

Engineering and Management Institute of India

Diploma in Engineering

ENVIRONMENTAL ENGINEERING SYLLABUS

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Department of Environmental Engineering

Vision:-

To strengthen the region through imparting superior quality technical education and research; which enables the fulfillment of industrial challenge and establish itself as a Centre of Excellence in the field of Environmental Engineering.

Strength of Material (ENE-2.1)**UNIT-I**

Simple Stresses & Strains : -Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT –II

Shear Force and Bending Moment Diagrams: -Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure.

UNIT – III

Flexural Stresses: - Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, sections. Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T sections.

UNIT – IV

Thin Shells:- Definition – Thin and thick cylindrical shell Failure of thin cylindrical shell subjected to internal pressure Derivation of Hoop and longitudinal stress causes in a thin cylindrical shell subjected to internal pressure simple problems change in dimensions of a thin cylindrical shell subjected to internal pressure -problems Derivation of tensile stress induced in a thin spherical shell subjected to internal pressure simple problems change in diameter and volume of a thin spherical shell due to internal pressure.

UNIT –V

Torsion of Circular Shafts: - Theory of pure torsion, Derivation of torsion equations: $T/J=q/r=N\theta/L$ Assumptions made in theory of pure torsion-Torsional moment of resistance – Polar section modulus – Power transmitted by shafts. Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders.

Reference Book:-

1. Strength of Materials by (R.K. Bansal ,Laxmi Publications 2010).
2. Strength of materials by (Sadhu Singh.Khanna Publications).
3. Strength of Materials by (S.Timshenko)

Fluid Mechanics (ENE-2.2)**UNIT-I**

Fluid statics:- Dimensions and units: physical properties of fluids-specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric gauge and vacuum pressure –measurement of pressure. Manometers- Piezometer, U-tube, inverted and differential manometers. Pascal's law, hydrostatic law. Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.

UNIT –II

Fluid kinematics:- Introduction, flow types. Equation of continuity for one dimensional flow, circulation and vorticity, Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrotational flow, flow net, source and sink, doublet and vortex flow.

Fluid dynamics:- surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its applications, force on pipe bend.

Closed conduit flow:- Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line.

UNIT – III

Boundary Layer Theory:- Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluff body and its applications, basic concepts of velocity profiles.

Dimensional Analysis:- Similitude and modelling – Dimensionless numbers.

Performance of hydraulic turbines:- Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. Hydraulic systemshydraulicram, hydraulic lift, hydraulic coupling. Fluidics – amplifiers, sensors and oscillators. Advantages, limitations and applications.

UNIT – IV

Basics of turbo machinery:- hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

of turbo machinery:- hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

UNIT –V

Centrifugal pumps:- classification, working, work done – manometric head- losses and efficiencies- specific speed- pumps in series and parallel-performance characteristic curves, cavitation & NPSH.

Hydraulic Turbines:- classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design – draft tube- theory functions and efficiency.

Reference Book:-

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

Workshop Technology (ENE-2.3)**UNIT-I****Introduction and Demonstration: -**

Introduction to various shops / sections and workshop layouts. Safety norms to be followed in a workshop should be conveyed to students.

Carpentry Shop:-

Introduction of Tools & operations, Types of woods & their applications, Types of Carpentry hardware and their uses, Carpentry Joints, carpentry operations such as marking ,sawing, planing, chiseling, grooving, boring, joining, types of woods and carpentry hardware.

UNIT –II**Fitting Shop:-**

Introduction of Tools & operations, Types of Marking tools & their uses, Types of fitting cutting tool & their uses, fitting operations such as chipping, filing, scraping, grinding, sawing, marking, drilling, tapping.

Smithy Shop:-

Tin Smithy: - Introduction of Tools like hammers, stakes, scissors etc, & operations like shearing , bending ,joining. Types of Sheet metal joints and applications. Black Smithy: Introduction of forging tools and it's operations.

UNIT – III**Metal Joining Shop: -**

Introduction of Tools, Types of welding Joint, Arc welding, Gas welding. Gas Cutting. Soldering, Brazing.

Machine Shop:-

Introduction of machine tools and operations, Demonstrations of basic machine tools like Lathe, Shaper, drilling, Milling machine and CNC with basic operations and uses.

UNIT – IV**Masonry:-**

Different types of Bricks, Different size and part of Bricks, Different types of Bonds, Types of tools used for various masonry works.

Electrical:-

Measure voltage, current, frequency, phase difference, power, power factor for single and three phase supply, Wire fan, tube light, two-way control, Wire MCB, ELCB for a given load circuit.

UNIT –V**Electronics:-**

Introduction to basic electronics components, Controller and its testing: Resistors, Inductors, Capacitor, Diode, BJT, Introduction to testing and Measurement Instruments: Power Supply, Function Generator, Oscilloscope.

Reference Book:-

1. Internal Combustion Engine by V. Ganesan.
2. Internal Combustion Engine by R.K. Rajpoot.

ENVIRONMENTAL ENGINEERING (ENE-2.4)**UNIT-I****INTRODUCTION:-**

Man and Environment :- Overview (socio-economic structure & occupational exposures) – Scope of Environmental Engineering – pollution problems due to urbanization & industrialization.

UNIT –II**AIR POLLUTION :-**

Causes of air pollution :- types & sources of air pollutants- Climatic & Meteorological effect on air pollution concentration- formation of smog and fumigation.

UNIT – III

Analysis of Air Pollutants :- Collection of Gaseous Air Pollutants- Collection of Particulate Pollutants – Analysis of Air Pollutants like : Sulphur dioxide – Nitrogen oxide – Carbon monoxide – Oxidants &Ozone – Hydrocarbons – Particulate Matter.

UNIT – IV

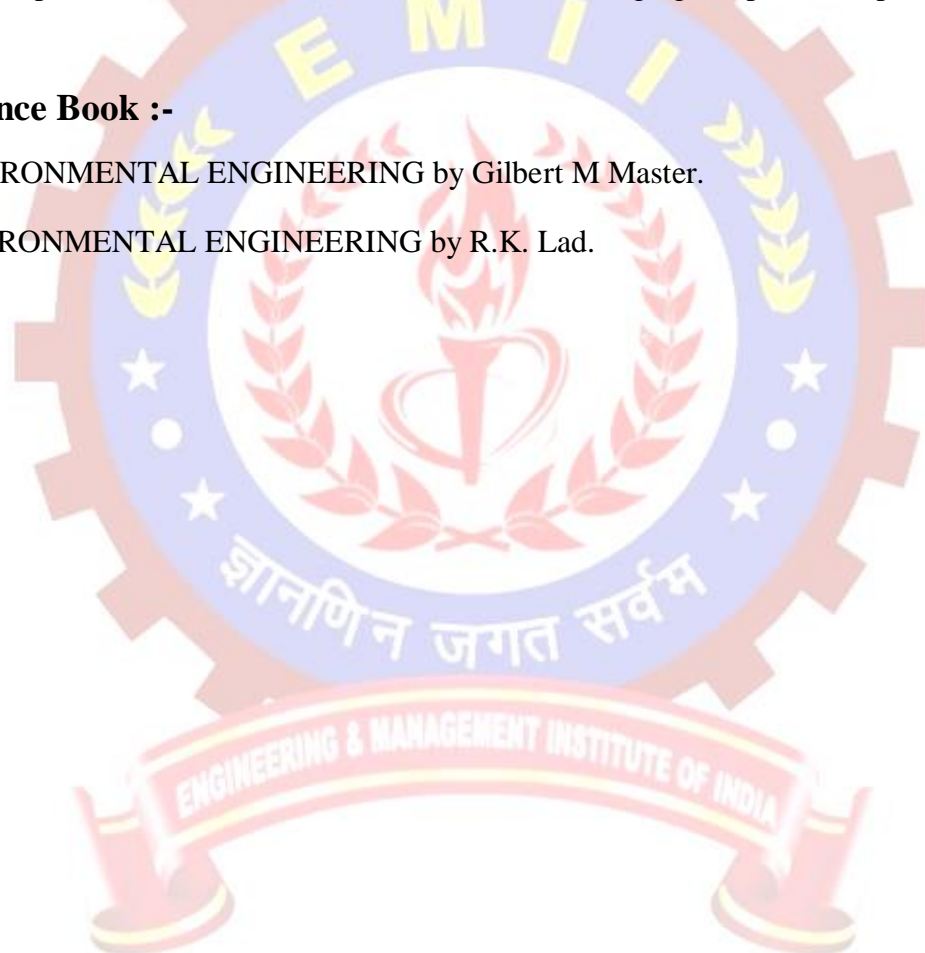
Air Pollution Control Measures & Equipment :- Control of Particulate Emission – Control of Gaseous Emission – Flue Gas Treatment Methods : Stacks Gravitational and Inertial Separation, Settling Chambers, Dynamic Separators, Cyclones, Filtration, Liquid Scrubbing, Spray Chambers, Packed Towers, Orifice and Ventury Scrubbers, Electrostatic Precipitators, Gas/solid Adsorption, Thermal Decomposition.

UNIT -V

Methods & Approach of Air Pollution Control :- Controlling smoke nuisance – Develop air quality criteria and practical emission standards – Creating zones suitable for industry based on micrometeorology of air area – Introducing artificial methods of removal of particulate and matters of waste before discharging to open atmosphere.

Reference Book :-

1. ENVIRONMENTAL ENGINEERING by Gilbert M Master.
2. ENVIRONMENTAL ENGINEERING by R.K. Lad.



MATERIAL SCIENCE & ENGINEERING (ENE-2.5)**UNIT-I**

Introduction and structure of materials:- study properties of materials? Structure of atoms - Quantum states-Atomic bonding in solids-binding energy-inter atomic spacing - variation in bonding characteristics - Single crystals – polycrystalline - Non crystalline solids - Imperfection in solids – Vacancies – Interstitials - Geometry of dislocation - Schmid's law - Surface imperfection - Importance of defects - Microscopic techniques - grain size distribution.

UNIT –II

Solid solutions and alloys - Phase diagrams - Gibbs phase rule - Single component systems – Eutectic phase diagram – lever rule - Study of properties of phase diagrams - Phase transformation - Nucleation kinetics and growth.

UNIT – III

Band model of semiconductors - carrier concentrations in intrinsic, extrinsic semiconductors – organic semiconductors - Fermi level - variation of conductivity, mobility with temperature – law of mass action - Hall effect - Hall coefficients for intrinsic and extrinsic semiconductors – Hall effect devices. Application of diffusion in sintering, doping of semiconductors and surface hardening of metals.

UNIT – IV

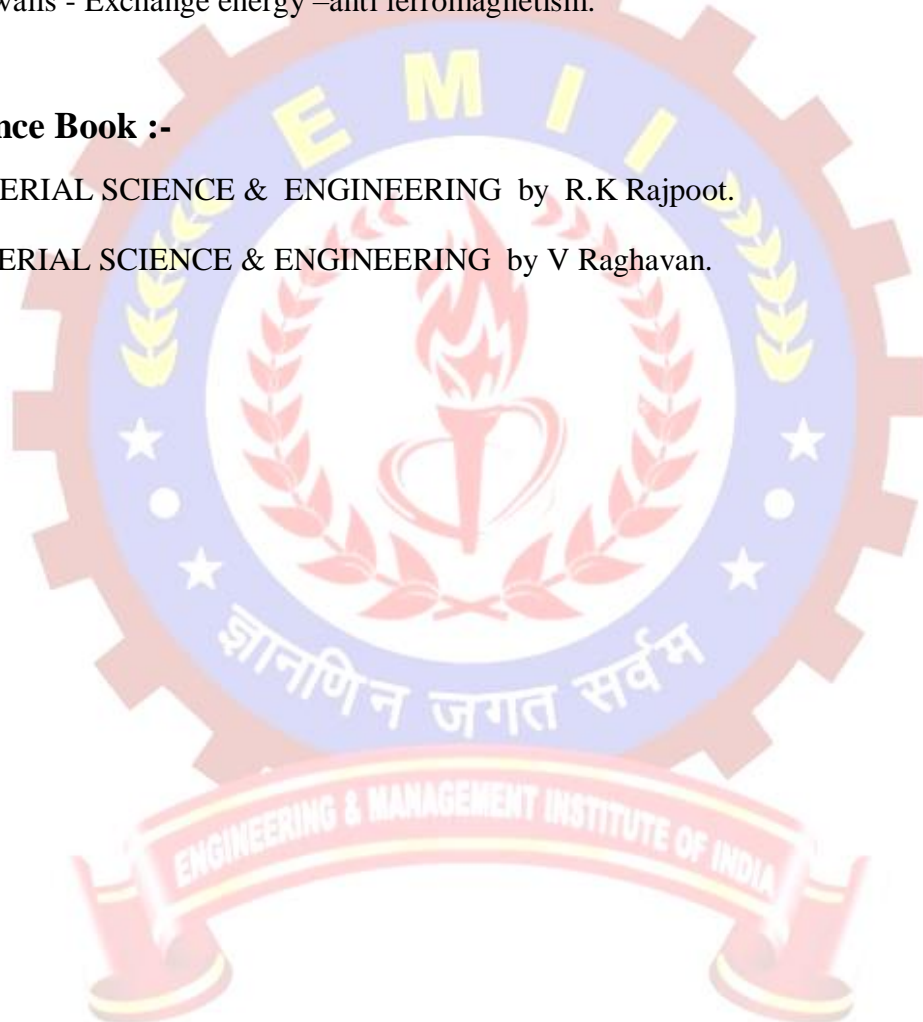
Mechanical properties - Stress, Strain, Elastic properties – Deformation – elasticity – hardness - Optical properties - Light interaction with solids - Atomic, electronic interaction, non – radiative transition - refraction, reflection, Absorption, Transmission, Insulators, luminescence.

UNIT –V

Magnetic properties - paramagnetism - ferromagnetism - domain theory - magnetic hysteresis, Weiss molecular field theory, Heisenberg's theory - magnetic anisotropy - domain walls - Exchange energy –anti ferromagnetism.

Reference Book :-

1. MATERIAL SCIENCE & ENGINEERING by R.K Rajpoot.
2. MATERIAL SCIENCE & ENGINEERING by V Raghavan.



BASIC ELECTRICAL ENGINEERING (ENE-2.6)**UNIT-I**

Elementary Concepts: - Concept of Potential difference. Current and resistance. Ohm's law, effect of temperature on resistance, resistance temperature coefficient, insulation resistance. SI units of work Power and Energy. Conversion of energy from one form to another in electrical and thermal systems.

UNIT –II

D. C. Circuits: -Kirchhoff's law, ideal and practical voltage and current sources. Mesh and Nodal analysis (Super node and super Mesh excluded). Source transformation. Star delta transformation. Superposition theorem, Thevenin's theorem Norton's theorem, maximum power transfer theorem (Source transformation not allowed for superposition theorem, Mesh and Nodal analysis).

UNIT – III

A.C. Fundamentals: -Sinusoidal voltage and currents, their mathematical and graphical representation, concept of cycle period, frequency, instantaneous, peak, average, r.m.s. values, peak factor, and form factor, phase difference, lagging, leading and in phase quantities and phasor representation. Rectangular and polar representation of phasors.

UNIT – IV

Single phase and poly phase A. C. circuits: -Single phase AC Circuits: Study of series and parallel R-L, R-C, R-L-C circuits, concept of impedance and admittance for different combinations, wave form and relevant voltage current phasor diagrams. Concept of active, reactive, apparent, complex power and power factor, resonance in series and parallel RLC circuit. Q- factor and band with Polyphase AC circuits: Concept of three phase supply and phase sequence. Balanced and unbalanced loads voltage current and power relations in three phase balance star and delta loads and their phasor diagrams.

UNIT –V

Electromagnetism: -Magnetic effect of electrical current cross and dot convention, right hand thumb rule and cork screw rule, nature of magnetic field of long straight conductor, concepts of solenoid and toroid. Concepts of m.m.f, flux, flux density, reluctance, permeability and field strength, their units and relationship. Simple series and parallel magnetic circuits. , comparison between electrical and magnetic circuits , force on current carrying conductor placed in magnetic field, Fleming’s left hand rule. Faraday’s law of electromagnetic induction, Fleming’s right hand rule, statically and dynamically induced EMF’s self and mutual inductance coefficient of coupling, energy stored in magnetic field.

Reference Book:-

- 1 BASIC ELECTRICAL ENGINEERING by V. N. Mittal and Arvind Mittal.
2. BASIC ELECTRICAL ENGINEERING by V Raghavan.

ENVIRONMENTAL BIOTECHNOLOGY (ENE-2.7)**UNIT-I**

Concept of Environmental Biotechnology: -Definition – concept and scope – Application of biotechnology – Role of microbial systems – Principles – Characteristics - Genetically engineered organisms – Merits and demerits – Bio tools for environmental monitoring – Role of biotechnology in environmental protection.

UNIT –II

Biotechnology and pollution abatement: - Biotechnology of wastewater treatment - Bioreactors - Microbial system in waste water stabilization – Biofilms - immobilization technology in waste water treatment – Microbial metabolism and growth kinetics – oil degradation – biodecolourization – Reed bed technology – Rhizosphere engineering - Biofiltration and Bioindicators.

UNIT – III

Role of Biotechnology in Bioremediation: -Soil pollution - Bioremediation – Principles - Biodegradation of agro chemicals and other organic compounds – Biotransformation of xenobiotic compound - Role of GEMS in degradation of xenobiotics; Bioscrubbers – Biomining of metals - Biopulping.

UNIT – IV

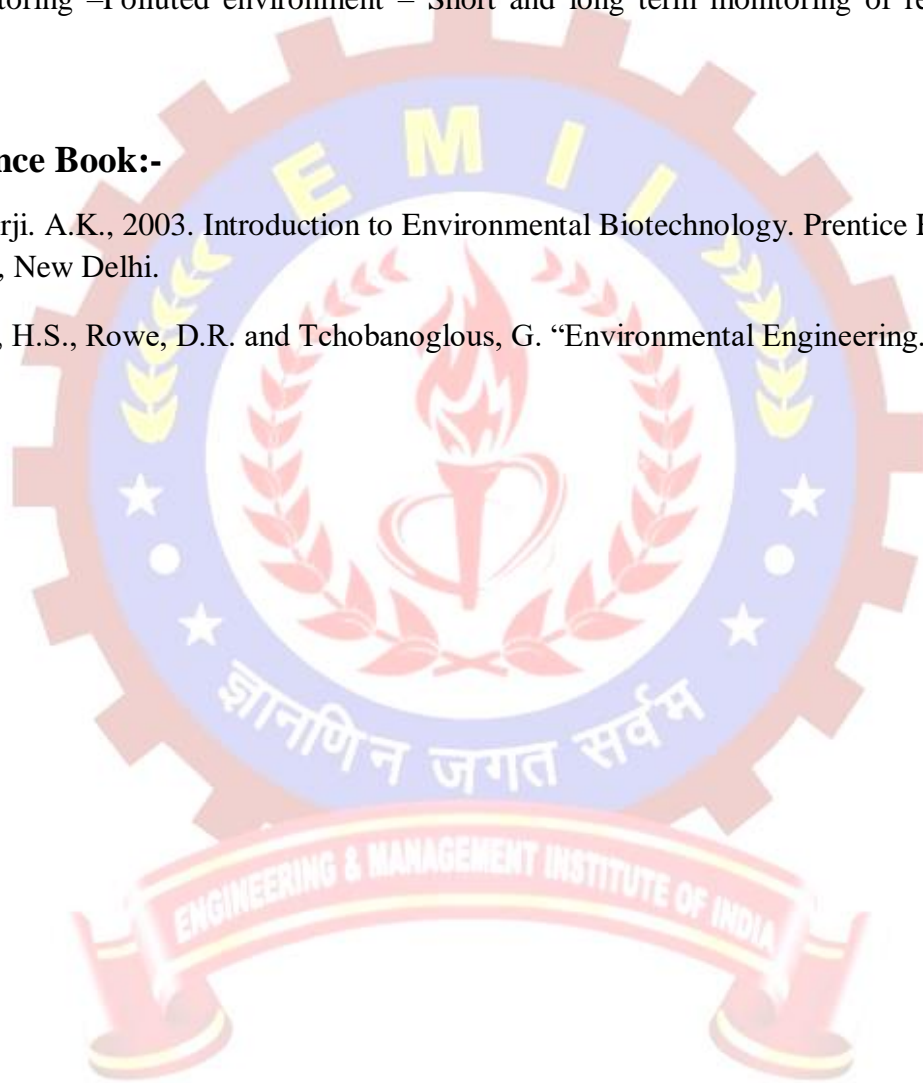
Biotechnology and value addition: -Bio processes in waste treatment - Production of value added products from waste – single Cell Protein (SCP), ethanol, methane and hydrogen, amino acids, vitamins -Enzyme production from wastes – Biodegradable plastics - Environmental implications -.Biotechnology of Microbial composting - Biofertilizers- Biopesticides

UNIT –V

Environmental Monitoring: -Bioindicators –Biomarkers –Biosensors –
Biomonitoring –Polluted environment – Short and long term monitoring of remediated sites .

Reference Book:-

1. Chatterji. A.K., 2003. Introduction to Environmental Biotechnology. Prentice Hall of India Pvt. Ltd., New Delhi.
2. Peavy, H.S., Rowe, D.R. and Tchobanoglous, G. “Environmental Engineering.



Environmental Chemistry (ENE-2.8)**UNIT-I**

Fundamental concepts in chemistry :- Elements and compounds – Atomic structure – Formation of molecules – Solutions: normality, molality and molarity - Ionization – radicals – Expressing concentrations.

UNIT –II

Properties of water :- Hydrogen Bonding – covalent bonding – ionic bonding – Water quality parameters: physical & Chemical Temperature profile of the atmosphere- Laps rates-Temperature inversion effects of inversion on pollution dispersion.

UNIT – III

Composition and structure of the atmosphere :- Meteorological Parameters – humidity, wind direction and speed – temperature inversion – Green House Gases and Global Warming – Acid rain.

UNIT – IV

Nature of soil :- Soil macro and micro nutrients – Soil structure and texture – Soil water – Soil air – Soil Temperature – Soil organic matter.

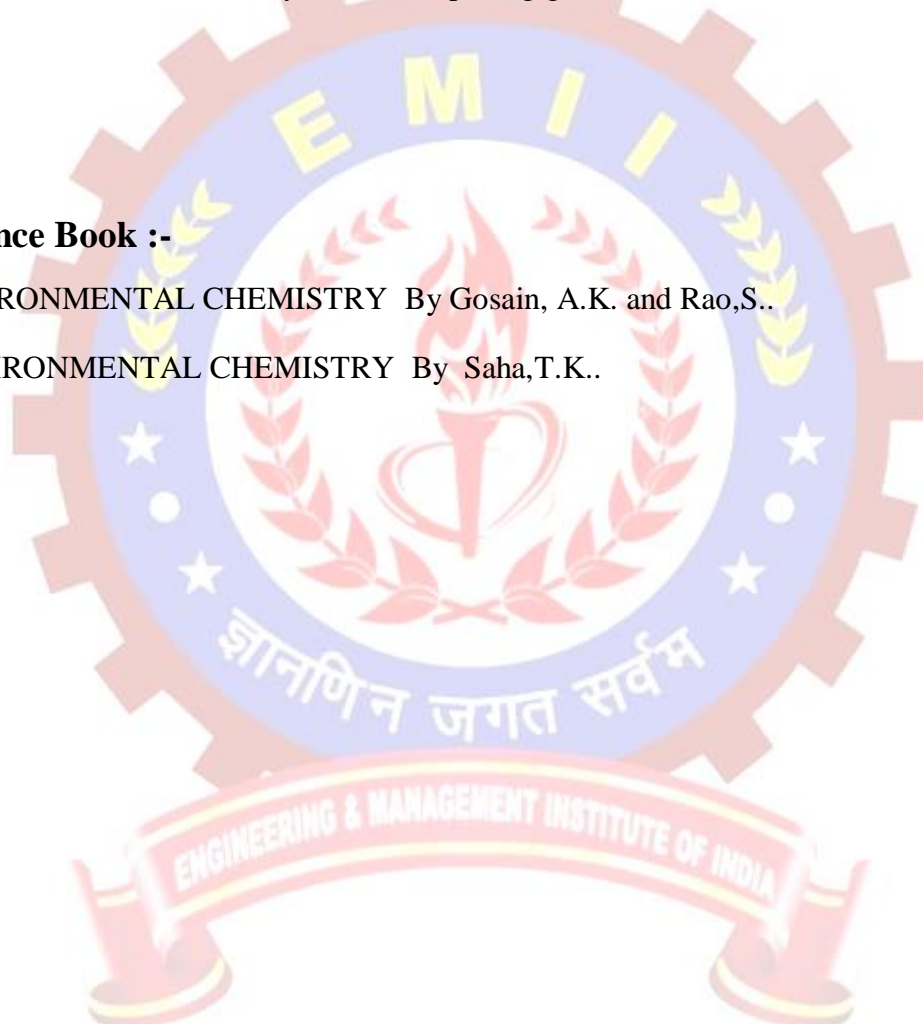
Causes of Climate change :- Change of Temperature in the environment melting of ice Pole-sea level rise-role of fossil fuels.

UNIT –V

Introduction:- Basic principle of Instrumentation and application of spectrophotometer – photometric laws – application of pH, conductivity meter and turbidity meter, Role of ozone in environment-ozone layer-ozone depleting gases-Green House Effect

Reference Book :-

1. ENVIRONMENTAL CHEMISTRY By Gosain, A.K. and Rao,S..
2. ENVIRONMENTAL CHEMISTRY By Saha,T.K..



Nature Resources Management (ENE-2.9)**UNIT-I**

Introduction to natural resources and conservation :- Types of natural resources, Importance of natural resources, Ecosystems and ecology: plant-land-climate-wildlife interactions, Government agencies and policies to support conservation, Scientific Method and Critical Thinking.

UNIT –II

Soil and land resources :- Soil erosion processes and impacts, Soil conservation practices in crop production, range and natural habitats, Invasive plants and Noxious weeds, Sustainable forestry.

UNIT – III

Water resources :- Groundwater pollution and management, Surface water pollution and management, Surface water resources in Nebraska, U.S. and Globally, Ogallala aquifer issues, Invasive plants: impacts on available water in Republican and Platte River Basins.

UNIT – IV

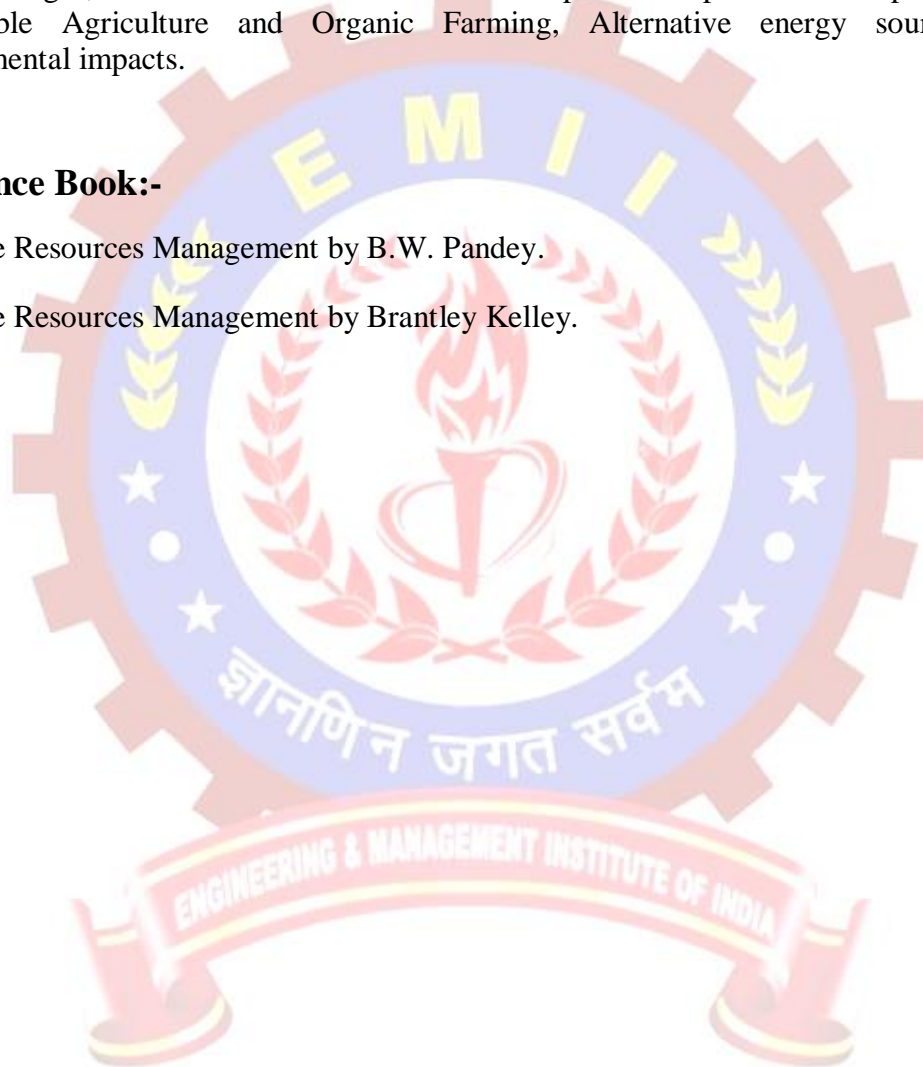
Air resources :- Air pollution and agriculture, Atmospheric carbon dioxide levels, global warming and agriculture.

UNIT –V

Global energy and food demands :- Population growth: impacts on energy and food shortages, Social values and economic impacts on policies and perceptions, Sustainable Agriculture and Organic Farming, Alternative energy sources and environmental impacts.

Reference Book:-

1. Nature Resources Management by B.W. Pandey.
2. Nature Resources Management by Brantley Kelley.



ENVIRONMENTAL MANAGEMENT (ENE-2.10)**UNIT-I**

Principles of Environmental Management: -Environmental Management perspectives: Development and environmental linkages. Environmental concern in India. The need for sustainable development. Actions for environmental protection: National and international initiatives, ISO framework, ecosystem approach, emerging environmental management strategies, Indian initiatives. Environmental Management tools, the role of professionals in environmental management. Emerging basis of environmental management in 21st century, e.g. fresh water availability global crisis. Case studies: International Conventions and Treaties: Stockholm Conference 1972, Rio Earth Summit 1992, Montreal Protocols, Agenda 21 Prominent NGOs and their contributions. International organizations; World Environment Day- Concept and themes.

UNIT –II

Policies and Legal Aspects of Environmental Management and Legislations: -Environmental Protection Acts. Rules and amendments thereof. Philosophy and major provisions of Act. Indian Forest Policy 1987. Policy Statement on Environment and Development and on Abatement of Pollution. The National Tribunal Bill 1992; The Forest Act, 1948. The Wildlife (Protection) Act, 1972. Ministry of Environment and Forest-notifications related to hazardous microorganisms and genetically modified organisms or cells. Biomedical Waste (Management and Handling) Rules, 1998. Environmental Clearances and Prevention & Control of Pollution Acts. Projects requiring clearances. Guidelines for industries. Statutory obligations of industries. Public Liability Insurance Act, 1991. Coastal Zone Regulations 1991 and modifications thereafter. Pollution Control Boards and their functions. Legislation for control of noise pollution. Judicial interventions in environmental management.

UNIT – III

Environmental Hazards and Disaster Management: -Introduction, definitions, Natural hazards; nature, causes, impacts and occurrences. Earthquakes, volcanic activity, landslides, cyclones, floods, droughts, forest fires; their mitigation.

Industrial and technological hazards: types and causes of industrial accidents physical, chemical, biological, electrical. Nature of accidents: fire, explosion, toxic release and dispersion. Disaster Management: Components of disaster management plan- on site and off site emergency plans. Technical hazards control system-incident reduction, incident management. Techniques of hazards assessment: PHA, HAZOP, HAZAN, MCAA.

UNIT – IV

Environmental Statement: -Evolution of and code of practice for environmental audit. Types of environmental audits: objectives-based and client-driven types. Waste audits and pollution prevention assessments. Liability audits and site assessment. General audit methodology and audit process: Introduction, the basic structure of an environmental audit program. General steps in an environmental audit procedure. Overview of element of audit processes: audit protocols (why, who, what and how). Audit certification and authorization.

UNIT –V

Environmental Impact Assessment (EIA): -Concept of EIA. Its scope, EIA study procedures, requirements for the same. Resources needed for EIA. Report preparation. Legal aspects.

Reference Book:-

1. Nature Resources Management by B.W. Pandey.
2. Nature Resources Management by Brantley Kelley.

Data Collection Analysis (ENE-2.11)**UNIT-I**

BUSINESS ANALYSIS :- Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet.

UNIT –II

DATA WAREHOUSING :- Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools – Metadata.

UNIT – III

DATA COLLECTION :- Introduction to univariate data analysis methods. Descriptive statistics and data visualization methods. Overview of sampling techniques for data collection, and introduction to statistical inference methods for decision making including simple linear regression, estimation procedures using confidence intervals and hypothesis testing.

UNIT – IV

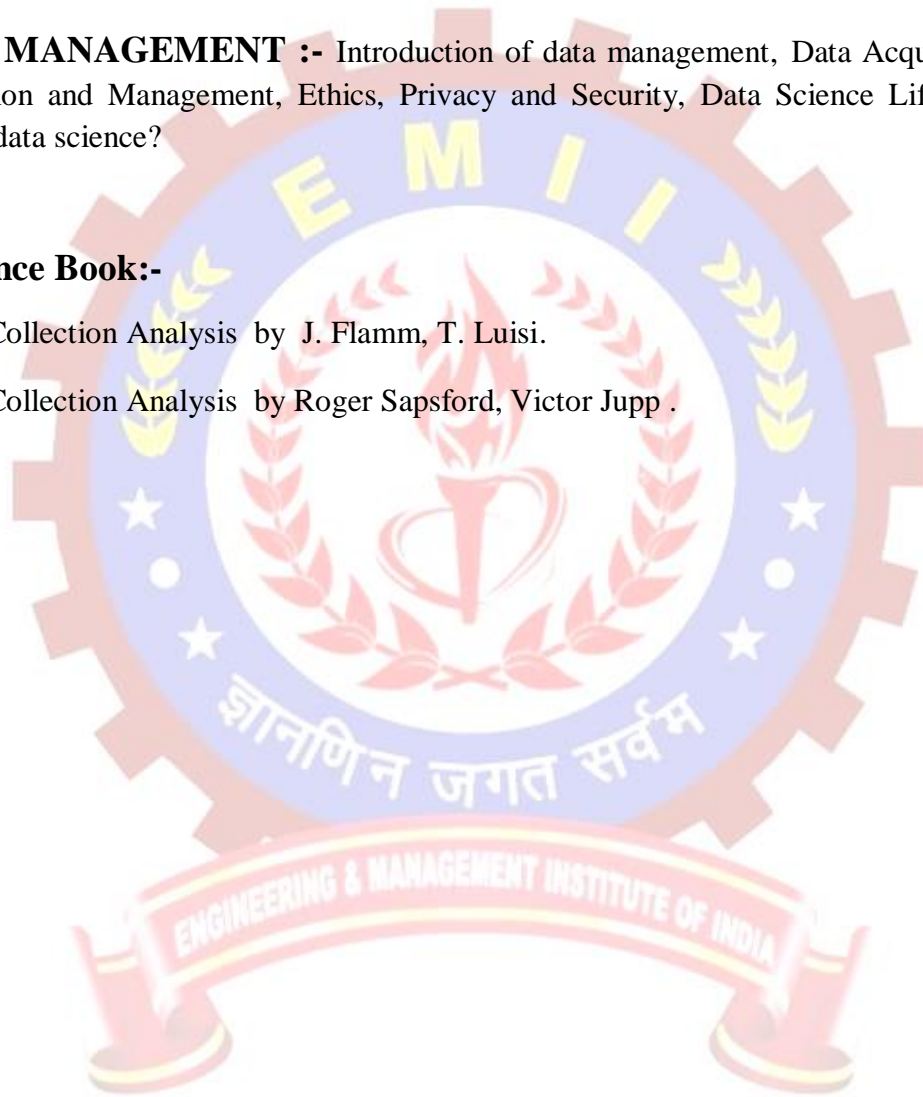
DATA ANALYSIS :- Course and ADA program introduction, data analysis fundamentals, data analysis process, Data Analysis Software, Communicating and Operationalizing Results, Surveys, Sampling and Estimation, Exploratory Data Analysis,

UNIT –V

DATA MANAGEMENT :- Introduction of data management, Data Acquisition, Preparation and Management, Ethics, Privacy and Security, Data Science Lifecycle, What is data science?

Reference Book:-

1. Data Collection Analysis by J. Flamm, T. Luisi.
2. Data Collection Analysis by Roger Sapsford, Victor Jupp .



ENVIRONMENTAL POLLUTION (ENE-2.12)**UNIT-I**

Air Pollution: - The atmosphere, composition of atmospheric air. Air Pollution-concepts, sources of air pollution- natural and anthropogenic. Air quality standards, emission standards. Primary and secondary air pollutants. Atmospheric reactions, mechanism of transformations and their relationship. Particulate matter- Sources, classification and composition, particulate dynamics, viable and nonviable particles. Effects of air pollution on human health, animals and vegetation. Pollution related phenomena and their consequences- greenhouse effect, global warming, temperature inversion, CFCs and ozone depletion, photochemical smog. Meteorological aspects: Lapse rates and atmospheric stability, temperature inversions. Plume behavior, Meteorological parameters: wind roses, dispersion models. Global climatic changes and future trends. International protocols.

UNIT –II

Water Pollution: - Characteristics of natural water, aquatic environment. Sources of potable water. Water quality standards- WHO, EPA and BIS. Industrial water quality standards. Types of water pollution- physical, chemical, biological and physiological. Sources of water pollution. Waste waters- domestic, industrial waste waters, their compositions, discharge standards and effects on receiving bodies. Fate of pollutants in water- metals, non-metals and their specifications. Pesticides, oils, greases, organic matters, biodegradation, bioaccumulation and their effects on water bodies. Marine, thermal and radioactive pollution in water and their consequences. Transport of pollutants, pollutant cycle in environment (land, air and water).

UNIT – III

Soil Pollution: - Soil formation, inorganic and organic components of soil, soil profile. Sources of soil pollution- agricultural, industrial, mining and dumping. Absorption of chemicals and toxic metals by soil and effects. Detrimental effects of soil pollution toxicity, diseases caused, impact on air and water bodies.

UNIT – IV

Noise Pollution and Control: - Sources of noise pollution, measurement of noise and indices. Effects of meteorological parameters on noise propagation. Noise exposure levels and standards. Impact of noise on human health. Control of Noise Pollution: Control of industrial and transport noise at source. Noise control in the transmission path, Noise barriers, enclosures and silencers. Protection of the receiver. Noise Pollution Standards and Legal Framework.

UNIT –V

Population Ecology: -Characteristics of population: natality, mortality, density, age distribution and sex ratio, population growth, population regulation, community ecology, predator-prey relationship.

Reference Book:-

1. Jacobson, M.Z. “Atmospheric Pollution: History, Science and Regulation”, Cambridge University Press.
2. Peavy, H.S., Rowe, D.R. and Tchobanoglous, G. “Environmental Engineering.

Principle & Practice of Management (ENE-2.13)**UNIT-I**

Functions of Management :- Planning, Organising and Controlling, systems approach to Management, patterns of analysis, economic, social political and ethical factors affecting management practice.

UNIT –II

Steps in the planning process: - management by objectives, programme budgeting, capital budgeting, economic analysis - marginal analysis, benefit / cost analysis etc. decision analysis -risk and uncertainty decision tress, strategy and policy analysis, limitation of planning.

UNIT – III

Organisational structure: - formal and informal organization, line and staff relations, relations with the public, principles of delegation, performance appraisal~ motivation, communication and leadership aspect, theories of organisation.

UNIT – IV

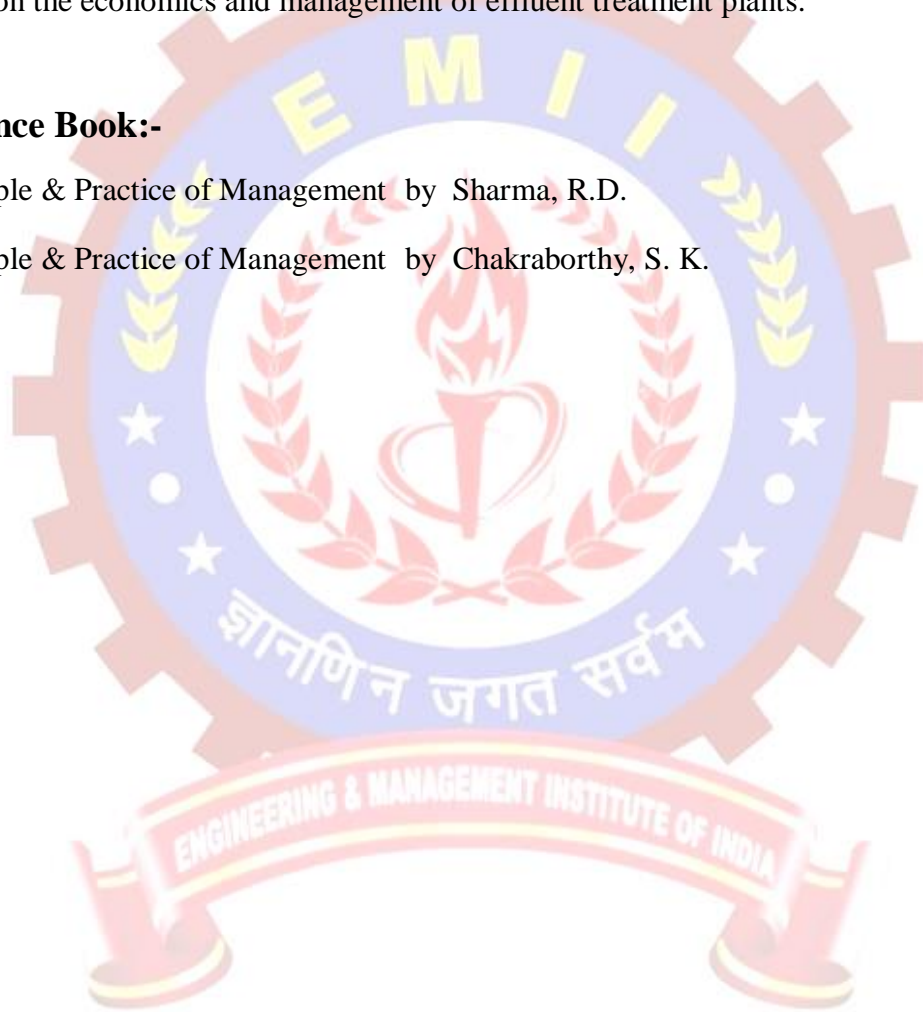
Management Control Systems: - Feed back mechanism, control techniques - budgeting, programme evaluation and audits.

UNIT –V

Setting environmental goals:- resource mobilization, use of natural resource and environmental indicators, output budgeting, monitoring and evaluating environmental programmes. Case studies in selected industries like garment manufacturing, tanneries focused on the economics and management of effluent treatment plants.

Reference Book:-

1. Principle & Practice of Management by Sharma, R.D.
2. Principle & Practice of Management by Chakraborty, S. K.



WRITEN ANALYSIS (ENE-2.14)**UNIT-I**

Introduction: -System and system analysis, Static and dynamic system, Models and modeling, Types of models, Stochastic and deterministic models, Dynamic simulation modeling, Necessity of models in management of environmental system, Steps followed in modeling, Model conceptualization, Model development, Solution methodologies numerical, analytical and monte carlo methods of simulation, Computer coding, Data acquisition and processing, Model calibration, Model validation and verification, Sensitivity analysis.

UNIT –II

Air pollution dispersion modeling: -Meteorological factors affecting air quality, Lapse rate, Dry adiabatic, moist Adiabatic and ambient lapse rates, Stable, unstable and neutral atmospheric condition, Maximum mixing height, Temperature inversions, Effect of lapse rate on plume behavior- coning, looping, lofting, fanning, fumigation. Point source Gaussian Plume Model- Effective stack height, Pasquill-gifforth stability criteria, Horizontal and vertical dispersion, Wind speed correction, Numerical examples and Some case studies on air pollution dispersion modeling.

UNIT – III

Surface water quality modeling: -Control mass and volume, Material balance equation, Dissolved oxygen depletion, Biochemical oxygen demand (BOD) measurement, Modeling BOD as a first-order reaction, Ultimate BOD, BOD: Temperature dependence, nitrogenous oxygen demand, Theoretical oxygen demand, Chemical oxygen demand, Dissolved oxygen sag curve, Steps in developing the DO sag curve, Numerical examples and some case studies on surface water quality modeling.

UNIT – IV

Storm Water Management Models: -Component of urban drainage system, Elements of EPA Storm water management model, Visual and non visual objects, Computational methods of runoff, Infiltration, Evapotranspiration and Peak flow component in EPA SWMM, Rainfall-runoff modeling, Unit hydrograph methods, Hydrologic and hydraulic routing methods, Typical application of SWMM with examples.

UNIT –V

Application of operation research in environmental engineering: - Introduction, Linear programming model, Examples of linear programming problems, Developing linear programming models, Graphical solution to LP problems, Simplex method, Simplex tableau for maximization problem, Marginal values of additional resources, Sensitivity analysis, Complications in applying the simplex method, Application in resource allocation and, Water quality and wastewater treatment, Application of transportation problems and dynamic programming in water supply engineering.

Reference Book :-

1. Sivakumar, R. “Introduction to Environmental Science & Engineering.
2. Peavy, H.S., Rowe, D.R. and Tchobanoglous, G. “Environmental Engineering.

ENVIRONMENTAL LEGISLATION (ENE-2.15)**UNIT-I**

Water (prevention and control of pollution) act 1974 as amended upto 1988, Water (Prevention and control of pollution) rules 1975 , Water (Prevention and control of pollution) (Procedures for Transaction of Business) rules 1975., Water (Prevention and control of pollution) cess Act, 1977 as amended by amendment act, 1991, Water (Prevention and control of pollution) cess rules, 1978.

UNIT –II

Air (Prevention and control of pollution) act, 1981 as amended by amendment act, 1987, Air (Prevention and control of Pollution) rules, 1982.

UNIT – III

Environment (Protection) act, 1986, Environment (Protection) rules, 1986, Hazardous wastes (Management and Handling) rules, 1989, Basel convention, Manufacture, storage and import of hazardous chemical rules, 1989. Scheme of labeling of environment friendly products (ECO –Marks)

UNIT – IV

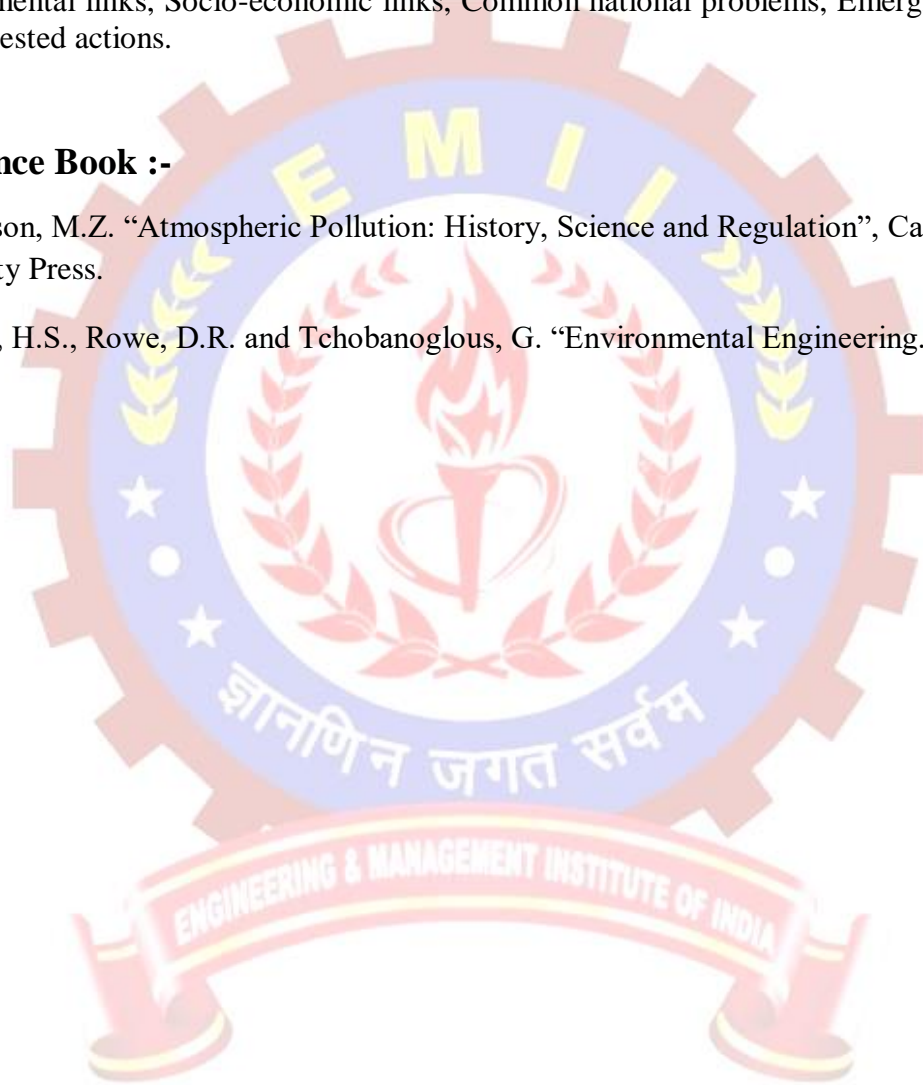
Public liability insurance act, 1991, Public Liability insurance rules, 1991, Municipal solid waste act/ rule 2000, Biomedical waste act/ rule-2004.

UNIT -V

Developing a national risk profile, Institutional arrangements, Risk management tasks, Environmental links, Socio-economic links, Common national problems, Emerging needs and suggested actions.

Reference Book :-

1. Jacobson, M.Z. “Atmospheric Pollution: History, Science and Regulation”, Cambridge University Press.
2. Peavy, H.S., Rowe, D.R. and Tchobanoglous, G. “Environmental Engineering.



Entrepreneurship Development & Management (ENE-2.16)**UNIT-I**

Introduction:- Meaning and Importance, Evolution of term 'Entrepreneurship, Factors influencing entrepreneurship, Psychological factors, Social factors, Economic factor, Environmental factors, Characteristics of an entrepreneur, Entrepreneur and Entrepreneur, Barriers to entrepreneurship.

Types of entrepreneur:- According to Type of Business, According to Use of Technology, According to Motivation, According to Growth, According to Stages, New generations of entrepreneurship viz. social entrepreneurship, Edupreneurship, Health entrepreneurship, Tourism entrepreneurship, Women entrepreneurship etc.

UNIT –II

Entrepreneurial Motivation:- Motivation, Maslow's theory, Herzberg's theory, McGregor's Theory, McClelland's Need – Achievement Theory, Culture & Society , Values / Ethics , Risk taking behavior.

Creativity:- Creativity and entrepreneurship, Steps in Creativity, Innovation and inventions, Using left brain skills to harvest right brain ideas, Legal Protection of innovation, Skills of an entrepreneur, Decision making and Problem Solving (steps indecision making).

UNIT – III

Organisation Assistance:- Assistance to an entrepreneur, New Ventures, Industrial Park (Meaning, features, & examples), Special Economic Zone (Meaning, features & examples), Financial assistance by different agencies, MSME Act Small Scale Industries, Carry on Business (COB) licence, Environmental Clearance, National Small Industries Corporation (NSIC), Government Stores Purchase scheme (e-tender process),

Excise exemptions and concession, Exemption from income tax, Quality Standards with special reference to ISO, Financial assistance to MSME, Modernisation assistance to small scale unit, The Small Industries Development Bank of India(SIDBI), The State Small Industries Development Corporation(SSIDC), Export oriented units, Incentives and facilities to exports entrepreneurs, Export-Import Bank of India, Export oriented zone.

UNIT – IV

Rules And Legislation:- Applicability of Legislation, Industries Development (Regulations) Act, 1951., Factories Act, 1948, The Industrial Employment (Standing Orders) Act, 1946, Suspension, Stoppage of work, Termination of employment, West Bengal Shops and Establishment Act, 1963, Environment (Protection) Act, 1986, The sale of Goods Act, 1950, Industrial Dispute Act 1947.

Project Report:- Introduction, Idea Selection, Selection of the Product / Service, Aspects of a Project, Phases of a Project, Project Report, Contents of a Project Report, Proforma of a Suggested Project Report for a manufacturing Organization, Suggested Readings.

UNIT –V

Agencies for industrial assistance:- West Bengal Electronics Development Corporation, ICICI West Bengal Infrastructure Development Corporation, West Bengal Industrial Infrastructure Development Corporation, Other Corporations with focus as specific segments, State Industrial Development Corporation (SIDC), State Financial Corporation (SFCs), Directorate General of Supplies and Disposals(DGS & D), Registration with DGS & D, Registration Categories, Registration Procedure, Benefits of DGS & D, Information facilities centre in DGS & D, Khadi and Village Industries Commission (KVIC), Industrial Estate, Financing of Industrial Estates, Shilpabandhu-M Incentives for entrepreneurs 9reference to The West Bengal State Support for Industries Scheme 2008 & 2013.

Reference Book :-

1. Entrepreneurial Development, by S S Khanka.
2. The Entrepreneur, by Mark Casson.

Industrial Management (ENE-2.17)**UNIT-I**

Basic of Management:- Management - Definition – Administration- Definition – Henry-Fayol's principles of management- Business Organisation-Types- Proprietorship-Partnership- Joint stock- Cooperative Society-Advantages and disadvantages -Functions of Management – Planning-Definition-Functions- Organisation-Definition- types of organisation –Line-Functional-Line &staff- advantages and disadvantages- Leadership -Types –Quality of good leader-Motivation - Maslow's Theory of Motivation -Hierarchy of needs- Communication - Process of Communication – Barriers for effective communication.

UNIT –II

Production Management:- Concept of project work - Project planning -Market survey- Project capacity-selection of site for project- Plant layout-Types of Plant layout-Product design-Stages in product design-drawing-Specifications-Material requirement-operation-Planning-Production-definition-Job, Batch & Mass production with their advantages and disadvantages-Productivity-definition-factors to improve productivity- Production planning and Control (PPC)-definition-Functions of PPC- planning, routing, scheduling, dispatching and Inspection-Introduction to CPM and PERT –Comparison.

UNIT – III

Material Management:- Material management - definition, functions- Purchase - Objectives, different methods of purchasing -Purchase procedure-Comparative statement-purchase order-Tender-Types of tender- Storekeeping- classification of stores - Functions of store keeper. Store management-Bin Card - Material Issue Requisition- Material Returned Note- Store ledgers -Codification of stores-Inventory Management- Definition - functions of Inventory Control- Advantages of Inventory Control. Material management - definition, functions- Purchase - Objectives, different methods of purchasing -Purchase procedure-Comparative statement-purchase order-Tender-Types of tender- Storekeeping- classification of stores - Functions of store keeper. Store management-Bin Card - Material Issue Requisition- Material Returned Note- Store ledgers -Codification of stores-

Inventory Management- Definition - functions of Inventory Control- Advantages of Inventory Control.

UNIT – IV

Total Quality Management:- Quality–Concept–Quality control- Definition - Factors affecting quality- Advantages of quality control –Inspection–Different types of inspection Total Quality Management–Meaning- Principles of total quality management–PDCA cyclesQuality Circles–definition–Function. TQM Tools- Flow charts, Control charts, Histograms, Pareto charts, Cause and effect diagram–5-S- Kaizen, and Six-sigma Quality Certification Systems- ISO 9000 series quality standards, QS14000– ISO 9000, ISO 9001,ISO9002,ISO9003 & ISO 9004- ISO9000 quality certification procedure.

UNIT –V

Plant Maintenance and Industrial Safety:- Plant maintenance–Definition -Types of maintenance–Preventive maintenance- Break down maintenance–Advantages and disadvantages- Total Productive Maintenance–Meaning benefits of TPM -Tools of TPM–planned maintenance and predictive maintenance. Industrial safety –Meaning - Accident–causes for accident- Direct and indirect losses due to an accident–Personal protective devices for preventions of accidents–Safety department- role of safety officer – safety supervisor -safety committee – Fire prevention and Protection- Fire triangle–principles of fire extinguishing- various classes of fire- A, B,C, D types of fire extinguishers.

Reference Book :-

1. Industrial Engineering and Management by S. C. Sharma, T. R. Banga.
2. Industrial Engineering and Management by Ravi, V.

Final year Project

Project (ENE-2.18)

Select any one topic:-

1. A Study On Construction Waste.
2. Approaches To Greenbelt Design.
3. Environmental Impact Assessment.
4. Bio Gas From Coral Organic Waste.
5. Green Buildings For Quality Living.
6. Pollution Study Of River Tunghabhadra.
7. Environmental Impact Assessment Report.
8. Study Of Recycling Industrial Effluent.
9. Vehicular Pollution Impact on Environment.
10. Effect Of Oil Spill On Marine Environment.