

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**B.Tech. in MINING ENGINEERING**

**III YEAR COURSE STRUCTURE AND SYLLABUS (R18)**  
**Applicable From 2018-19 Admitted Batch**

**III YEAR I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	MN501PC	Introduction to Industrial Engineering	3	0	0	3
2		Professional Elective - I	3	0	0	3
3	MN502PC	Mine Environmental Engineering -II	3	1	0	4
4	MN503PC	Mine Mechanization-II	3	1	0	4
5	MN504PC	Surface Mining Technology	3	1	0	4
6	MN505PC	Mineral Processing Engineering Lab	0	0	3	1.5
7	MN506PC	Mine Environmental Engineering Lab	0	0	3	1.5
8	MN507PC	Mine Mechanization Lab	0	0	2	1
9	*MC510	Intellectual Property Rights	3	0	0	0
		<b>Total Credits</b>	<b>18</b>	<b>3</b>	<b>8</b>	<b>22</b>

**III YEAR II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1		Open Elective – I	3	0	0	3
2		Professional Elective – II	3	0	0	3
3	MN601PC	Introduction to Instrumentation	3	1	0	4
4	MN602PC	Underground Coal Mining Technology	3	1	0	4
5	MN603PC	Rock Mechanics Engineering	3	1	0	4
6	MN604PC	Ground Control & Instrumentation Lab and Computer Applications in Mining Lab	0	0	3	1.5
7	MN605PC	Rock Mechanics Engineering Lab	0	0	3	1.5
8	EN608HS	Advanced Communication Skills Lab	0	0	2	1
9	*MC609	Environmental Science	3	0	0	0
		<b>Total Credits</b>	<b>18</b>	<b>3</b>	<b>8</b>	<b>22</b>

**\*MC - Environmental Science – Should be Registered by Lateral Entry Students Only.**

**Note:** Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

**Professional Elective - I**

MN511PE	Environmental Management in Mines
MN512PE	Tunneling Engineering
MN513PE	Mining of Deep-Seated Deposits

**Professional Elective - II**

MN611PE	Computer Applications in Mining
MN612PE	Mineral Processing
MN613PE	Material Management in Mines

**MN501PC: INTRODUCTION TO INDUSTRIAL ENGINEERING****III B.Tech. Mining. Engg. I-Semester****L T P C**  
**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 Mc - Graw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.

**MN511PE: ENVIRONMENTAL MANAGEMENT IN MINES (Professional Elective – I)****III B.Tech. Mining. Engg. I-Semester**

L	T	P	C
3	0	0	3

**Pre-Requisites:** NIL**Course Objectives:**

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures
3. Understanding the environmental policies and regulations

**Course Outcomes:** Based on this course, the Engineering graduate will understand /evaluate/ develop technologies on the basis of ecological principles and environmental regulations which inturn helps in sustainable development

**UNIT - I**

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT - II**

Natural Resources: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

**UNIT - III**

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT - IV**

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-waste and its management. Pollution control technologies: Waste water Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. Global Environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

**UNIT - V**

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-

economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style. Procedure of obtaining environmental clearances for mining Projects.

**TEXT BOOKS:**

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

**REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHI Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.

**MN512PE: TUNNELING ENGINEERING (Professional Elective – I)**

III B.Tech. Mining. Engg. I-Semester

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

**Course Objectives:** To familiarize the subjects with the recent trends in tunneling methods including design of supports, maintenance off tunnels, provision of facilities such as ventilation, illumination etc. in tunnels.

**Course Outcomes:** Students can understand various methods of tunneling use of latest numerical techniques for tunnel design, stability analysis, and ground control measures with various steel support and rock reinforcement

**UNIT- I**

Introduction to tunneling; geological parameters to be considered for tunneling.  
Influence of geological aspects on design & construction of tunnels.  
Types of underground excavations.

**UNIT- II**

Different methods of tunneling; Conventional and special drill & blast roadway drivage methods, Tunnel Boring Machine (TBM);

**UNIT- III**

Stresses and displacements associated with excavating tunnels, Ground control or treatment in tunneling and drivages. Design of Supports of Tunnels; Steel supports, rock enforcements, new Australian tunneling methods (NATM)

**UNIT- IV**

Design of Tunnels: Rock conditions, RMR, Q-system, RSR, rock mass behaviour, stress strain behaviour, and stress analysis of tunnels. Maintenance: Dewatering, ventilation and illumination drivages tunnels.

**UNIT - V**

Tunneling in soft ground; Excavation of large tunnels; hazards in tunneling. Ground treatment in excavation.; application of road headers and drill jumbos in tunneling: principle of operation, applicability, advantages and limitations. Applications of numerical techniques and relevant software's in tunneling (in brief).

**TEXT BOOKS:**

1. Richards E. Bullock – Tunneling and Underground Construction Techniques
2. Stack Barbara – Hand Book of Mining and Tunneling Machinery, John Wiley & Sons.

**REFERENCE BOOKS:**

1. R.V. Proctor – Rock Tunneling with Steel Supports
2. J. Johnsen – Modern Trends in Tunneling and Blast Design

**MN513PE: MINING OF DEEP-SEATED DEPOSITS (Professional Elective – I)**

III B.Tech. Mining. Engg. I-Semester

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

**Course Objectives:** To give very highly specialized knowledge to the upcoming mining professionals with future demand of deep seam mining for coal extraction.

**Course Outcomes:** Future coal production depends on deep seam mining associated with complex geo-mining conditions, and the students in this course gets an opportunity to understand the challenges of deep seam mining alternative methods of safe extraction of coal.

**UNIT- I**

Exploration: Modern Exploration Techniques to Identify the Complex Coal Deposits. Classification: Classification of Coal Deposits Lying under Typical Geo-mining conditions.

**UNIT- II**

Challenges: Challenges to improve production and productivity from Deep Seated Deposits. Challenges in Liquidation of Locked-up Pillars. Experimental Trials: Innovative Technologies for Stability Analysis.

**UNIT- III**

Design and Development of Deep-Seated Deposits.

**UNIT- IV**

Modern Techniques: Application of Numerical Modeling Techniques to Control Ground Problems of Complex Deposits.

**UNIT - V**

Use of Modern Instruments for Strata Control of deep-seated deposits. In-situ Gasification and Mineral Biotechnology for Complex Coal Deposits.

**TEXT BOOKS:**

1. R.D. Singh, Principles & Practices of Modern Coal Mining, New age international New Delhi, 1997
2. T.N. Singh, Underground winning of Coal, Oxford and IBH New Delhi, 1992

**REFERENCE BOOKS:**

1. Peng S S and Chiang H S. Longwall mining, Wiley, New York, 708p
2. S.K. Das, Modern Coal Mining Technology, Lovely prakashan Dhanbad, 1992

**MN502PE: MINE ENVIRONMENTAL ENGINEERING – II****III B.Tech. Mining. Engg. I-Semester**

L	T	P	C
3	1	0	4

**Pre-Requisites:** NIL**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 susceptible 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 firefighting 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. Design of stone dust barriers.

**UNIT- IV**

Mine Inundation: Causes of inundation with statistical data of Indian mines. Precaution to be taken while approaching old workings, safety boring machines preventive measures of inundation. Design of water dams, recording of flooded mines, layout of drainage systems and sumps, 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, electric-hand and cap lamp, their maintenance and examination, lamp room design and organization. Illumination arrangement of opencast and underground working. Illumination surveys. Rescue and recovery work, equipment, short distance apparatus. Self-contained oxygen-breathing apparatus. Rescue stations, principles of risk management. First aid in mines and statutory requirements. Rescue and recovery operations in mines including through bore holes.

**TEXT BOOK:**

1. Mine Environment & Ventilation – G.B. Misra.

**REFERENCE BOOKS:**

1. Mine Fires, Explosion, Rescue, Recovery and Inundation – M.A. Ramulu.
2. Fires in Coal Mines – Kaku

**MN503PE: MINE MECHANIZATION - II****III B.Tech. Mining. Engg. I-Semester**

L	T	P	C
3	1	0	4

**Pre-Requisites:** NIL

**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 and its design, head gear pulley, shaft fitting – Keps, rope guides, shaft sinking and bells, capping and recapping and its design, cage and suspension gear. Pit top and pit bottom lay outs. Pit top railway sidings.

**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. Numerical problems in different types of winding including Torque – time diagrams.

**UNIT- III**

Man riding system in underground mines. Face Machinery: SDL, LHD, Shuttle cars, underground trucks different types of mechanical loaders – 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. Maintenance of equipment including preventive maintenance and condition monitoring. Hydraulic layouts of longwall focus. Introduction to automation: construction and operation of coal drill and lachhammer.

**UNIT- IV**

Power loader (Mechanical loader), Shuttle cars: their constructions, operation, applications, capacity and maintenance. Pumps: Sources of water in mines, design of sumps, types, Construction, operation, characteristics and application, Calculation of size, efficiencies and capacities. Layout of drainage system.

**UNIT - V**

Opencast Machinery: Blast Hole Drill, Ripper, front and loaders, dozers, road grades, Shovel, rock breakers, water tankers, Dragline, Dumper, including machinery and tracker –etc., Bucket Wheel Excavator, Continuous Miners drayars – their basic construction, applications and operation. Mine Electrical Engineering: Distribution of electrical power in mines, types of mine cables and their fields of application, flame proof and intrinsically safe equipment/circuits, signaling and telecommunication in mines including fiber optic cables and walking talkies and mining switch years. Electrical layout of longwall focus.

**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.

**MN504PC: SURFACE MINING TECHNOLOGY**

III B.Tech. Mining. Engg. I-Semester

L	T	P	C
3	1	0	4

Pre-Requisites: NIL

**Course Objectives:**

- The objective of this course is to provide students in mining engineering with the necessary knowledge to design safe, efficient and environmentally responsible surface mining operations.
- To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

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

**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 SURFACE MINES:** Slopes in surface mines – Highwall and waste dumps; Working pit slope and ultimate pit slope, common modes of slope failures, factors influencing stability of slopes, Development of opencast mine layouts for various shapes of deposits. Conversion of Underground mine to opencast mine vis-a vis open cast mine to underground mine related problems and probable solutions.

**UNIT III**

**GROUND PREPARATION METHODS:** Preparation of the site – Ripping, Drilling and Blasting; Types, operation, selection, applications and limitations of ground preparation equipments – Rippers, Dozers, Blasthole drills and rock breakers, Determining number of drill machines, dozers and rippers for planned production. Concept of rippability, Blasting in Opencast Mines over Developed Galleries. Introduction to Placer and Sea bed mining, hydraulicking, dredging ground slicing. Exploitation systems of sea bed mineral resources.

**UNIT IV**

**EXCAVATION SYSTEM IN SURFACE MINES:** Selection criteria for excavation / loading and material transport equipment used in surface mines. Classification, application and limitations of different types of excavating / loading equipment used in surface mining projects; Cycle time and productivity calculation for excavating & loading equipments; Dragline - calculation of required bucket capacity for a given handling requirement, Method and cycle of operations of Draglines, Front end loaders, Scrapers, Bucket wheel and bucket chain excavators, Surface miners. Introduction to dredgers of different types. Determining the capacity and number of shovels and dumpers for planned production.

**UNIT V**

**TRANSPORT AND WASTE DUMPS:** Scope and application of different modes of transport system in surface mines – Trucks, Synchronization of shovel and dumper capacity for required production; Locomotives; Conveyors (shiftable and high-angle) – mode of operation, applicability and limitations, Scope and application of in-pit crushers in surface mines. Illumination in surface mines. Types of waste dump – internal and external; dump formation methods and corresponding equipment; Dump stability

and stabilisation measures.

**TEXT BOOKS:**

1. Kennedy, B.A., Surface Mining – 2<sup>nd</sup> Edition, SME, New York, 1990.
2. Hartman H.L., Introductory Mining Engineering, John Wiley and Sons, 2002.

**REFERENCES:**

1. Hartman, H.L. (Ed.), SME Mining Engg. Handbook Vol. I and II, Society for Mining, Metallurgy, and Exploration, Inc., 3<sup>rd</sup> edition, 2011.
2. Mishra G.B., Surface Mining, Dhanbad Publishers, Dhanbad, 1990.
3. Pfeider, E. P, Surface Mining, 1st Edition, New York, 1968.
4. Rzhovsky V., Open pit Mining Operations, Mir Publications, 1971.

**MN505PC: MINERAL PROCESSING ENGINEERING LAB**

III B.Tech. Mining. Engg. I-Semester

L	T	P	C
0	0	3	1.5

Pre-Requisites: NIL

**Course Objectives:** To study various mineral processing techniques to enrich minerals**Course Outcomes:** At the end of the course, students will be able to

1. Know different sample division techniques.
2. Determine the grinding and crushing characteristics of a given mineral sample.
3. Know the washability characteristic of a coal sample.
4. Determine the moisture content by drying of mineral sample.
5. Determine the average size of samples.

**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 using ball mill.
4. Sieve analysis of a given sample and to calculate (a) percentage sample retained on screens (b) average size of sample material and (c) to plot sizing curves
5. Concentration of a given mineral 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

**MN506PC: MINE ENVIRONMENTAL ENGINEERING LAB****III B.Tech. Mining. Engg. I-Semester****L T P C  
0 0 3 1.5****Pre-Requisites:** NIL**Course Objectives:**

- To determine the psychrometric properties, gas percentage in atmosphere.
- To study the principles and characteristics governing mine fans.
- To understand lamp design and perform underground illumination surveys.

**Course Outcomes:** The students will get practical knowledge about underground mine ventilation equipment's functions, usage and interpretation of data.

**LIST OF EXPERIMENTS (Any 10 to 12 Experiments to be done minimum)**

1. Detection of mine gases
2. Orsat/Haldane apparatus for gas analysis.
3. Measurement of relative humidity by hygrometer.
4. Kata thermometer.
5. Characteristic curves for fans.
6. Operation of fans in series and parallel.
7. Design of various ventilation devices, Airshaft, Evasese, Doors crossing regulators.
8. Reversal of Ventilation system.
9. Measurement of air quantity by anemometer velometer and smoke tube, pressure survey.
10. Measurement of relative humidity by hygrometer.
11. Study and analysis ventilation network circuit.
12. Study of mine air-conditioning plant.
13. Study of Constructional features of a flame safety lamp and cap lamp,
14. Study of Layout of lamp room.
15. Assessing spontaneous heating susceptibility of coal using DTA/Wet oxidation Apparatus
16. Study of MSA type gas mask i) Filter type apparatus ii) Self Rescue
17. Study of self-contained breathing apparatus i) Drager BG-174 ii) By Travox -120
18. Study of Drager pulmotor (Model: PT-60)
19. Estimation of SPM concentration in air using high volume sampler.
20. Study of construction and working of explosion proof fire stopping.
21. Determination of susceptibility of coal by chemical method or by puff Temperature method.
22. Determination of water quality parameters using water analyzer kit.
23. Determination of flammability temperature of coal by using inflammability index apparatus.
24. Determination of nutrient status in soil using soil test kit.
25. Measurement of Noise level by integrated sound level meter.
26. Measurement of Lux by light meter.
27. Air born dust modeling
28. Air pollution modeling

**MN507PC: MINE MECHANIZATION LAB**

III B.Tech. Mining. Engg. I-Semester

L	T	P	C
0	0	2	1

Pre-Requisites: NIL

**Course Objectives:** To impart knowledge to students about:

1. Construction as operations of various types of engineer, mining equipment etc.
2. Testing procedure for determination of various properties of mining machinery like efficiency, strength friction etc.

**Course Outcomes:** The students will be able to

1. Describe the constructional details of various mining equipment.
2. Explain the working of mining machinery.
3. Evaluate the properties of mining machinery.

**LIST OF EXPERIMENTS (Any 10 to 12 Experiments to be done minimum)**

1. To find out the angle of friction for different materials.
2. Coefficient of friction between belt / rope and pulley
3. Determination of Efficiency of a screw jack
4. Study of construction and operation of 4stroke SI engine model.
5. Study of construction and operation of 4 stroke CI engine model.
6. Performance testing of a 4 stroke Diesel engine.
7. Performance test of reciprocating air compressor
8. Study of different types of gear and gear trains.
9. To study the construction of multi-speed gearbox used in dozer.
10. Study of rope brake dynamometer.
11. Study of different types of couplings.
12. Study of multiple clutches
13. To study the jump phenomena of Cam and Follower
14. Study of gate end box
15. Study of drill panel and hand held electrical in a drill
16. Study of mining type electric cable.
17. Study of pillar switch
18. To develop different hydraulic circuits in hydraulic trainer.
19. To study the construction and operation of hydraulic pumps, motors and valves
20. To study the construction and operation of hydraulic fittings and hoses.
21. Performance investigation of hydrostatic transmission systems with different motors.
22. To develop different pneumatic logic circuits in pneumatic trainer
23. Performance test of centrifugal pumps
24. Performance test on reciprocating pump
25. Dismantling and assembly of Jack Hammer Drill machines
26. Determination of fatigue strength of steel wires
27. Determination of Breaking strength of steel wire ropes

**\*MC510: INTELLECTUAL PROPERTY RIGHTS****III B.Tech. Mining. Engg. I-Semester**

L	T	P	C
3	0	0	0

**UNIT – I**

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT – II**

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

**UNIT – III**

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT – IV**

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

**UNIT – V**

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

**TEXT BOOKS & REFERENCES:**

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

**MN611PE: COMPUTER APPLICATIONS IN MINING (Professional Elective - II)**

III B.Tech. Mining. Engg. II-Semester

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

**Course Objectives:**

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

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

**UNIT I**

**INTRODUCTION TO COMPUTERS:** Configuration of computers and servers, evolution of operating systems; Networking Concepts, MIS Concepts – Cloud computing / grid computing in mining, Big Data analytics.

**UNIT II**

**PROGRAMMING & DBMS CONCEPTS:** Algorithm, flow charts and Programming of mining application like pillar design, blast design, subsidence, - Database and Relational database - development of software packages for mining companies – forms, queries and reports, Enterprise resource planning for material managements

**UNIT III**

**COMPUTERISED MINE PLANNING:** Introduction of Geostatistics, Reserve Estimation, kriging, block modelling and orebody modelling, Optimization and mine design, mine scheduling.

**UNIT IV**

**PROBLEM SOLVING – APPLICATIONS IN MINING:** Ventilation network analysis; support design, Applications of CAD in mining, GIS in Mining, online and offline monitoring and control, TDS, FEM and CFD Concepts and basics of modeling and simulation.

**UNIT V**

**RECENT TRENDS & MINING SOFTWARE:** Artificial intelligence, expert system, neural networks, robotics and their applications in mining Functionalities of mine planning software, fragmentation software, and numerical software applicable to mining. Case studies of mining applications

**TEXT BOOKS:**

1. Kadri Dagdelen, Editor, Computer Applications in the Minerals Industries, Colorado School of Mines, 1999.
2. Ramani R.V., et al. Computers in Mineral Industry, Oxford and IBH Publishers, 1994.

**REFERENCES:**

1. R.V. Ramani – Editor, APCOM Proceedings Application of Computers and Operations Research in the Mineral Industry, The Society of Mining, Metallurgy and Exploration, Inc., 1996

2. Fytas, K. and Singhal, R.K. Computers Applications in Mineral Industry, A. A. Balkema Publication, 1988.
3. E Balagurusamy , Fundamentals of Computers , Mc Graw Hills Publication, 2009
4. Basandra S K, Computers Today Fourth Edition, Galgotia Publications Pvt. Ltd, 2004

**MN612PE: MINERAL PROCESSING (Professional Elective - II)****III B.Tech. Mining. Engg. II-Semester****L T P C**  
**3 0 0 3****Pre-Requisites:** NIL

**Course Objectives:** The prime objective of this course is to build the solid foundation on principals and equipment of various mineral beneficiations procedures that would facilitate metal extraction. It also focuses on mathematical derivations that are associated with concentration processes.

**Course Outcomes:** At the end of the course the student will be able to:

- Understand the importance of mineral processing technology.
- Understand techniques of mineral processing for concentration of ore minerals economically.
- Review environment friendly techniques for concentration of sulphide minerals.
- Compute the recovery of ore mineral after concentration.

**UNIT - I**

Scope and Objectives of Ore Dressing: Sampling of ores by different methods; Theory of liberation of minerals; Crushers - Jaw, Gyratory, Cone, Rolls and Toothed Roll crushers; Grinding - Types of grinding operations like Batch and Continuous grinding, Dry and Wet grinding, Open circuit and Closed-circuit grinding, Grinding Mills - Ball mills, Theory of ball mill operation, Rod and Tube mills; Comminution laws - Rittinger's laws, Kick's law and Bond's law.

**UNIT - II**

Sizing: Study of laboratory sizing techniques and reporting of sizing data; Industrial sizing units - Types of screen surfaces, Grizzlies, Trommels, Vibrating and Shaking screens; Movement of solids in fluids – Stokes' and Newton's laws, Terminal velocity and its relation with size, Relation between time and velocity, Relation between distance travelled and velocity; Equal settling ratio, Free and hindered settling ratios; Quantifying concentrating operations - Ratio of concentration, Recovery, Selectivity Index and Economic Recovery; Classification – Types of classifiers, Study of Settling Cones, Rake Classifier, Spiral Classifier and Cyclones.

**UNIT - III**

Heavy Media Separation - Principles, flow chart, different media used, Heavy Media Separation using heavy liquids and heavy suspensions, Washability curves for easy, normal and difficult coal; Magnetic separation processes and Electrostatic separation process.

**UNIT - IV**

Jigging: - Theory of jigging, jigging machines - Harz jig, Denver jig Baum jig, Hancock jig, James coal jig and HalkyIn jig, Design considerations in a jig. Tabling - Study of stratification on a table. Shaking tables, Wilfley table.

**UNIT - V**

Flotation - Principles of flotation, Factors affecting flotation, Classification of Collectors and Frothers, Regulators, and Factors affecting their efficiency, Application of flotation process for Cu, Pb and Zn ores.

**TEXT BOOKS:**

1. Mineral processing technology - B. A. Wills
2. Principles of Mineral Dressing - A.M. Gaudin
3. Introduction to Mineral Processing by V. Malleswara Rao, Indian Academy of Geoscience

**REFERENCE BOOKS:**

1. Ore dressing Practices - S. K. Jain
2. Elements of Ore Dressing - A. F. Taggart

**MN613PE: MATERIAL MANAGEMENT IN MINES (Professional Elective - II)**

III B.Tech. Mining. Engg. II-Semester

L	T	P	C
3	0	0	3

**Pre-Requisites:** NIL**Course Objectives:**

1. To teach the students on various aspects of materials management like purchasing procedures, and management etc.
2. To teach students on store management and inventory, etc.

**Course Outcomes:** At the end of the course the students will be able to

1. List out the various items to be purchase and procurement methods.
2. Organize the consumption and inventory of materials at regular intervals, etc.
3. Plan store house management for smooth inflow and outflow of the materials.

**UNIT – I**

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

**UNIT – II**

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

**UNIT – III**

**WAREHOUSING AND STORE MANAGEMENT:** Store keeping principles – past and latest techniques, stores – general layout, cost aspect and productivity, problems and development, store system procedures, incoming material control, store accounting and stock incoming material control, store accounting and stock verification, value analysis.

**UNIT – IV**

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

**UNIT – V**

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

**TEXT BOOKS:**

1. Goplakrishnan, P, and Sundaresan, M. Material Management: An Integrated Approach, Prentice Hall of India Pvt Ltd., New Delhi, 1982.
2. Datta, A.K., Materials Management procedure, Test and cases, Prentice Hall of India Pvt Ltd., New Delhi 1984.

**REFERENCES:**

1. Peckam, H.H., Effective Materials Management, prentice Hall Of India Pvt Ltd., 1984.
2. Prichard, J.W., and Eagle, R.H. Modern Inventory Management, N,Y., Wiley and Breach Science Publishers, 1972.

**MN601PC: INTRODUCTION TO INSTRUMENTATION**

III B.Tech. Mining. Engg. II-Semester

L	T	P	C
3	1	0	4

Pre-Requisites: NIL

**Course Objectives:** To have a knowledge of

1. Electronic Instruments
2. Pressure measurements
3. Flow measurements
4. Vibration, Viscosity and Humidity Level measurement
5. Various analysers

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

**UNIT I**

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

**UNIT II**

**PRESSURE MEASUREMENTS:** Unit of Pressure – Manometers- Different types, - Elastic type pressure gauges – Bourdon tube – Bellows – Diaphragm – Elastic elements with LVDT and strain gauge – Capacitive type pressure gauge – Measurement of vacuum – McLeod gauge – Thermal conductivity gauge – Ionisation gauge.

**UNIT III**

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

**UNIT IV**

**VIBRATION, VISCOSITY, HUMIDITY, LEVEL MEASUREMENT:** Mechanical type vibration measuring instruments – Seismic instruments as an accelerometer - Vibrometers – Viscosity – Saybolt viscometer. Humidity – Hot wire electro type hygromer - Dew cell – Electrolysis type hygrometer.

**UNIT V**

**ANALYSERS:** Dissolved Analyzer: Conductivity meter – pH meter – Dissolved oxygen analyser – Sodium analyser – Silica analyser – Turbidity meter – Gas analyser – NOx analyser – H2S analyser – CO and CO2 monitor, Dust & Smoke measurement.

**TEXT BOOKS:**

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

**REFERENCES:**

1. Murthy, D.V.S. Transducers and Instrument and Instrumentation, Prentice Hall of India Pvt. Ltd. New Delhi.
2. Patranabis, D. Principle of Industrial Instrumentation, Tata McGraw Hill Publishing Co., New

Delhi 1999.

3. Jain, R.K. Mechanical and Industrial Measurements, Khanna Publishing, New Delhi, 1999.
4. Liptak B.G. Instrumentation Engineers Hand Book (Measurement), Chilton Book Co., 1994

**MN602PC: UNDERGROUND COAL MINING TECHNOLOGY**

III B.Tech. Mining. Engg. II-Semester

L	T	P	C
3	1	0	4

Pre-Requisites: NIL

**Course Objectives:**

1. To study the development of panels and extraction of coal in Bord and Pillar method
2. To study the Long wall advancing and retreating methods
3. To study the various special methods of winning coal
4. To study and update of the mine criteria as per various legislation of India.
5. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

**Course Outcomes:** The students will gain knowledge on development and depillaring of coal by Bord and Pillar and advancing and retreating in Longwall methods. They will also know about methods of winning of coal seams which have special features.

**UNIT I**

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

**UNIT II**

**BORD AND PILLAR METHOD-DEVELOPMENT:** Design and development of a district / panel, sizes and shapes of galleries and pillars, bord and pillar, room and pillar methods, with conventional and continuous mining techniques with various equipment.

**UNIT III**

**BORD AND PILLAR METHOD – EXTRACTION:** Pillar extraction by caving and stowing methods; mechanised extraction of pillars, shaft pillar extraction, systematic supports, surface, underground and face arrangements for stowing. Partial extraction.

**UNIT IV**

**LONGWALL METHOD:** Advance and retreat methods, continuous and cyclic systems, extraction with different machines-ploughs, shearers, design of longwall workings, optimum length of face, size of panel, gates, support system, personnel, organisation and safety measures, salvaging and relocations of equipment, Punch longwall.

**UNIT V**

**SPECIAL METHODS OF WORKING:** Problems of working thick & thin seams, multi slices, sublevel caving, horizon mining, gallery blasting method, contiguous seam working, working steeply inclined seams, working under surface structures and seams liable to spontaneous heating, outburst and bumps, etc. hydraulic mining, Wongawalli, shortwall, highwall mining, underground coal gasification, coal bed methane, shield mining.

**TEXT BOOKS:**

1. Singh, R.D. Principles and Practices of Modern Coal Mining, New Age International (P) Ltd., Chennai, 1994.
2. Peng S.S., and Chiang, H.S., Longwall Mining, John Willey and Sons, New York, 1992.

**REFERENCES**

1. Singh, T.N. Singh, Underground Winning of Coal – Oxford & IBH Publishing Co. Ltd., 1992.
2. Mathur, S.P., Coal Mining in India, M.S. Enterprises, Bilaspur, 1999.
3. Mathur, S.P., Mining Planning for Coal., M.G. Consultants, Bilaspur, 1993.
4. Szwilski and Richards M.J., Underground Mining Methods and Technology, 1987.
5. [Internet: www.miningindia.com](http://www.miningindia.com)

**MN603PC: ROCK MECHANICS ENGINEERING**

III B.Tech. Mining. Engg. II-Semester

L	T	P	C
3	1	0	4

Pre-Requisites: NIL

**Course Objectives:**

- To study and understand various aspects of rock mechanics and its application to mining.
- Introducing the various instrumentation and measurement methods.
- To study the theories of failure and approaches used for open pit and underground designs.
- To understand various aspects of supports and their design for various situations.
- To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

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

**UNIT I**

**Physical and Mechanical Properties of Rocks:** Definition of some important terms used in rock mechanics, application of rock mechanics in mining, Physical properties of rocks-density, porosity, moisture content, permeability, water absorption various indices of rocks like hardness, Protodynakov index, slake durability index, impact strength index, etc, Preparation of test specimens, laboratory determination of mechanical properties of rocks-compressive strength, tensile strength, flexural strength, shear and triaxial strength, modulus of elasticity, Poisson's ratio. Dynamic wave velocities, dynamic elastic constants, their determination in the laboratory, application in mining, time dependent properties of rocks, creep, mechanism of creep of rocks-different stages, rheological models.

**UNIT II**

**Supports and Supporting:** Various methods of roof examination, objectives and limitations of supports, ground forces and in situ stresses, pressure arch theory, evolution of supports, conventional supports-timber and steel supports, arches, yielding supports; rock and cable bolting, shotcreting, roof stitching, support of shaft bottoms, galleries, junctions and places of roof falls, freshly exposed roof supports, longwall powered supports. Design of systematic support rules for B & P and longwall (face and roadways) - development, depillaring, etc.

**UNIT III**

**Rock Mechanics Instrumentation, Pit Slope Stability:** Convergence indicators, load cells, strain gauges, flat jacks, LVDT, dial gauges, pressure cells and recorder, anchorage testing equipment, laboratory and in situ measurements, hydraulic fracturing rock mechanics, strata instrumentation for B & P and longwall workings, Approach to slope stability, slope parameters, different types of slope failures, factors affecting slope stability, introduction to methods of failure, analysis, determination of factor of safety,. Introduction to different rock slope stabilisation techniques,

**UNIT IV**

**Subsidence and Stowing:** Theories of subsidence, factors affecting subsidence, subsidence surveys, subsidence prediction techniques, subsidence control – surface and underground measures, pseudo-mining damage. Selection and preparation of stowing materials, principal methods of stowing, collection, fields of application and limitations, surface, underground and face arrangements, design of stowing plants.

## **UNIT V**

**Theories of Failure, Pillar Design, Design of Underground Workings and Rock Burst:** Different theories of failure of rocks, modes of failure - Griffith, Coulumb-Navier, Mohr, Hoek-Brown, empirical criteria, etc. and their field of applications, Strength of pillars, barrier and shaft pillar design – roof load estimation, factor of safety, various formulae, rock burst and bumps - phenomena, causes, prediction, monitoring and control, gas outbursts, stress distribution in underground workings including bord and pillar and longwall workings.

### **TEXT BOOKS:**

1. Obert, L. and Duvall, W.I., Rock Mechanics and Design of Structure in Rock John Wiley and Sons Inc., New York, 1967.
2. Vutukuri, V.S. and Lama, R.D., Handbook on Mechanical Properties of Rocks, Vol.I, II, III and IV, Transtech Publication Berlin, 1974/78.
3. Peng S.S., and Chiang, H.S., Longwall Mining, John Willey and Sons, New York, 1992.

### **REFERENCES:**

1. Brady, B.H.G. and Brown, S.T., Rock Mechanics, Wiley Interscience, 1985.
2. Hoek, E and Brown, E.T., Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980.
3. Jumkis, A.R. Rock Mechanics, Transtech Publications, Berlin, 1983.
4. [Internet: www.miningindia.com](http://www.miningindia.com)

**MN604PC: GROUND CONTROL & INSTRUMENTATION LAB AND COMPUTER APPLICATIONS  
IN MINING LAB**

**III B.Tech. Mining. Engg. II-Semester**

**L T P C  
0 0 3 1.5**

**Pre-Requisites:** NIL

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

**Course Outcome:** The students will able use the planning software for surface and underground mining methods.

**LIST OF EXPERIMENTS:**

1. Design of pillars
2. Blast design
3. Subsidence prediction.
4. Mine ventilation network analysis.
5. Modelling of airflow through underground workings using CFD.
6. Ore body modeling.
7. Slope stability analysis in soil and rocks.
8. Fragmentation Analysis
9. Truck dispatch system optimization
10. Digital Terrain and Wire-frame modelling
11. Surface Mine Design using MPD Software
12. Underground Mine Design using MPD Software
13. Pit optimization using MPD Software
14. Production Scheduling for grade control
15. Design of experiments.

**LIST OF EXPERIMENTS:**

1. Studies on CONVERGENCE METER for monitoring convergence in mines
2. Studies on BOREHOLE STRESS CELL for monitoring stress in underground workings.
3. Studies on VIBRATING WIRE TYPE LOADCELL for monitoring load on supports.
4. Studies on LAYOUT OF INSTRUMENTS for monitoring ground behavior around Longwall
5. Studies on LAYOUT OF INSTRUMENTS for strata behavior monitoring in thick seams.
6. Studies on LAYOUT OF INSTRUMENTS for monitoring ground behaviour in metal mines.
7. Studies on LAYOUT OF INSTRUMENTS for slope monitoring in opencast mines.
8. Studies on REMOTE CONVERGENCE INDICATORS for roof fall monitoring in mines.
9. Studies on BOREHOLE EXTENSOMETER for monitoring bed separation in mines.
10. Studies on VIBROGRAPH for monitoring ground vibrations due to blasting.

**REFERENCE BOOKS:**

1. E Balagurusamy, Fundamentals of Computers, Mc Graw Hills Publication, 2009
2. MPD Software Manual.
3. Fragalyst Software Manual

**MN605PC: ROCK MECHANICS ENGINEERING LAB****III B.Tech. Mining. Engg. II-Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Pre-Requisites:** NIL**Course Objectives:**

- To study the various of methods to determine the properties of rocks.
- To study the operation of various instruments and equipment.

**Course Outcomes:** The students will have knowledge on strength and deformation characteristics of rock using different methods.

**List of Experiments (Any 10 to 12 Experiments to be done minimum)**

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.
13. Determination of time dependent deformation of rocks.
14. Determination anchoring capacity of rock bath
15. Blast induced ground vibration and air-ore pressure determination
16. Determination of percentages shrinkages of different blowing materials
17. Determination of in-situ stress by flatjack
18. Determination of port failure behavior of rocks.

**EN608HS: ADVANCED COMMUNICATION SKILLS LAB****III B.Tech. Mining. Engg. II-Semester**

L	T	P	C
0	0	2	1

**1. Introduction:**

The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

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

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

**3. Syllabus:** The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

**4. Minimum Requirement:**

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. **Prescribed Lab Manual:** A book titled **A Course Book of Advanced Communication Skills (ACS) Lab** published by Universities Press, Hyderabad.

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

- **Oxford Advanced Learner's Compass**, 7<sup>th</sup> Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
  - Preparing for being Interviewed
  - Positive Thinking
  - Interviewing Skills
  - Telephone Skills
  - Time Management

**7. Books Recommended:**

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2<sup>nd</sup> Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5<sup>th</sup> Edition
3. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
4. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
5. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
6. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
7. English Vocabulary in Use series, Cambridge University Press 2008.
8. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
9. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
10. Job Hunting by Colm Downes, Cambridge University Press 2008.
11. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.

**\*MC609: ENVIRONMENTAL SCIENCE**

III B.Tech. Mining. Engg. II-Semester

L	T	P	C
3	0	0	0

**Course Objectives:**

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures
- Understanding the environmental policies and regulations

**Course Outcomes:**

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

**UNIT - I**

**Ecosystems:** Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT - II**

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

**UNIT - III**

**Biodiversity And Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT - IV**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

**UNIT - V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-

economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

**TEXT BOOKS:**

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

**REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4<sup>th</sup> Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.