

**BUNDELKHAND INSTITUTE OF
ENGINEERING AND TECHNOLOGY
JHANSI
JHANSI – 284128 (U. P.), INDIA**



EVALUATION SCHEME & SYLLABUS

**FOR M. TECH.
(ENVIRONMENTAL ENGINEERING)**



Affiliated to

**Dr. A.P.J. Abdul Kalam Technical University, Lucknow
(Formerly Uttar Pradesh Technical University)**

SEMESTER - I

S. No	Course Code	Subject	Periods			Evaluation Scheme						Subject Total
						Sessional					Examination	
			Theory	L	T	P	CT	Lab	Attendance	TA	Total	
1	ENV-11	Environmental Chemistry & Microbiology	3	0	3	15	15	10	10	50	100	150
2	ENV-12	Water treatment & distribution	3	0	0	30	-	10	10	50	100	150
3	ENV-13	Water treatment	3	0	3	15	15	10	10	50	100	150
4	§§	Elective –I	3	0	0	30	-	10	10	50	100	150
5	RMA	Remedial mathematics*	3	0	0	30	-	10	10	50	100	150*
		Total	12	0						200	400	600

*The student not having mathematics at intermediate level shall be required to qualify 'remedial mathematics' (RMA-01), a non-credit course in I semester for which passing marks are 40% in theory and 50% in aggregate. The failure students will have carry over facility in each semester in this course to audit it. The candidates not qualifying this audit course will not be allowed to submit the Dissertation.

SEMESTER – II

S. No	Course Code	Subject	Periods			Evaluation Scheme						Subject Total
						Sessional					Examination	
			Theory	L	T	P	CT	Lab	Attendance	TA	Total	
1	ENV-21	Solid waste management	3	0	0	30	-	10	10	50	100	150
2	ENV-22	Air and noise pollution and control	3	0	3	15	15	10	10	50	100	150
3	ENV-23	Environmental quality management**	3	0	3	15	15	10	10	50	100	150
4	§§	Elective-III	3	0	0	30	-	10	10	50	100	150
		Total	12	0						200	400	600

**Includes design project as practical.

SEMESTER - III

S. No	Course Code	Subject	Periods			Evaluation Scheme						Subject Total
						Sessional					Examination	
			Theory	L	T	P	CT	Lab	Attendance	TA	Total	
1	§§	Elective-I	3	1	0	30	-	10	10	50	100	150
2	§§	Elective-I	3	1	0	30	-	10	10	50	100	150
3	SE 01	SEMINAR	-	-	2		-	-	-	100		100
4	DR 01	Dissertation***	-	-	8		-	-	-			
		Total	6	2	10					200	200	400

***100 marks are for dissertation work will be evaluated during IV semester.
§§ carries specific course code against each elective subject.

REMEDIAL COURSE

RMA 01 REMEDIAL MATHEMATICS

Only for the candidates not having Mathematics at intermediate level

LIST OF SUBJECTS FOR ELECTIVE – I

ENV 14 A EARTH AND ENVIRONMENT

ENV 14 B APPLIED COMPUTATIONAL METHOD

ENV 14 C ENVIRONMENTAL SANITATION AND ECOLOGY

ENV 14 D SYSTEM ANALYSIS AND MANAGAEMENT

ENV 14 E PROBABILITY AND STATISTICS

ENV 14 F RENEWABLE SOURCES OF ENERGY

ENV 14 G INSTRUMENTAL METHOD OF ANALYSIS

LIST OF SUBJECTS FOR ELECTIVES – II

ENV 24 A ENVIRONMENTAL REMOTE SENSING

ENV 24 B DISASTER MANAGAEMENT

ENV 24 C WATER POLLUTIION

ENV 24 D RURAL ENVIRONMENTAL TECHNOLOGY

ENV 24 E WATER RETAINING STRUCTGURES

ENV 24 F ENVIRONMENTAL GEOLOGY

LIST OF SUBJECTS FOR ELECTIVE – III

- ENV 31 A GROUND WATER MANAGEMENT
- ENV 31 B HILL ECOLOGY AND ECO-DEVELOPMENT
- ENV 31 C BUILDING ENVIRONMENT & SERVICES
- ENV 31 D GEO-ENVIRONMENTAL ENGINEERING
- ENV 31 E HYDROLOGY AND HYDROMETRY
- ENV 31 F GROUND WATER HYDROLOGY
- ENV 31 G DESIGN OF WATER SUPPLY SYSTEMS

LIST OF SUBJECTS FOR ELECTIVE – IV

- ENV 32 A WATER POLLUTION AND HAZARDOUS WATER MANAGEMENT
- ENV 32 B ADVANCED GEO-ENVIRONMENTAL ENGINEERING
- ENV 32 C PLUMBING SERVICES
- ENV 32 D FINITE ELEMENT ANALYSIS
- ENV 32 E HAZARDOUS WASTE MANAGEMENT
- ENV 32 F DESIGN OF WASTE WATER SYSTEMS
- ENV 32 G INDUSTRIAL WASTE WATER TREATMENT
- ENV 32 H ENVIRONMENTAL GEO-TECHNOLOGY

SYLLABI OF SUBJECTS

ENV 11 Environmental Chemistry and Microbiology

Introduction, Basic Concept From General Chemistry, Colloidal Chemistry, Environmental Biochemistry, Physico-Chemical And Biological Examination Of Water And Waste Water, Thermodynamic Of Microbiological Systems, Mass And Energy Balance Of Microbial Process, Aerobic Microbial Growth

ENV 12 Water Treatment and Distribution

Introduction And Sources Of Water, Population Forecasting And Water Requirement, Physical, Chemical And Biological Water Quality Parameters, Solid Separation , Settling Operation, Coagulation Softening Filtration, Disinfection, Desalination , Dissolved Solids Removal, Adsorption And Ion Exchange, Electrolysis Osmosis, Special Treatment, Pumping And Distribution Systems.

ENV 13 Waste Water treatment

Overview Of Waste Water Engineering, Terminology In Wastewater Treatment, Wastewater Flow Rates, Wastewater Characteristics, Water Borne Disease , Physical And Chemical Unit Operations, Biological Unit Processes Including Kinetics Of Biological Growth, Sludge Thickening , Digestion , Disposal And Nutrient Removal, Self Purification Of Streams, Advanced Treatment Processes, Wastewater Collection, Disposal And Reuse, Introduction To Generation Of Industrial Wastewater.

ENV 21 Solid Waste Management

Introduction, Overview Of Solid Waste Management, Types Of Solid Wastes, Sources Of Solid Wastes, Properties Of Solid Wastes, Solid Wastes Generation, Onsite Handling, Storage, Collection, Transfer And Transport, Processing Techniques, Ultimate Disposal, Resources And Energy Recovery Systems, Biomedical Waste Management, Introduction To Hazardous Waste And Fly Ash Management, Site Selection Criteria For Landfill.

ENV 22 Air and Noise Pollution and Control

Introduction, Classification, Sources, Effects, Air Quality Standards, Role of Meteorology and Natural Purification Processes, Sampling, Measurement and Analysis, Control Devices for Particulate and Gaseous Contaminants, Industrial, Vehicular Pollution, Indoor Air Pollution, Physics Of Sound Noise-Sources And Standards, Measurement And Control Of Noise Pollution.

ENV 23 Environmental quality management

Introduction, Development Needs, Environmental Impact Assessment (EIA), Environmental Statement (ES), Environmental Management Plan (EMP), Environmental Audit(EA), ISO-14000, Rules and Regulation for Getting Consent to Establish and Operate Industry, General

Provisions and Salient Features Water Act, Cess Act, Air Act, EP Act, Hazardous Waste Act/Rules, Biomedical Waste Act/ Rules, Municipal Solid Waste Rules, Ozone Depleting Substances Rules, Various Internal Treaties Related to Environmental Issues.

SYLLABI OF ELECTIVES COURSES

ENV 14A Earth and Environment

Introduction, Biosphere and Environment , Importance of Clean Environment, Assimilation Capacity of Environment, Thermal Pollution, Radio Active and Non- Radioactive Pollution, Soil and Land Pollution, Impact of Mining and Deforestation, Green House Effect and Global Warming, Depletion of Ozone, Biodiversity, Sustainable Development, E-Waste, Plastic Waste.

ENV 14B Applied Computational Method

Algorithms, Numerical Differentiation and Integration, Solution of Ordinary Differential Equation, Solution of Linear and Non-Linear Algebraic Equations, Boundary Value Problems, Initial Value Problems, Numerical Solution of Partial Differential Equation, Eigenvalue Problems.

ENV 14C Environmental Sanitation and Ecology

Introduction and Terminology, Pollution Types and Sources, Health Hazards, Water Supply and Sanitary Installations in Buildings, Ecology and Environment, Principles of Ecology, Ecosystems, Energy Flow, Trophic Level, Food Chain and Food Web, Eco-Cycles of Pollutants and Species.

ENV 14D System Analysis and Management

Introduction to Computer Languages, Linear, Quadratic, Direct and Non- Linear Programming, Concept of Optimization Techniques, Theory of Programming, Concept of Optimization, Application of Optimization Techniques, Theory of Random Variables, Modelling and Simulation, Design and Management Of Information System Application In Environmental Management.

ENV 14E Probability and Statistics

Introduction, Frequency Distribution and Measures of Location, Measures of Dispersions, Skewness and Kurtosis, Moments of Frequency Distributions, Theory of Probability, Discrete Probability Distribution, Univariate and Special Continuous Probability Distribution, Principles of Least Square, Fitting of Curve and Orthogonal Polynomials, Correlation and Regression, Multiple and Partial Correlation, Theory of Sampling, Sampling Distributions, Significance Tests.

ENV 14F Renewable Sources of Energy

Geothermal Energy, Hot Spring and Steam Energy, Wind Energy, Ocean and Tidal Energy, Solar Energy, Nuclear Energy, Bio- Energy(Biogas, Hydrogen and Ethyl Alcohol), Bio-Gasification Energy, Hydrogen Energy, Fuel Cells, Environment Friendly Lithium Cells, LPG/CNG, Bio- Diesel.

ENV 14G Instrumental Method of Analysis

Introduction, Concept of Quantitative Chemistry, Electron Paramagnetic Resonance, X- Ray Fluorescence, Infrared Spectroscope, Emission Spectroscope, Flame Photometry, UV- Visible Spectroscope, Atomic Absorption Spectroscope, Nephelometry and Turbidimetry, Gas Chromatography, Gas- Solid Chromatography, Gas –Liquid Chromatography, High Pressure Liquid Chromatography, Polarography, Voltmtry and Chronopotentionmetry, Colorimetry, Fluorimetry, Laser Techniques, Electron Microscope, Ion Chromatography, Nuclear Magnetic Resonance, TOC Analyser.

ENV 24A Environmental Remote Sensing

Definition of Terms, Space and Airborne Imageries, Characteristics of Photographic Images, Colour, Tone and Texture, Techniques of Photo-Interpretation, Ground Truth Collection and Verification, Principles of a Remote Sensing, Spectral Characteristics of a Various Earth Features, The Multi-Concept, Remote Sensing Through Visible and Other Spectral Regions. Different Methods of Remotely Sensed Data Interpretation, Machine Processing of Remotely Sensed Data, Geographical Information System (GIS), Global Positioning System (GPS), Applications of Remote Sensing for Environmental Studies, Land Use and Land Cover Analysis, Water Resources Management of Natural Resources.

ENV 24B Disaster Management

Disaster : Type, Causes, Consequences and Mitigation Technique Respect to Earthquake, Land Slides, Floods, Avalanches, Cyclones, Tsunamis and Drought, Dam Failure Due To Reservoir Included Seism City.

Glacier: Type, Characteristics Protection of Important Monuments From Glacial Flow

Disaster Management : Scope , Concept and Terms in Disaster Management, Tools and Methods of Disaster Management, Technologies of Disaster Management.

Disaster Preparedness and Mitigation: Preparedness Planning, Role and Responsibility, Public Awareness and Warning, Basic Principles, and Elements of Disaster Mitigation.

ENV 24C Water Pollution

Definition of Pollution, Effluent Standards, Development of Water Quality Standards Water Quality Index, River Water Classification, Classification and Impacts of Pollution Variables, Stream Surveys, Pollution Zones and Classification Processes in Natural Systems, Bod Kinetics Assimilation and Do Sags, Impoundments and Their Effects, Pollution Control Strategies Including Legislative Approach, Surface Water Modelling.

ENV 24 D Rural Environmental Technology

General: Concept of Environmental and Scope of Sanitation in Rural areas. Magnitude of Problems of Rural Water Supply and Sanitation. Population to be Covered , Difficulties. National Policy. Water Supply

Design Population and Demand Loads.

Various Approaches of Planning of Water Springs. Wells, Infiltration Wells, Radial Wells and Infiltration Galleries, Collection of Raw Water From Surface Source. Specific Problems In Rural Water Supply and Treatment.

Improved Methods and Compact Systems of Treatment of Surface and Ground Water For Rural Water Supply such as Multi Bottom Settlers (MBS), Diatomaceous Earth Filter, Cloth Filter, Slow Sand Filter, Chlorine Cartridges. Pumps, Pipe Materials, Appurtenances and Improved Devices for use in Rural Water.

Planning of Distribution System in Rural Areas.

Treatment and Disposal Of Waste Water.

Various Methods of Collection and Disposal of Night Soil.

Community and Sanitary Latrines. Compact and Simple Waste –Water Treatment Units and Systems in Rural Areas such as Stabilization Ponds, Septic Tanks, Imhoff Tank, Soak Tank, Soak Pit etc.

Disposal of Waste Water –Soakage Pits and Trenches.

Disposal of Solid Wastes.

Composting, Land Filling, Incineration.

Biogas Plants.

ENV 24 E Water Retaining Structures

Project Planning, Site Investigations, Choice of type of Dams, Cost Benefit Studies.

Non-Overflow Dams: Gravity , Arch and Buttress, Rock -fill and Earthen Dams, their Design.

Different Types Of Spillways and Energy Dissipations, Their Design , Preparation And Protection For Dams. Model Analysis Of Hydraulic Structures. Instrumentation in Dams.

Temperature Control in Concrete Dams.

Water Harvesting: Types of Storages Structures, Water Yield From Catchments, Runoff Diversion, Ponds and Reservoirs, Earth Embankments.

ENV 24 F Environmental Geology

Each Science and its Application in Environmental Engineering, Interior of the Earth , Character and Capabilities of the Terrain.

Geological Work of Streams, Wind and Glacier and its Signification.

Soil Erosion and Conservation, Rock Weathering.

Conservation of Mineral Resources and Environmental Impact of Mining.

Desertification : Its Causes and Method of Combating the Desertification Problems.

Geological Consideration for the Suitable Sites for Dams and Reservoirs, Roads, Tunnels and Bridge and their Environmental Impact.

Movement of Surface and Underground Water, Water- Logging and its Impact on Environmental and Remedial Measures. Natural Hazards such as Like Earthquake, Landslides, Floods, Cyclones, their Effects, Cause and Migration.

Geological Consideration for Site Selection for Disposal of Waste and Pollutants.

ENV 31 A Ground Water Management

Introduction, Occurrence of Ground Water, Hydrological Cycle, Ground Water Movement, Well Hydraulics and Water Wells, Ground Water Modelling Techniques, Surface and Subsurface Investigations of Ground Water, Artificial Discharge and Recharge of Ground Water, Water Management Techniques.

ENV 31 B Hill Ecology and Eco development

Ecology, Levels of organization , Supervision of Ecology Principles and Concepts Pertaining to Ecosystems, Examples of a Lake, a Watershed Unit , a Forests , as Ecosystems , Homeostasis of an Ecosystems, Principles and Concepts Pertaining to Flow of Energy in Ecosystems, Principles and Concepts Pertaining to Biogeochemical Cycles .

Principles Pertaining to Limiting Factors Development and Evolution of Ecosystems , Ecosystems Development with Regards to Shifting Cultivation

Fresh Water Ecology and Terrestrial Ecology of Hilly Regions.

The Systems Approach and Mathematical Modelling In Ecology Remote Sensing as a Tool for the Study and Management of Ecosystems Eco development

The Existing Trends of Economic Development in Hills. The Adverse Impact of Water Resources, Industrial Agricultural, Horticultural Tourist Development in Hills. The Concepts of Eco- Development, Sukhomajri Models .

Socio Economic Development Coordinated, A Action Oriented Research. Post Harvest Operation, Agro and Plant Based Industries. Institutional Framework. Forest Policy.

ENV 31C Building Environmental and Services

Acoustics Material Properties, Reverberation, Acoustical Design of Assembly Hall Building, Noise and Its Control.

Ventilation, Health and Comfort Ventilation, Ventilation System, Natural and Artificial Ventilation for Tropic Regions.

Electrical Wiring Systems in Domestic and Commercial Buildings, Conductors, Cable and Conduits.

Communications, Intercommunication Systems, Sound Amplification Equipments.

Fire Protections, Intercommunication Systems, Sound Provisions from NBC. Illumination, Artificial Lighting, Day Lighting, Laws and Principles of Illumination.

Design of Lighting Systems, Flood Lighting, Relevant IS Codes.

Elevators, Escalators Conveyors.

Thermal environment inside a building and its control, factors affecting inside conditions, heat transfer through building fabric, steady state and periodic heat transfer, thermal properties of building materials and insulation materials for building.\

Thermal responding of building cooling and heating loads.

Air- conditioning system, types, design, installation and maintenance costs.

Energy conservation in buildings.

Water supply to building, systems of water supply, appurtenances, difficulties encountered in water supply to high rise building systems suggested, hot water and fire water systems. Drainage of buildings, systems of drainage from building, appurtenances, choice of systems, solid waste disposal from buildings.

ENV 31D Geo- Environmental Engineering

Waste Characterization and Solid Waste Interaction:

Composition of Municipal and Industrial Wastes, Hazardous Waste at Municipal Landfill Sites, Chemical and Bio- Chemical Reactions, Solid- Waste Interaction, Engineering Properties of Waste.

Application of Geo- Synthetics in Waste Contamination:

Types, Geo- Textiles, Geo- Nets, Geo- Composite, Drainage Nets, Geo- Grid, Geo- Synthetic, Clay Liner, Friction Tests.

Low Permeability Liner and Drainage Materials.

Contaminant Transport in Soil: Contaminant Migration, Diffusion and Monitoring.

Sludge Solidification and Stabilization: Regulation, Physical and Chemical Tests, Treatment Method and Solidification and Stabilization Methods, Quality Control.

Vertical Barriers: Slurry Walls, Soil Slurry Interaction, Permeability Compatibility.

Design of Liner System of Landfills.

Leachate Collection and Removal System.

Stability and Settlement Analysis Including Seismic Stability and Liquefaction.

Special Topics.

ENV31E Hydrology and Hygrometry

Introduction: Historical Background, Hydrological Cycle, Forms of Precipitation, its Aerial and Time Variation, Missing Records, Hydrological, Runoff, Hydrograph Analysis, Unit Hydrograph, IUH, Nash and Clarke Models, Black – Box type and Physics Based Models.

Statistical Methods: Correlation Coefficient, Curve Fitting, Regression Analysis, Multiple Regression, Various Distribution and their use in Hydrology, Plotting Positions, Frequency Factors, Extreme Value Theory. Generation of Random Numbers and Synthetic Data When Persistence is Absent.

Flow Generation; Stochastic, their Classification, Time Series and its Components, Correlogram, Autoregressive Processes. Synthetic Generation of Yearly and Monthly Flows in Hydrology.

Floods and Droughts: Flood Estimation by Various Methods, Design for Various Hydraulic Structures, Flood Forecasting, Droughts.

ENV 31F Ground Water Hydrology

Darcy's Law, General Hydrodynamic Equations, Flow Nets in Isotropic Medium. Steady and Unsteady Flow Through Confined and Unconfined Aquifers, Schwartz Christoffel Transformation and its Application for Groundwater Flow and Seepage Problems. Multiple Well System, Partially Perpetrating Wells, Image Wells, Mutual Interference of Wells. Contamination of Groundwater, Control of Groundwater Pollution. Storage and Exploration of Groundwater, Design, Construction and Maintenance of Wells, Groundwater Recharge and Runoff, Water Quality, Budgeting, Simulation of Groundwater Basin, Application of GIS and Remote Sensing for Groundwater. Roof-Top Rainwater Harvesting and Ground Recharge.

ENV 31G Design of Water Supply Systems

Concepts of Planning of Water Projects, Topographic Surveys, Design of Intake Wells and Rising Mains, Detailed Design and Drawing of Water Treatment Systems, Design of Distribution Systems, Working Drawings.

ENV 32 A Water Pollution and Hazardous Waste Management

Water Pollution: Preliminary- Beneficial Uses of Natural Waters, Sources of Pollution. Effects of Pollution on Water Quality. Underground Water Quality. Pollution Surveys. Acts ,River and Effluent Standards, Strategies of The Pollution Control. Natural Regeneration of Waters-Self Purification of The Rivers- Mechanisms, Factors and Zones. Dilution and D.O. Sag Computations, Self Purification of Impoundments And Estuaries. Case Histories.

Hazardous Waste Management and Risk Assessment: Types of Hazardous Waste, Health Effect, Nuclear Fission, Cradle-To-Cradle Management, Treatment Methods, Final Disposal, Risk Assessment, Case Histories.

ENV 32B Advance Geo- Environmental Engineering

Environmental Cycle and their Interaction with Geo- Technology. Particle-Energy-Energy Theory and its Application. Soil Mineralogy and Technology Changes in Respect of Waste Water Flow. Thermal and Electrical Properties of Soil and Rock. Application of Geo- Environmental Engineering. Load Environmental Factors Design, Soil Structure- Soil Interaction, Bearing Capacity, Lateral Earth Pressures , Pile Foundation Grouting and Injection, Slope Stability of Wetlands, Coastal Margins and Anti-Desertification. Special Topics Related with Field Problems.

ENV 32C Plumbing Services

Various Plumbing Services, Economics of Plumbing Services, Codes.

Water Supply Services

Cold Water Supply: In Low Rise Buildings- Tank and Cylinder System. Requirements of Various Appurtenance. Planning of Hot Water Supply in Buildings With Vertical And Horizontal Spread.

Fire Water Supply; Requirements Systems – Wet and Dry Riser Systems, Sprinkler System. Waste Water Drainage Services.

Various Systems and their Design. Limiting Capacities of Stacks, The Terminal Velocities. Modification of Drainage Systems.

Strom Water Drainage System and Requirements.

Refuse Collection.

Quantity And Quality. System- Bin/ Chute System.

ENV 32D Finite Element Analysis

Finite Element Method and Implementation, Variation Methods, Formulation of Linear Elastic Continuum, Element Types and Properties, Boundary Conditions, Stress Strain Determination, Solution Techniques, Mesh Refinement ,Ax Symmetric Problems, Application to Fluid Mechanics and Heat Transfer.

ENV 32E Hazardous Waste Management

Hazardous Waste, Regulatory Process, Process Fundamentals, Fate and Transport Contaminants, Toxicology, Environmental Audits, Pollution Prevention, Facility Development and Operations, Physic- Chemical Treatment Process, Biological Treatment Methods, Stabilization and Solidification, Thermal Treatment Methods, Land Disposal, Quantitative , Risk Assessment.

ENV 32F Design of Waste Water Systems

Concepts of Planning of Wastewater Collection, Treatment and Disposal Projects, Topographic Surveys, Design of Sewerages, Detailed Design and Drawings of Wastewater, Treatment Systems, Design of Disposal Systems, Working Drawings.

ENV 32G Industrial Waste Water Treatment

Scenario of Industrial Pollution, Capabilities and Constraints of Industries for Pollution Control, Impact of Pollution Control on Project Coast, Typical Industrial Wastes Characteristics and Treatment Planning of Sugar Industry, Distillery, Tannery, Electroplating Industry, Petroleum Industry, Pesticide And Fertilizer Industry, Pharmaceutical Industry, Textile Industry, Pulp and Paper Industry, Chlor- Alkali Industry, Soap and Detergent

Industry, Atomic Power Plants, Dairy, Steel, Thermal Power Plants, General Standards for Disposal of Effluents, Concept of Common Effluents Treatment Plant.

ENV 32H Environmental Geo- Technology

Introduction, Geo- Synthetics, Forms of Waste and their Engineering Properties, Selection of Waste Disposal Sites, Landfills for Municipal and Hazardous waste , ash Pond and Mine tailing Impoundments, Site Investigation for detection of Subsurface Contamination, Remediation, Geotechnical Reuse of Waste Materials and Fills, Mechanics of Erosion and Erosion Control Methods, Landslides and their Control.

PRACTICAL COURSES

ENV11 ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY

0-0-3

1. To determine the chlorine demand and residual chlorine in water.
2. To estimate the hardness of the given water sample.
3. To estimate the pH and electrical conductivity of the given water sample.
4. To estimate the acidity of the given water sample.
5. To estimate the alkalinity of the given water sample.
6. To estimate the acidity of the given water sample.
7. To estimate the total solids, total dissolve solids and volatile solids of the given water sample.
8. To determine the filtration head loss.
9. To determine the optimum coagulant dose in raw water using jar test.
10. To determine the cations (Na, K, Li) and anions (sulfate, nitrate, fluoride).
11. To determine the MPN count – total and fecal.
12. Field visit of water treatment plant.

ENV13 WASTE WATER QUALITY MONITORING LAB 0-0-3

1. To determine the COD of the given sample.
2. To determine the DO, BOD, exerted, kd and Y parameters for given wastewater sample.
3. To verify class I sedimentation.
4. To determine the efficiency of class II sedimentation tank for a given wastewater sample.
5. To perform class III type settling test to determine the zone settling rate of sludge.
6. To determine the sludge volume index (SVI) of the given sludge sample.
7. To determine the heavy metals (Pb, Cr, As, CN, Cd) in waste water.
8. To determine the phenol compound in waste water.
9. To determine the total/ kjeldahl nitrogen in waste water.
10. To determine the total phosphate in wastewater.
11. Field visit of industrial / wastewater treatment plant.

ENV22 AIR AND NOISE MONITORING LAB 0-0-3

1. Monitoring OF AMBIENT air quality for total suspended particulate matter and respirable SPM.
2. Measurements of CO and HC in exhaust.
3. Measurements of SO₂ by sodium tetra chloro mercurate method.
4. Measurements of NO_x in ambient air.

5. Measurements of H₂S and NH₄.
6. Stack monitoring by BIS/EPA methods by field visit.
7. Detection of level of noise pollution in residential, commercial, industrial and silent/ sensitive area of Lucknow city.
8. Asbestos monitoring.

ENV23 DESIGN PROJECT

0-0-3

The students are required to select a topic on some practical problem and have to compile a project report, which shall be presented at the end of the semester.

SYLLABUS OF REMEDIAL COURSE

RMA 01 Remedial Mathematics

Matrices and Determinants

Concepts, Notion, Order, Equality, types of Matrices, Zero Matrix, Transpose of a Matrix, Symmetric and Skew Symmetric Matrices. Addition and Scalar Multiplication of Matrices (Simple Cases Only)
Determinant of a Square Matrix (Up to 3×3 Matrices), Properties of a Determinants, Minor, Cofactors and Applications of Determinants in Finding The Area of a Triangle.

Differentiation

Continuity and Differentiability, Derivative of Composite Functions, Chain Rule, Derivatives of Inverse Trigonometric Functions. Concept of Exponential and Logarithmic Functions and Their Derivative.
Maxima and Minima (Simple Cases Only).

Integration

Integration As Inverse Process of Differentiation . Integration of Functions By Substitution, by Partial Fractions and by Parts (Only Simple Integrals of The To Be Evaluated).
Definite Integrals as a Limit of a Sum.

Coordinate Geometry

Slope of a Line and Angle Between Two Lines. Various Forms of Equations of a Line: Parallel to Axes, Point- Slope Form, Slope –Intercept Form, Sections of a Cone: Circle, Ellipse, Parabola, Hyperbola.

Statistics

Mean, Median and Mode, Measure of Dispersion, Mean Deviation, Variance and Standard Deviation of Ungrouped / Grouped Data.