DEPARTMENT OF TECHNOLOGY

FINAL YEAR B. TECH

Scheme of Teaching and Examination
Semester – VII (Environmental Science & Technology)

Sr. No.	Subject	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Total	Scheme	Max. marks	Min. Passing	Scheme	Max. marks	Min. Passing
1.	Air Pollution and Air Quality Management	4	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
2.	Industrial waste Treatment	4	1	-	05	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
3.	Environmental Biotechnology and Bioinformatics	3	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
4.	Quantity Surveying and Valuation	3	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
5.	Elective I	3	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
6.	Air Pollution and Air Quality Management	-	-	2	02	--------	--------	--------	EOE	25	20
						--------	--------	--------	IOE	25	10
7.	Industrial waste Treatment								IOE	50	20
8.	Environmental Biotechnology and Bioinformatics	-	-	2	02	--------	--------	--------	IOE	25	10
		-	-			--------	--------	--------			
9.	Quantity Surveying and Valuation	-	-	2	02	--------	--------	--------	IOE	25	10
		-	-								
10	Project	-	-	2	02	--------	--------	--------	IOE	50	20
11	Seminar	-	-	2	02	--------	--------	--------	IOE	50	20
	Industrial Training Report	-	-	-	00	--------	--------	--------	IOE	50	20
	Total	**17**	1	**10**	**28**		**500**			**300**	

Elective I

1. Numerical methods and Environmental statistics
2. Optimization Techniques
3. Environmental Toxicology
4. Environmental Impact Assessment

CIE – Continuous Internal Evaluation
SEE – Semester End Examination
IPE – Internal Practical Evaluation
IOE- Internal Oral Evaluation
EOE- External oral Examination
EPE- External practical Examination

DEPARTMENT OF TECHNOLOGY

FINAL YEAR B. TECH

Scheme of Teaching and Examination
Semester – VIII (Environmental Science & Technology)

Sr. No.	Subject	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Total	Scheme	Max. marks	Min. Passing	Scheme	Max. marks	Min. Passing
1.	Advance Wastewater Treatment	4	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
2.	Project Management appraisal	3	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
3.	Operation and maintenances of Environmental facilities	2	1	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
4.	Environmental Legislation and policy	3	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
5.	Elective II	3	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
6	Project										
7.											
	Advance Wastewater Treatment	-	-	2	02	--------	--------	--------	IOE	50	20
						--------	--------	--------			
8.											
	Project Management appraisal	-	-	2	02	--------	--------	--------	IOE	25	10
9.	Operation and maintenances of Environmental facilities					--------	--------	--------	IOE	25	10
9	Environmental Legislation and policy					--------	--------	--------	IOE	25	10
9.											
	Elective II	-	-	2	02	--------	--------	--------	IOE	25	10
10											
	Project	-	-	06	06	--------	--------	--------	EOE	100	40
						--------	--------	--------	IOE	50	20
	Total	**15**	**1**	**12**	**28**		**500**			**300**	

Elective I

1. Noise Pollution and Control
2. Disaster Management And Risk Assessment
3. Environmental Modelling and Simulation
4. Watershed Management

CIE – Continuous Internal Evaluation
SEE – Semester End Examination
IPE – Internal Practical Evaluation
IOE- Internal Oral Evaluation
EOE- External oral Examination
EPE- External practical Examination

Detailed Examination Scheme

1. Out of total 100 theory marks, 50 marks are assigned for Continuous Internal Evaluation (CIE). In each subject, in CIE, minimum 20 marks are required to become eligible for Semester End Examination (SEE) of that particular subject. In a semester, a student will be given an additional attempt to acquire passing marks in CIE. Upon failing to clear the CIE in the additional attempt, he/she will be allowed to appear for the Continuous Internal Evaluation scheme of the respective subject in the next semester. The tests will be conducted by the subject teacher. Only after passing the CIE, the particular student will become eligible for the Semester End Examination.

2. CIE (50 marks) includes:
   - Surprise Test – I of 10 marks in 4^{th} week
   - Mid Semester Test of 30 marks in 8^{th} week
   - Surprise Test - II of 10 marks in 12^{th} week

3. For the Semester End Examination (SEE), 100 marks (3 hrs.) paper will be set and finally it will be converted to 50 marks, in which student must secure minimum 40% i.e. 20 marks as university examination passing head.

4. Final theory marks (out of 100) will be the addition of CIE (out of 50 marks) and SEE (out of 50 marks).

5. IPE means Internal Practical Evaluation in which students have to demonstrate the practical work of his Project Topic as an internal examination at the term end.

6. IOE means Internal Oral Evaluation in which students have to face an internal oral examination at the term end. This examination is based on the practical work carried out by them throughout the year

7. EPE means External Practical Examination in which students have to demonstrate the practical work of his Project Topic as an external examination at the term end. It is as university passing head.

8. EOE means External Oral Examination in which students have to face an external oral examination at the term end. It is as university passing head.

Semester VII

AIR POLLUTION & AIR QUALITY MANGEMENT (EN 411)

Teaching Scheme	Examination Scheme
Lectures: 4 Hrs/week	Theory: CIE (50) + SEE (50) =100 Marks
Practical: 2 Hrs/week	IOE: 25 Marks
	EOE: 25 Marks

UNIT 1 The structure of atmosphere (6 Hours)

Definition and scope of Air Pollution scales of Air Pollution, sources of Air Pollution Natural and Artificial, 'Units of measurement~, Quantity and composition of gaseous and particulate pollutions, automobile exhaust quantity, composition and control measures.

UNIT 2 Effects of pollutions (6 Hours)

Effects of pollutions on man, animals, plant and materials, aesthetic value and visibility, Air, pollution episodes, Air quantity, criteria and Air Quality standards, Ambient Air Quality standards and emission standards.

UNIT 3 Meteorology of air pollution (6 Hours)

solar radiation, climate, humidity, wind circulation, Lapse rate and inversion phenomena vertical stability of atmosphere, precipitation, wind patterns, direction, velocity and fluctuations, wind Rose diagrams, Dispersion of pollutants in atmosphere by Eddy diffusion model and Gaussian dispersion model, point sources, line sources, plume "behavior, Maximum Ground line concentration Determination of stack height, sampling time corrections, Effect of inversion trap.

UNIT 4 Particulate matter (6 Hours)

Definition of different particulate matter, distribution and sources of SPM. Terminal setting velocity Hood and Duct Design, particulate collection mechanisms, Control equipments for particulate matter, setting chambers, cyclones wet collectors, fabric filters, Electrostatic precipitators, problems on design of equipments, component detailing, collection efficiency.

UNIT 5 Control of Gaseous pollutants (4 Hours)

General control of Gaseous pollutants, principles of absorption and adsorption. Basic design of absorption and adsorption unit. Incineration and after burners, control of sulphur dioxides, Nox.

UNIT 6 Automobile sources (6 Hours)

Emission of pollutants from automobiles, reduction of emissions by different methods, Alternative fuels and their utilization.

UNIT 7 Air pollution monitoring and regulatory control (6 Hours)

Emission limits, Ambient air sampling, sampling equipment for stack and ambient air sampling, methods of sampling, pollution monitoring of existing sources and new installations.

UNIT 8 Air quality management (6 Hours)

Air Quality Standards , Air Quality Monitoring, Preventive Measures , Air pollution control efforts, Zoning , town planning regulation of new industries ,Legalisation and enforcement , environmental impact assessment and air quality

UNIT 9 Status of air pollution in India (2 Hours)

Air pollution control Act and strategy for effective control of air pollution.

1. **PRACTICALS:**
   2. Problems on air pollution.
   3. Problems on air pollution control equipments design and collection efficiency.
   4. Sampling and Analysis of Ambient Air.
   5. Sampling and Analysis of stack or automobile exhaust.

REFERENCE BOOKS:

1. Work and Warner, "Air Pollution"
2. Martin Crawford, "Air Pollution
3. Vo\. I, II, III, IV, V – By Sten, "Air Pollution
4. R.D. Ross., "Air Pollution and Industries
5. Rao and Rao., "Air Pollution

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INDUSTRIAL WASTE TREATMENT (EN412)

Teaching Scheme	Examination Scheme
Lectures: 4 Hrs/week	Theory: CIE (50) + SEE (50) =100 Marks
Tutorial 1 Hrs/week	IOE: 50 Marks

UNIT 1 Use of Water in industry (5 Hours)

Sources of Waste water, Quality and Quantity variations in waste discharge, Water budgeting, Characterization and monitoring of Waste water flow, Stream standards and Effluent standards.

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UNIT 2 Waste volume and strength reduction (5 Hours)

Inplant control measures, good housekeeping, Process Change, Leakage prevention, Segregation and Recycling

UNIT 3 Treatment techniques for removal of specific pollutants in industrial Wastewaters, (6 Hours)

Oil and Grease, Cyanide, Fluoride, Calcium, Magnesium, Toxic Organics, Heavy Metals, Radioactive

UNIT 4 Treatability aspects (5 Hours)

Treatability aspects of raw industrial wastewater with domestic sewage, Partially treated industrial wastewater with domestic sewage, Completely treated industrial wastewater with domestic sewage, Waste minimization, 3R concept.

UNIT 5 Major industrial Waste water sources, process, Treatment (10 Hours)

Water requirements, Waste water sources, Characterization & composition of wastes, Manufacturing process & flow sheet and Treatment flow sheet in Major industries such as Sugar, Distillery, Dairy, Textile, Paper & Pulp. Fertilizer, Petroleum, Refinery, Pharmaceuticals, tannery, Steel, Foundry, Plating etc.

UNIT 6 Common Effluent Treatment Plant: (6 Hours)

Concept, Objectives, Methodology, Cost benefit analysis, Design, concept, Operation and Maintenance, Grouping of Industries

UNIT 7: Biological treatment for Toxic waste (3 Hours)

Acclamatization of bacteria to Toxic waste, Process sensitivity

IOE: consisting of the following:

1. Assignments/Tutorials based on above units
2. A report of visit to at least two industries covering manufacturing process & treatments of wastes.
3. Oral Examination

REFERENCE BOOKS -

1. Nelson Nemerow, "Theories and Practices of Industrial waste treatment"
2. M.N.Rao & Datta "Waste water treatment"
3. IS Standard guide for treatment and disposal of various industries

ENVIRONMENTAL BIOTECHNOLOGY AND BIOINFORMATICS (EN413)

Teaching Scheme	Examination Scheme
Lectures: 3 Hrs/week	Theory: CIE (50) + SEE (50) =100 Marks
Practical: 2 Hrs/week	IOE: 25 Marks

UNIT 1 Introduction to Biotechnology (2 Hours)

Concept of Environmental biotechnology, public perception of biotechnology, Role of biotechnology in Environmental Engineering

UNIT 2 Problems of Environmental Pollution (3 Hours)

Sewage and Industrial wastewater, gaseous emissions, solid and semi solid wastes from residences as well as industries, problems associated with their disposals

UNIT 3 Aerobic, Anaerobic degradation and bioremediation (4 Hours)

Aerobic v/s Anaerobic degradation ,Kinetics of Aerobic and Anaerobic biodegradation, Concept of bio remediation, various micro organisms involved, bioremediation processes and technologies

UNIT 4 Application of biotechnology (4 Hours)

Application of biotechnology for control of environmental pollution and its bio abatement, bioconversion of agriculture and other organic waste matter into useful products like gaseous and liquid fuels, soil conditioners, food for livestock

UNIT 5 Biological calcification and bio absorption (4 Hours)

Biotechnology in the reduction of carbon dioxide through biological calcification, heavy metalpollution and its bio-abatement, biodegradation of hazardous waste, phenolic compounds and chemical pesticides, concept of bio absorption, factors affecting bio-absorption, limitations of bio absorption

UNIT 6 Introduction: Biology in the computer age (8 Hours)

computing changes in biology, Bioinformatics just about building database, Meaning of informatics to biologists, challenges offered by biology to computer scientists, skills required for this field, Available information & software for this domain, use web information, understand sequence alignment data, writing programs to align two biological sequences, predict protein structure from sequence, questions bioinformatics can answer, Watson's Definition, Information Flow, Human Genome project.

UNIT 7 Tools for Bioinformatics (5 Hours)

Biological Research on the web, Using search engines, finding scientific articles. Public biological databases, Searching biological databases,

Depositing data into the public databases, finding software Judging the quality of information

UNIT 8 Sequence Analysis, Pair-wise alignment& Database searching (6 Hours)

Chemical composition of bio-molecules, Composition of DNA & RNA, Watson & Crick Solve structure of DNA, Development of DNA sequencing methods, Gene finders & feature detection in DNA, DNA translation, Pair wise sequence comparison, Sequence queries against biological databases, Multifunctional tools for sequence analysis.

PRACTICALS

The journal consist of following

1. At least six assignments based on above units.
2. A report based on industrial visit.

REFERENCE BOOKS:

1. Introduction to Environmental Biotechnology - A.K. Chatterji, Prentice Hall India, New Delhi
2. Environmental Biotechnology - S.K.Agrawal, APH Publishing Corp., New Delhi.
3. Environmental Biotechnology - Basic Concepts and Applications, Indu Shekhar Thakur, I.K. International Pvt. Ltd., New Delhi.
4. Environmental Biology - P.S.Verma & V.K.Agrawal, S.Chand & Company Ltd., New Delhi ,
5. Environmental Biotechnology - Jognand, S.N., Himalaya Publishing house, New Delhi.
6. Elements of Environmental Biotechnology - P.K.Gupta, Rastogi Publishing House, New Delhi
7. Environmental Treatment Technologies for Hazardous and Medical Wastes - Subijoy Dutta, Tata MacGraw Hill Ltd., New York
8. Environmental Pollution and Management of Wastewater by Microbial Techniques - G.R.Pathade & P.K.Goel, ABD Publishers, Jaipur
9. Cynthia Gibas & Per Jambeck , "*Developing Bio-informatics computer skills*", (O'REILLY)
10. T K Attwood D J Parry-Smith, "*Introduction to Bioinformatics*", (Pearson Education)
11. Bryan Bergeron M.D. , "*Bioinformatics Computing*", (Prentice-Hall of India)

QUANTITY SURVEYING & VALUATION (EN 423)

Teaching Scheme	Examination Scheme
Lectures: 3 Hrs/week	Theory: CIE (50) + SEE (50) =100 Marks
Practical: 2 Hrs/week	IOE: 25 Marks

UNIT 1 **(4 Hours)**

A) General Introduction to Quantity surveying, purpose of estimates types of estimates, various items to be included in estimate. Principles in selecting units of measurement for different trades. Administrative approval and Technical sanction to estimates, I S 1200.
B) Specifications: Purpose and basic principles of general and detailed specifications, specifications for different items of work for water supply and sewerage works

UNIT 2 **(4 Hours)**

A) Prime cost, Provisional sums and provisional quantities, taking out Quantities. P. W. D. method, Measurement and Abstract sheets and Recording. M. E. S. Method: Dimensioning, abstracting, bills of quantities use of Performa,
B) Analysis of Rates: Factors affecting the cost. Materials, Labour, task work schedule as basis of labour cost, plants and equipment, hour costs based on total costs and output. Transports, overhead charges. Rates for various items of construction of civil Engineering works, standard schedule of Rates. Price escalation. DSR and use of DSR for estimating

UNIT 3 **(8 Hours)**

A) Estimate of residential building ; Estimate of basic items of buildings
B) Detailed estimates of water supply scheme: Estimate of intake works, estimates of water supply line and ESR. Detailed estimate of water treatment plant and distribution system.
C) Estimate of sewerage system and sewage treatment plant: Detailed estimate of various components like sewerage line, various appurtenances like manholes, flushing systems. Detailed estimate of sewage treatment plant
D) Estimate of mechanical equipments and accessories e) Estimates of various electrical equipments
E) Use of various software for estimating
F) Approximate Estimates: Purpose, various methods used for building and other Civil Engg. works like Bridge, water supply, Drainage, irrigation and Road projects.

UNIT 4 **(4 Hours)**

A) Different methods for executing work like contract method, Departmental,
B) Organizational set-up of various govt. bodies like PWD, Water Supply Departments and general idea about its working and delegation of power, classification of works, Methods for carrying out work . Two Envelop method,, measurement books, mode of payment, bill forms, Global contractors, local competitive bidding

UNIT 5 **(4 Hours)**

A) Contracts: Essentials of legally valid contract, Appointment and Authority of Agents for
B) Execution contract between government and contract for various water supply and sewage projects. Competitive bidding contracts: Item rate, percentage Rate, Lump sum,
C) Tender Procedure: Various types of tenders, preparing tender papers, invitation of tenders, tender notice, submission, scrutiny and Acceptance of tenders, conditions of contracts, right and responsibilities of the parties to contract.
D) Negotiated contacts: Cost plus percentage, cost plus fixed fees, cost plus sliding scale of fees, targe costs as based on sharing risks and profits, Turnkey contracts.

UNIT 6 **(6 Hours)**

A) Principles of valuation: Definition of 'value' unit price and cost Attributes of values.
B) Different types of value. Books value, salvage & scrap value. Replacement value. Reproduction Value. Earning value. Market value. Potential value, distress value, speculation values, sentimental value, Accommodation values, Essential characteristics of market value.
C) Valuer and his duties, purpose of valuation and its function.
D) Factors affecting the valuation of properties, Tangibles and intangibles, Landed properties, freehold and lease hold properties.
E) Different type of Lease.

UNIT 7 **(6Hours)**

A) Depreciation: Different methods of calculating depreciation: declining balance method,
sinking fund method, depreciated cost, factors for obsolescence
B) Sinking Fund: Definition, purpose, calculation of sinking fund, Sinking fund calculations for various equipments and machinery used in water supply and sewerage schemes.
C) Cost benefit analysis for various water supply and sewage systems
D) BOT, BOOT: Concepts of execution of works by the methods like BOT, BOOT
E) Various methods of valuation: Methods of Valuation applicable for residential and commercial buildings, methods of valuation for public buildings, valuation for water supply and sewerage schemes, valuation of different components of the scheme
F) Introduction to Arbitration.

PRACTICALS

I – Tutorials:

a) Writing specifications for at least 10 items of work for various items in water supply and sewerage system.
b) Rate Analysis for at least ten items of work.

II – Reports:

a) Detailed Estimate of a water treatment plant or sewage treatment plant.
b) Preparing detailed estimate for any one of the following-
    1. Water supply line
    2. Sewerage line
    3. A small culvert
    4. A stretch of road about 1 km long including earthwork
    5. A reach of canal about 1 km long
    6. A percolation tank
c) Valuation Report for any two of the following-
    1. Water supply/ sewage treatment plant.
    2. Water resource project

The report must include a 'Valuation Certificate' also.

REFERENCE BOOKS

1. Quantity Surveying – P. L. Bhasin
2. Elements of estimating and costing – S. C. Rangawala.
3. Civil Engg. Contracts and Estimates – B. S. Patil
4. Professional Practice – Roshan Namavati (Estimating and Valuation)
5. Estimating and Costing - Datta
6. Estimating, costing and specifications in civil engineering – Chakraborty M.
7. Estimating and Costing - Birdi
8. Bombay P. W. D. volumes I and II
9. Valuation of real properties – S. C. Rangawala
10. District Schedule of Rates for PWD, MJP

PROJECT (EN 416)

Teaching Scheme	Examination Scheme
Practical – 2 Hours / Week	IOE– 50 Marks

The project work to be based on any problem pertaining to Environmental Engineering. The work to be completed shall consist of

- Identification of problem, Literature survey & Data collection.
- Preparation of Synopsis.
- At least one presentation highlighting significance, relevance & scope of the project work.

The same project work will continue for detailed study, laboratory analysis, field visits as necessary for the project work.

SEMINAR (EN 417)

Teaching Scheme	Examination Scheme
Practical – 2 Hours / Week	IOE– 50 Marks

The topic of seminar shall be based on any area of Environmental Engineering & preferably considering new ideas, concepts, technologies & developments in the field of Environmental Sciences & Technologies. At least two oral presentations and submission of report in soft & hard copies is expected.

INDUSTRIAL TRAINING (EN 416)

Teaching Scheme	Examination Scheme
	IOE– 50 Marks

Evaluation of the report on industrial training submitted by the students

NUMERICAL METHODS AND ENVIRONMENTAL STATISTICS (EE 415.1)

Teaching Scheme

Lectures: 3 Hrs/week

Examination Scheme

Theory: CIE (50) + SEE (50) =100 Marks

UNIT 1 Error and Its Propagation (6 Hours)

Solving non-linear equations; Interpolation,

UNIT 2 Solution of simultaneous linear and non-linear equations (6 Hours)

Direct and iterative methods.

UNIT 3 Numerical Differentiation And Numerical Integration (6 Hours)

Numerical solution of ordinary differential equations, systems of ODEs, Runge-Kutta method.

UNIT 4 Classification of partial differential equations (6 Hours)

Solution of PDEs, finite difference techniques, implicit and explicit methods, stability, converges of the solution, Finite element method.

UNIT 5 Statistics (6 Hours)

Statistical concepts, Curve fitting least squares, linear and non-linear regression, linear correlation, Multiple regression

UNIT 6 Probability: (6 Hours)

Frequency distribution, Characteristics of distributions, Central tendency and dispersion, Concepts of probability. The Chi-squared test, F-test, t-test. Analysis of variance, Tolerance and control charts

REFERENCE BOOKS

1. Chapra "Numerical methods"
2. Taha "Operation research"

OPTIMIZATION TECHNIQUES (EE 415.2)

Teaching Scheme

Lectures: 3 Hrs/week

Examination Scheme

Theory: CIE (50) + SEE (50) =100 Marks

UNIT 1 Introduction (6 Hours)

Optimization problem statement, Classification of optimization problems. Classical optimization theory: Unconstrained optimization, Method of Lagrange multipliers, kuhn-Tucker conditions

UNIT 2 Linear programming (6 Hours)

Construction of LP model, Graphical method, Simplex method, Big M, Duality, Sensitivity analysis.

UNIT 3 Transportation problems (6 Hours)

Assignment problems Decision theory, decision tree,

UNIT 4 Inventory models (6 Hours)

Deterministic models probabilistic model. Game theory Queuing theory, simulation applications

UNIT 5 Dynamic programming (6 Hours)

Principle of optimality, Computational procedure in DP, DP applications.

UNIT 6 Introduction to Non-linear programming (6 Hours)

Introduction to Genetic algorithm, simulated annealing, ' Neural network and fuzzy systems. Applications of optimization techniques to Environmental systems

REFERENCE BOOKS:

1. S. S. Rao “Engineering optimization”
2. Taha “Operation research”
3. Goldberg “Genetic algorithm”

ENVIRONMENTAL TOXICOLOGY (EE 415.3)

Teaching Scheme

Lectures: 3 Hrs/week

Examination Scheme

Theory: CIE (50) + SEE (50) =100 Marks

UNIT 1 Toxic chemicals in the environment (10Hours)

Air, water & their effects, Pesticides in water, Biochemicals aspects of arsenic, cadmium, lead mercury, carbon monoxide, ozone and PAN pesticide.

UNIT 2 Mode of entry of toxic substance (10 Hours)

biotransformation of xenobiotics detoxification, Carcinogens in air, chemical carcinogenicity, mechanism of carcinogenicity, Environmental carcinogenicity testing.

UNIT 3 Concept of major, trace and Rare Earth Element (8 Hours)

Insecticides, MIC effects. Concept of major, trace and Rare Earth Element (REE)- possible effects of imbalance of some trace elements

UNIT 4 Biogeochemical factors in environmental health (8Hours)

Biogeochemical factors in environmental health,. Epidemiological issues goiter, fluorosis, arsenic poisoning..

REFERENCE BOOKS -

1. Sodhi “Environmental chemistry”
2. Manhan “Principals of Environmental chemistry”
3. R.B. Philip “Environmental hazards & human health”
4. Niesink & Jon devries “Toxicology - principles & applications”
5. Chatterjee “Parasitology”
6. Perk “ Preventive & Social medicines”

ENVIRONMENTAL IMPACT ASSESSMENT (EE 415.4)

Teaching Scheme

Lectures: 3 Hrs/week

Examination Scheme

Theory: CIE (50) + SEE (50) =100 Marks

UNIT 1 Introduction (4 Hours)

concept of EIA , necessity of EIA , objectives of EIA , Legal provisions for EIA in India,History of EIA , NEPA & it's implementation , CEQ guidelines , Role of USEPA

UNIT 2 Components of EIA studies (7 Hours)

Types of impacts, planning & management of EIA studies, Methodology: background information, environmental monitoring, interaction matrix methodologies, simple matrix, stepped matrix, summary observations, network methodologies, checklist methodologies, Simple & descriptive checklists, Description of environmental settings: conceptual framework, Environmental indices & indicators: background information, Various indices like WQI, AQI , EQI , etc . Procedure for calculating these indices.

UNIT 3 Impact on airenvironment (7Hours)

Basic information , effects , conceptual approach , identification of impacts , description of existing air quality conditions , emission inventory , meteorological data necessary , impact prediction , man balance Approach , box model approach , air quality dispersion modeling , assessment of impact , various mitigation measures Noise environment: basic information, regulations, conceptual approach, identification, existing noise condition.

UNIT 4 Impact of water quality (7 Hours)

Basic information of surface water quality & quantity , various regulation , conceptual approach , of impacts , population equivalent , description of existing conditions , impact prediction, man balance approach , mathematical modeling approach , aquatic ecosystem modeling approach, assessment of impact significance, neighbors measures, Impact on soil & groundwater: background information, various regulations, conceptual approach, identification of impacts, existing soil & groundwater environment, impact prediction.

UNIT 5 Impacts on biological environment. Socioeconomic environment (4 Hours)

Background information, Existing condition

UNIT 6 Public participation in EIA (7 Hours)

Basic definition, legal requirement, advantages & disadvantages, procedure of public hearing in India. Environmental site appraisal: Necessity, legal provisions for site appraisal in India, EPA guidelines, Studies involved in site appraisal. Documentation and Reporting of EIA studies, Environmental Impact Statement, post monitoring of EIA, post impact assessment, Concept of carbon foot prints due to industry.

REFERENCE BOOKS -

1) Canter L.W "Environmental Impact assessment" McGraw Hill Publishers
2) Rou, Wooten "Environmental Impact assessment handbook"
3) Manual of Environmental Impact Assessment - Govt. of India Publication
4) Kulkarni V.S, Kaul N, Trivedi R.K. "Handbook of Environmental Impact assessment" Scientific Publishers
5) Harr and Hagerty "Environmental assessments and statements" -

SEM-VIII

ADVANCE WATER &WASTEWATER TREATMENT (EN 421)

Teaching Scheme	Examination Scheme
Lectures: 4 Hrs/week	Theory: CIE (50) + SEE (50) =100 Marks
Practical: 2 Hrs/week	IOE: 50 Marks

UNIT 1 Need for advanced water and wastewater treatment (6 Hours)

Solids separation: Types of settling, hindered and zone, settling.
Filtration: design and operation of dual mediafilter, head loss calculation in depth filtration Water reclamation technologies

UNIT 2 Ion exchange (6 Hours)

Process, exchange materials, exchange capacity, ion exchange chemistry and reactions.

UNIT 3 Membrane filtration (6 Hours)

Terminology, Process classification, Membrane configurations, Membrane fouling and its control, Application of membranes.
Electrodialysis: Theory. Disposal of concentrate waste streams.

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UNIT 4 Adsorption (6 Hours)

Development of adsorption isotherms activated carbon adsorption kinetics, analysis and design of adsorption columns

UNIT 5 **Gas stripping and Nutrient removal (6 Hours)**
Analysis, design of stripping towers. Nitrogen and phosphorous removal.

UNIT 6 Disinfection (6 Hours)

Disinfection with ozone Chemistry, modelling UV disinfection: system components, modelling

UNIT 7 Wetland treatment systems (6 Hours)

Types, application, free water surface and subsurface constructed wetlands, Design procedure for FWS and SF constructed wetlands

REFERENCE BOOKS

1. Metcalf Eddy “Wastewater Engineering treatment and reuse”
2. Ronald Droste “Theory and Practice of water and Wastewater treatment”
3. Weber “Physico-chemical processes of water purification”
4. Soli Arceivale “Wastewater Treatment for Pollution Control”

PROJECT MANAGEMENT APPRAISAL (EN 423)

Teaching Scheme	Examination Scheme
Lectures: 3 Hrs/week	Theory: CIE (50) + SEE (50) =100 Marks
Practical: 2 Hrs/week	IOE: 25 Marks

UNIT1 Introduction (6 Hours)

Principles of Management (by Henry Fayol)
Functions of Management:
a) Planning – Nature, Process and Importance of Planning,
b) Organizing – Types, Organization Charts, Site Layout.
c) Staffing – Introduction
d) Directing, Co-Ordination, Communication, Motivation and Controlling.
Decision Making- process; Decision Tree
Liner Programming – Graphical Method, Introduction of Simplex Method, Transportation Problem and Assignment Problem, Sensitivity Analysis (Concept Only)

UNIT 2 Project Management (6 Hours)

Objectives, Agencies, Phases; Work Breakdown Structure., Project Planning - Bar Chart, Mile Stone Chart, CPM, Development of CPM Network – Time Estimates, Floats, Critical Path. Network Compression, Resource Allocation, Network Updating

UNIT 3 PERT (6 Hours)

Concept of Probability, Normal and Beta Distribution, Time Estimates, Slack, Probability of Project Completion, Precedence Network: Concept, Introduction to Work Study.

UNIT 4 Engineering Economics – (10 Hours)

(a) Introduction, Importance.
(b) Time Value of Money, Equivalence, Tangible and Intangible Factors,
Economic Comparisons-
(a) Present worth Method, Equivalent Annual Cost Method, Capitalized Cost Method, Net Present Value, Rate of Return, Benefit Cost Ratio, Payback Method
(b) Linear Break Even Analysis.

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UNIT 5 Site Layout (4 Hours)

Factor Affecting, Typical Layout of few Major Construction Projects., Legal Aspects Child Labour Act., Workmen's Compensation Act, Minimum Wages Act.

UNIT 6 Resource Management (4 Hours)

Material Management – Objectives, Functions, Inventory Control- Necessity, Techniques Such As ABC, EOQ Analysis, Safety Stocks, Queuing Theory

PRACTICAL

1. At least TWO assignments based on each unit.
2. Visit report covering Project Management and Site Layout

REFERENCE BOOKS

1. Stoner "Engineering Management"
2. Davar "Principles of Management"
3. A.S.Deshpande "A Text book of Management"
4. Koontz, Dounell and Weigrick "Essentials of Management"
5. Kast and Rosinweig "Management and Organization"– Tata McGraw Hill publication.
6. S.H.Deshpande "Operation Research"
7. Operation Research – Wagner Wikey Easter Ltd., New Delhi
8. L.C.Zhamb "Quantitative Techniques in Management" Vol. I,
9. Gopal Krishnan, Sdueshan "Material Management"
10. Miller and Stars "Executive Decisions & Operation Research", Prentice Hall of India, Publisher.
11. Roy Pilcher "Principles of Construction Management"

OPERATION & MAINTENANCE OF ENVIRONMENTAL FACILITIES (EE 417)

Teaching Scheme

Lectures: 2 Hrs/week
Tutorial: 1 Hrs/week

Examination Scheme

Theory: CIE (50) + SEE (50) =100 Marks
IOE- 25 marks

UNIT 1 Introduction (4 Hours)

Need of 0 and M, Basic principles, corrective nad preventive maintenance, Data: detailed plans, drawings, operation manuals, computer usage in 0 and M.

UNIT 2 O &, M of water supply (4 Hours)

Intakes, pumps, transmission pipes, water treatment process control Quantity and quality monitoring.

UNIT 3 Water distribution system (4Hours)

Loss of carrying capacity of pipes. pipe breaks and leakages, leak detection, record keeping, O and M of Appurtances, Use of network models in 0 and M

UNIT 4 O & M of wastewater facilities (4 Hours)

Sewerage system, Inspection methods, Manual and television, Cleaning and rehabilitation Safety in sewer inspection, 0 and M of wastewater treatment plant, Monitoring and operational problems, Corrective measures

UNIT 5 Air pollution control facilities (4 Hours)

Regular inspection of device, SPM control equipment, Gravity settlers, Cyclone separators, Bag filters, Scrubbers, Electrostatic precipitator, Gaseous control Devices, incinerators and their trouble shooting.

UNIT 6 O and M planning (4 Hours)

Organizational structure, work planning planning, preparation and scheduling, cost estimates.

REFERENCE BOOKS:

1. CPHEEO manual on water supply and treatment
2. CPHEEO manual on sewerage and sewage treatment
3. Neumann “Industrial air pollution control systems”

ENVIRONMENTAL LEGISLATION & POLICY (EN 424)

Teaching Scheme	Examination Scheme
Lectures: 3Hrs/week	Theory: CIE (50) + SEE (50) =100 Marks IOE: 25 Marks

UNIT 1 Introduction, (8 Hours)

Need and Necessity, Basic information, Various five year plans and the provision for environment in these plans, Various environmental policies like National water policy, sustainable developmental policy, National forest policy, otherpolicies related to environment

UNIT 2 Environmental Legislation (8 Hours)

Historical development of various environmental legislations, USEPA 1969, Clean Air Act, Clean Water Act, NEPA. Water (Prevention & Control of Pollutants act), 1974 and Rules, Water Cess Act and Rules, Air (Prevention & Control of Pollutants act), 1981 and Rules, Indian Forest act and Rules

UNIT 3 Biomedical and Hazardous Waste Rules, (6 Hours)

Environmental Protection Act 1986 and Rules, EIA notification and procedure, Municipal Waste (Management and Handling) Rules, Biomedical Waste (Management and Handling) Rules, Hazardous Waste Rules, Noise Pollution Rules, other rules under EPA. Present status of these rules in India.

UNIT 4 Functions and powers of ministry of Environment and forest and pollution control Boards in centre and state (4 Hours)

Energy Bureau of India, energy audit, Environmental audit, National River action Plan, National Lake action Plan

UNIT 5 Environmental economics (8 Hours)

Case studies of various landmark judgments in Environmental field, Critical Evaluation of current environmental Risk Policy, Environmental Management plans at centre and state. Environmental Economics, Basic concepts in economics, GDP, GNP, GEP, Green rating of industries, cost benefit analysis of environmental management

UNIT 6 Environmental Ethics (4 Hours)

Ethics in society, Environmental consequences, Responsibility of environmental degradation, Ethical theories and codes of ethics, changing attitudes, Environmental Education, Role of NGO's in Environmental planning and education.

REFERENCE BOOKS

1) Environmental Planning and Management in India - Saxena
2) All Environmental Legislations, amendments, rules Published by Ministry of Environment and Forest, Govt of India
3) Handbook of Environmental Law, Acts, Guidelines, Compliances and Standards Vol. I, II - Trivedi R.K.
4) Environmental Law - Kaur Gurkbal
5) Environmental Law - Jaswal P.S.
6) Environmental Law - Tripathi S.C.
7) Environmental Law - Tiwari H.N.
8) Environmental Law Case book - Leelakrishnan P.
9) Environmental Law in India - Upadhye J.J.R.
10) Introduction to Environmental Law - Shantakumar S.
11) International environmental Law - Lakshman
12) Environmental Education - Pande V.C.
13) Environmental Education in India - AIU
14) Environmental Economics - Kolstad C.D.
15) Environmental Economics - Sankar Ulganathan
16) Environmental Management - Agarwal S.K.
17) Environmental Management Handbook - Wall J.D.
18) Environmental Management - Uberoi N.K.
19) Introduction to Environmental Management - Nag Choudhary BD
20) Handbook of Environmental Management & Technology - Burke, Singh BR
21) Handbook Environmental Management & Technology - Holmes, Singh
22) Environmental Policies in India – Singh Shekhar

PROJECT (EN 426)

Teaching Scheme	**Examination Scheme**
Practical – 6 Hours / Week	IOE– 50 Marks EOE: 100 Marks

The project work should be a continuation of the problem identified for detail studies in part -I. The work to be based on any problem pertaining to Environmental Engineering. The work to be completed shall consist of

- Identification of problem, Literature survey & Data collection.
- Preparation of Synopsis.
- At least one presentation highlighting significance, relevance & scope of the project work.

The same project work will continue for detailed study, laboratory analysis, field visits as necessary for the project work. A typed Report should include design, drawing and estimates if necessary.

NOISE POLLUTION & CONTROL (EE 425.1)

Teaching Scheme	Examination Scheme
Lectures: 3 Hrs/week	Theory: CIE (50) + SEE (50) =100 Marks
Practical: 2 Hrs/week	IOE– 25 Marks

UNIT 1 Introduction to Noise pollution (5 Hours)

The menace of noise pollution in India, Engineering definition of noise and sound, Mechanization of hearing, hearing principle, Noise characteristics, decibel levels, sound pressure, power, intensity, frequency band analysis, measurement of noise.

UNIT 2 Noise survey and noise monitoring (4 Hours)

Noise propagation and transmission, noise survey and noise monitoring, environmental monitoring, health monitoring

UNIT 3 Sources of noise (4 Hours)

Neighbourhood noise, traffic noise, occupational noise, community noise, common noise levels and permissible noise levels

UNIT 4 Effects of noise (4 Hours)

Effects of noise, effects on health, effects on wild life, effects on plants, hazards of noise physiological and psychological hazards

UNIT 5 Industrial noise (4 Hours)

Types, sources, frequency, distribution, characteristics / range of industrial noise generated in various industrial operations, measurement of industrial noise

UNIT 6 Engineering control of community noise (4 Hours)

Basic control approach, regulatory control, simplified estimation procedures

UNIT 7 Control of noise (6 Hours)

Types, isolation, suppression, shielding, noise measuring equipments, sound level meter, octave band analyzer, magnetic tape recorder, and audiometer.
Methods of reducing industrial noise: location, lay out, source, enclosure, barrier, acoustical absorbance devices

UNIT 8 Legal aspects (5 Hours)

Legislation in India and other countries, Case studies in India and abroad

PRACTICAL

The Journals consist of:

1. Study of noise measuring equipments & their use.
2. Study of Noise pollution problems in following & it report
. a) Industry.
   b) Traffic.
   c) Public places.

3. Assignments based on above theory.

REFERENCE BOOKS:

1. Handbook of Environmental management and technology by Gwendolyn Holmes, Ben Ramnasiue singh and Louis Theodore (A Wiley – Enter science publication)
2. Standard Hand book of Environmental Engineering by Robert A. Corbett (McGraw Hill Inc.)
3. Industrial Pollution by N. Irving Sax (Van Nostrand Reinhold Company)
4. Environmental issues and programme by I. Mohan (Ashish publishing house)
5. Environmental Engineering by G.N.Pandey and G.C. Carney (Tata McGraw Hill)
6. Some thought on Environmental and law by C.S. Mehta (RBSA Publisher)
7. Environmental health criteria 12: NOISE, WHO & ONEP Publication.
8. IS code for practice for noise reduction in industrial buildings IS: 3483, 1965
9. Noise Pollution – S.K.Agrawal- APH Publishing carporation, New Delhi.
10. Soil & Noise pollution: Dr B.K.Sharma & Dr. H.Kaur, Goel Publishing House, Krishana Prakashan mandir, Meerut.

DISASTER MANGEMENT& RISK ANALYSIS (EE 425.2)

Teaching Scheme	Examination Scheme
Lectures: 3 Hrs/week	Theory: CIE (50) + SEE (50) =100 Marks
Practical: 2 Hrs/week	IOE: 25 Marks

UNIT 1 Disaster (2 Hours)

Definition, types, Classification, hazards and its types, Difference between natural disasters and manmade disasters

UNIT 2 Natural disasters (8 Hours)

Causes of occurrence, consequences, Impact on human health, animal health, socioeconomic impacts, and impact on environment, major events of the past and recent , pattern of occurrence in India and world of following
Natural disasters - Earthquakes, Floods, Tsunami, Landslide, Cyclones, Volcanoes, Drought and Pest infestation

UNIT 3 Disaster Management (8 Hours)

Definition and Purposes, Planning and Control of Various Natural Disasters,
Various Mitigative & Preventive Measures, Disaster Management Planning in India at Central level, State level, District & Local level, Application of Remote Sensing and GIS for Disaster Management

UNIT 4 Manmade Disasters (6 Hours)

Types and causes of occurrences, Industrial Disasters and their impacts, Environmental disasters, definition and causes of occurrence and their Impacts

UNIT 5 Disaster Management for Manmade Disaster (6 Hours)

Identification and control of hazards,
Risk Analysis – Definition, Various Techniques of Risk Analysis for Industries- HAZOP, HAZAN, FMEA, Fault Tree Analysis, Event Tree Analysis

UNIT 6 Risk Analysis for Environmental Disasters (6 Hours)

Dose- Response Relationship, Control of Environmental Risk, Case studies

PRACTICAL

A journal consisting of

i) Assignments based on above units.
ii) A visit report on any Major Risk Industry.

REFERENCE BOOKS

1) B.Narayan "Disaster Management" APH Publishing Corporation
2) Chakrabarty "U.K Industrial Disaster Management", Asian company, new Delhi
3) Peter K.Lagoy "Risk Assessment- An Environmental Perspective" Jaico Publishing House, Mumbai
4) A.H. Hommadi "Industrial Occupational Safety, Health and Hygiene" Indian Bibliographies Bureau, New Delhi
5) O.P.Shukla "Pesticides, Man and Biosphere" APH Publishing Corporation, New Delhi
6) Websites of Government of India

ENVIRONMENTAL MODELLING & SIMULATION (EE 425.3)

Teaching Scheme	Examination Scheme
Lectures: 3 Hrs/week	Theory: CIE (50) + SEE (50) =100 Marks
Practical: 2 Hrs/week	IOE: 25 Marks

UNIT 1 Fundamentals (4 Hours)

Mass balance principle, Reaction kinetics (types of reaction, rate and order of reaction, Effect of temperature), Analysis of experimental data, Determination of rate constants

UNIT 2 Mathematical model of physical systems (5 Hours)

Hydraulic models of natural systems (Types of reactors), CFSTR, PFR Models, Ideal flow models, Mass balance applications

UNIT 3 Modelling Water quality in Environment (5 Hours)

Transport phenomena, Advection, diffusion, dispersion, Dispersion and mixing in streams, Air/water interface, Gas transfer (agitated and stagnant), pH modelling

UNIT 4 Surface water quality modelling (5 Hours)

Water quality in rivers & streams, Point and non-point sources, BOD model, Point source Streeter –Phelp equation, Nitrogenous BOD modelling, Sediment oxygen demand, Stream quality modelling using QUAL2E

UNIT 5 Water quality of lakes & reservoirs (6Hours)

Hydraulic behaviour, Effect of physical processes on Water quality, Modelling of lakes & reservoirs, 1D model, Vertical modelling, Ecological modelling, Significance, Eutrophication inflowing water

UNIT 6 Subsurface water quality modelling (5 Hours)

Transport of non reactive & reactive contaminant in Ground water, Gaussian plume model

UNIT 7 Microbe / Substrate modelling (3 Hours)

Bacteria growth, substrate utilization, Microbial kinetics, batch and CSTR, toxicant modelling inflowing water.

UNIT 8 pH modelling (3 Hours)

Toxics substance model in CSTR, Bio-concentration and Bioaccumulation model.

REFERENCE BOOKS

1. Steven Chopra, McGraw hill "Surface water quality modelling"
2. Tchobanoglous (Addision & Wesley Edward Schroedar) "Water quality modelling; modification"-
3. Sincero and Sincero "Environmental Engineering"
4. USEPA: www.epa.gov.in QUAL2E model
5. Metcalf & Eddy. "Waste Water Engg. Treatment & Disposal, Tata McGraw - Hill Pub."

WATERSHED MANAGEMENT (EN 425.4)

Teaching Scheme	Examination Scheme
Lectures: 3Hrs/week	Theory: CIE (50) + SEE (50) =100 Marks
Practical: 2 Hrs/week	IOE– 25 Marks

UNIT 1 Introduction (4 Hours)

Place in environment, global effects, status in India, historical background

UNIT 2 Watershed concept (4 Hours)

Need, characteristics, proforma for basic data on watershed, watershed management, integrated multidisciplinary approach, administrative aspects.

UNIT 3 Land & soil conservation (4 Hours)

Land survey preparation and development, soil & soil moisture conservation, soil survey, conservation measures, rainwater management, reclamation of saline soils.

UNIT 4 Water conservation (5 Hours)

investigation, data & analysis, surface water, utilization of wasted flows, Rainwater harvesting, groundwater, potential & harvesting, well construction, integrated water resources management.

UNIT 5 Role of greenery in wetland management (5 Hours)

Agriculture, sustainable agriculture, dryland agriculture, selection of water use efficiency, crops, irrigation, water losses, pasture and silvipastures, horticulture, tree culture, farm forestry, afforestation.

UNIT 6 Socio economics (4 Hours)

peoples part, awareness, participation, state & integrated approach, sustainable society, role of NGOs, international agencies, future, economic viability.

UNIT 7 Appropriate technology (5 Hours)

Farm equipment, contour methods, check dams, water catchments & harvesting, low cost technology, rural technologies

UNIT 8 Impact of water shed management (5 Hours)

Model watershed, Government watershed, Government projects national projects, World Bank projects, ICRISAT, NGOs in water shed management.

PRACTICAL

A journal consisting of the following -

1) Preparing model management plan for one watershed in nearby area.
2) Field visit to an ideally managed watershed area & its report.
3) Plan & prepare budget for watershed.
4) To find economical viability of the watershed management plan.

REFERENCE BOOKS -

1) J.V.S. Murthy, "Watershed management"
2) J.V.S.Murthy, "Watershed management in India"
3) Ghansham Das, "Hydrology & Soil Conservation Engineering" Prentice Hall of Indial
4) R. Suresh, " Soil & Water Conservation Engineering" Standard Punlishers Distributors
5) Gurumal Singh, "Manual of Soil & Water Conservation Practices" Oxford & IBH Publishing Company