Advantages and disadvantages- applications of simulation to queuing and inventory.

TEXT BOOKS:

1. Operations Research /J. K. Sharma 4e. /MacMilan
2. Operations Research/Er. Prem Kumar Gupta & Dr. D. S. Gupta/S. Chand

REFERENCE BOOKS:

1. Operations Research/S. R. Yadav & A. K. /Oxford
2. Operations Research/ ACS Kumar/Yesdee

REMOTE SENSING AND GIS IN MINING
(Professional Elective-I)

B.Tech. III Year II Sem. **L T P C**
Course Code: MN612PE **3 0 0 3**

Course Objectives: To introduce with basic concept of with remote sensing process, Geographical Information System and applications in mining, and modern trends of GIS in various natural resources and engineering applications.

Course Outcomes: In the present scenario, remote sensing and GIS application in mining plays important role. Details of the course enable the student to understand basic concept of remote sensing and its process to acquire data, digital Image processing system, and various application in mining.

UNIT-I

Remote Sensing Process: Introduction to Remote Sensing, data acquisition and processing, sensor systems, applications, Electromagnetic Radiation (EMR) and its characteristics, Radiation principles, Planck's Law, Stefan's law, properties of solar radiant energy, atmospheric windows.

UNIT-II

Physical Basis of Remote Sensing: Interaction in the atmosphere, nature of atmospheric interaction, atmospheric effects of visible, near infrared thermal microwave wavelengths, interaction at ground surface and, interaction with soils and rocks, effects of soil moisture, organic matter, particles, size and texture, interaction with vegetation, spectral characteristics of individual leaf, vegetation canopies, effect of leaf pigments, cell structure, radiation geometry.

UNIT-III

Platform and Sensors: Multi concept in remote sensing, general requirements of a platform, balloon aircraft, satellite platforms sun synchronous orbits, sensors for visible near infrared wavelengths, profilers, images, scanners, radiometers, optical mechanical and push button scanners, spectral, spatial, radiometric and temporal resolution, IFOV, FOV, geometric characteristics of scanners, V/H ratio, comparison of satellite/ aerial platforms and sensors and remote sensing data products, land sat and TM, SPOT, IRS, ERS; applications in mining.

UNIT-IV

Visual & Digital Image Processing: Remote Sensing Data Products, Elements of visual Image Interpretations, Generation of Thematic Maps, Digital Image Processing System, Image Enhancement, Image Transformation, Image Classification.

UNIT-V

Geographical Information System: Difference between image processing system geographical system (GIS), utility of GIS, various GIS packages and their salient features, essential components of a GIS, scanners and digitisers, raster and vector data, storage. hierarchical data, network systems, relational database, data management, conventional database management systems, spatial database management, data manipulation and analysis, reclassification and aggregation, geometric and spatial operation on data management and statistical modeling, Applications and Modern Trends of GIS in various natural resources and mining applications

TEXT BOOKS:

1. B. Bhatta - Remote Sensing and GIS
2. T.M. Lillensand and R.W. Keifer - Remote Sensing and Image Interpretation

REFERENCE BOOKS:

1. P.J. Curren - Principles of Remote Sensing
2. R. C. Gonzalez, R. E. Woods, Digital Image Processing.

DIMENSIONAL STONE TECHNOLOGY
(Professional Elective-I)

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: MN613PE	**3**	**0**	**0**	**3**

Course Objectives: To familiarize students with the resources of dimensional stone in India & abroad and basic concept of mining techniques for all types of dimensional stones, processing techniques, multiwire technology and study about environmental impact in surrounding.

Course Outcomes: Dimensional Stone Technology is important to get idea to excavate blocks of marble, granite, sandstone etc. Students get a benefit of detailed understanding of various techniques of dimensional stone mining including diamond wire saw, blind cut technique etc. Also get the benefit of processing techniques such as gang saws, automatic tiling plant, multiwire machine for slab making etc. and environmental impact due to mining and processing activities.

UNIT-I

Resources of Marble, Granite, Slate, Sandstone and Limestone as Dimensional stones in India vis a vis world, uses, marketing, export. Geological, mineralogical and physico-mechanical properties of dimensional stones, Criteria for selection of dimensional stone deposit, Procedure for obtaining mining lease and preparation of project proposal.

UNIT-II

Mining: Conventional mining of Sandstone, Limestone, Marble and Granite; Recent developments- wire saw including blind cut technique, chainsaw, belt saw, hydraulic splitting, flame jet cutting, water channeling etc; Blasting techniques in dimensional stone mines: various types of explosives used, controlled blasting for providing horizontal & vertical cut; Splitting by swelling material.

UNIT-III

Insitu splitting technique used in compact limestone (Kota stone) for utilization of waste as dimensional stone. Various types of loaders cranes and hydraulic excavator used in dimensional stone mines; Quarry layouts. Hole making technique using hole-finder and laser beam. Application and development of diamond tools, formation of stone block and their handling

UNIT-IV

Processing: Dressing- Mono block dresser; Sawing- gang saws, circular saws; Preparation and mounting of blades/discs and segments; slab repair by resin Polishing - Manual, Mechanical; Various types of polishing machines; Abrasives- type, use and selection, shaping; Tile preparation; Automatic tiling plant, slurry handling and treatment including water supply. Multiwire technology.

UNIT-V

Environmental impacts of mining and processing of dimensional stones; Secondary use of quarried land and waste of the industry; Land reclamation, Environmental management plan, Environment Protection measures.

TEXT BOOKS:

1. S. S Rathore., G. S. Bhardwaj and S. C Jain: Dimensional Stone Technology

REFERENCE BOOKS:

1. S. S., Rathore and V.; Laxminarayana "Safety and Technology in Marble Mining and Processing in New Millennium" Proc. Of National Workshop held March 10-11 200 Udaipur
2. S. S. Rathore, Y. C. Gupta and R. L Parmar; "Recent Development in Machinery and Equipment for Dimensional Stone Mining" held Dec. 13-14, 2003 at Udaipur.

MINERAL EXPLORATION
(Professional Elective-I)

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: MN614PE	**3**	**0**	**0**	**3**

Course Objectives: Expose the mining engineer to various aspects of prospecting and exploration methods for search of important ore minerals using different geological, geophysical and geochemical techniques.

Course Outcomes: Students can understand the procedures for exploration of mineral deposits, estimation of mineral resources as outcome of this course, which is highly beneficial for the mining engineers in the industry.

UNIT-I

Geological Prospecting and Exploration: Definitions and Principles; Methods of Prospecting; Methods of Exploration.

UNIT-II

Sampling: theory and methods; Geological plans and sections for orebody evaluation; Exploration drilling, drill core logging and sampling Cut-off grade concepts and applications; Resources and Reserves. Estimation of reserves – methods and practice.

UNIT-III

Geochemical Exploration: Introduction, Geochemical cycle, geochemical mobility and association of elements. Pathfinder and target elements for geochemical exploration. Principles of geophysical exploration methods.

UNIT-IV

Primary and secondary dispersions of elements; Determination of background, and geochemical anomalies; Geo-chemical methods of mineral exploration: Procedures for geochemical sampling; Interpretation of geochemical surveys. Indian case studies.

UNIT-V

Collection of data along Geological (G), Feasibility (F) and Economic (E) axes during various stages of exploration.

TEXT BOOKS:

1. Reedman, J H. Techniques in Mineral Exploration: 1979. Applied Science Publishers Ltd, UK
2. Peters, W.C. Exploration and Mining Geology (2nd Ed.); 1987. John Wiley & Sons, New York.

REFERENCE BOOKS:

1. Sharma, N L and Agarwal Y K. Tables for Mineral Identification.
2. A.M. Evans. 1997: Ore Geology and Industrial minerals- An introduction (III edn.) Geo-science, Texas.

ROCK MECHANICS LAB

B.Tech. III Year II Sem.	L	T	P	C
Course Code: MN604PC	0	0	3	2

List of Experiments:

1. Determination of RQD of rocks.
2. Determination of Protodyaknov index of a given rock sample
3. Determination of point load index strength of a given rock sample
4. Determination of porosity of rocks.
5. Determination of uniaxial compressive strength of a given rock sample
6. Determination of tensile strength of a given rock sample using Brazilian method
7. Determination of shear strength of rocks
8. Determination of modulus of elasticity of given rock sample using strain gauge.
9. Determination of triaxial strength of rock and drawing of Mohr's envelope
10. Determination of slake durability of rocks
11. Study of drillability index of rocks.
12. Study of different types of roof convergence and other ground control instruments.

MINERAL PROCESSING ENGINEERING LAB

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: MN605PC	**0**	**0**	**3**	**2**

List of Experiments:

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

ADVANCED ENGLISH COMMUNICATION SKILLS (AECS) LAB

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: EN606HS	**0**	**0**	**3**	**2**

Introduction

A course on *Advanced English Communication Skills (AECS) Lab* is considered essential at the third year level of B.Tech and B.Pharmacy courses. At this stage, the students need to prepare themselves for their career which requires them to listen to, read, speak and write in English both for their professional and interpersonal communication. The main purpose of this course is to prepare the students of Engineering for their placements.

Course Objectives: This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve students' fluency in spoken English
- To enable them to listen to English spoken at normal conversational speed
- To help students develop their vocabulary
- To read and comprehend texts in different contexts
- To communicate their ideas relevantly and coherently in writing
- To make students industry-ready
- To help students acquire behavioral skills for their personal and professional life
- To respond appropriately in different socio-cultural and professional contexts

Course Outcomes: Students will be able to:

- Acquire vocabulary and use it contextually
- Listen and speak effectively
- Develop proficiency in academic reading and writing
- Increase possibilities of job prospects
- Communicate confidently in formal and informal contexts

Syllabus

The following course activities will be conducted as part of the Advanced English Communication Skills (AECS) Lab:

1. **Inter-personal Communication and Building Vocabulary** - Starting a Conversation – Responding Appropriately and Relevantly – Using Appropriate Body Language – Role Play in Different Situations - Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.
2. **Reading Comprehension** –General Vs Local Comprehension, Reading for Facts, Guessing Meanings from Context, , Skimming, Scanning, Inferring Meaning.
3. **Writing Skills** – Structure and Presentation of Different Types of Writing – Letter Writing/Resume Writing/ e-correspondence/ Technical Report Writing.
4. **Presentation Skills** – Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ e-mails/Assignments… etc.,
5. **Group Discussion and Interview Skills** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas and Rubrics of Evaluation- Concept and Process,

Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

Minimum Hardware Requirement

Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- **Spacious room with appropriate acoustics**
- **Eight round tables with five movable chairs for each table.**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**
- **Computer with suitable configuration**

Suggested Software: The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass**, 8th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**

REFERENCES:

1. Kumar, Sanjay and Pushp Lata. ***English for Effective Communication***, Oxford University Press, 2015.
2. Konar, Nira. ***English Language Laboratories – A Comprehensive Manual,*** PHI Learning Pvt. Ltd., 2011.