Shivaji University, Kolhapur

S.E. (ENVIRONMENTAL ENGINEERING) – I

Sr. No.	Subject	Teaching Scheme					Paper Marks	Examination Scheme			Total marks
		L	T	P	Dr.	Total		TW	POE	OE	
1	Environmental Chemistry	3	-	2	-	5	100	50	-	25	175
2	Engineering Mathematics - III	4	1	-	-	5	100	25	-	-	125
3	Surveying Remote Sensing & GIS	3	1	2	-	6	100	25	50	-	175
4	Fluid Mechanics	3	1	2	-	6	100	25	-	25	150
5	Ecology & Env. Sanitation	3	1	-	-	4	100	25	-	-	125
6	Programming Laboratory	2	-	2	-	4	-	50	-	-	50
		18	4	8	-	30	500	200	50	50	800

S.E. (ENVIRONMENTAL ENGINEERING) – II

Sr. No.	Subject	Teaching Scheme					Paper Marks	Examination Scheme			Total marks
		L	T	P	Dr.	Total		TW	POE	OE	
1	Environmental Microbiology	3	1	2	-	6	100	25	-	25	150
2	Environmental Geology	3	-	2	-	5	100	25	25	-	150
3	Water Supply Engg.	3	-	2	-	5	100	50	-	25	175
4	Environmental Chemo dynamics	3	-	2	-	5	100	50	-	-	150
5	Energy & Environment	3	1	-	-	4	100	25	-	-	125
6	Building Services	3	-	-	2	5	-	50	-	-	50
		18	2	8	2	30	500	225	25	50	800
	Grand Total										1600

SHIVAJI UNIVERSITY, KOLHAPUR
STRUCTURE OF THE B.E (ENVIRONMENTAL ENGINEERING) COURSE

T.E. (ENVIRONMENTAL ENGINEERING) - I

Sr. No.	Subject	Teaching Scheme					Paper Marks	Examination Scheme			Total marks
		L	T	P	Dr.	Total		TW	POE	OE	
1	Waste Water Engg.	3	1	2	-	6	100	50	-	25	175
2	Urban & Rural Planning	4	1	-	-	5	100	50	-	-	150
3	Water Resources Engg.	3	-	2	-	5	100	25	-	-	125
4	Environmental Geotechnology	3	-	2	-	5	100	50	-	25	175
5	Green Building	3	1	-	-	4	100	25	-	-	125
6	Environmental Instrumentation	2	-	2	-	4	-	50	-	-	50
		18	3	8	-	29	500	250	-	50	800

T.E. (ENVIRONMENTAL ENGINEERING) - II

Sr. No.	Subject	Teaching Scheme					Paper Marks	Examination Scheme			Total marks
		L	T	P	Dr.	Total		TW	POE	OE	
1	Air Pollution – I	4	-	2	-	6	100	25	-	25	150
2	Solid Waste Management	3	-	2	-	5	100	50	-	-	150
3	Environmental Management	3	-	2	-	5	100	25	-	25	150
4	Noise Pollution & Control	3	-	2	-	5	100	25	-	-	125
5	Quantity Surveying & Valuation	3	-	2	-	5	100 *	50	-	25	175
6	O & M of Env. Facilities	2	1	-	-	3	-	50	-	-	50
		18	1	10	-	29	500	225	-	75	800
	Grand Total										1600

* Theory paper of four hours duration

Vocational Training in any organization related to Environmental Engineering for about four weeks after TE – II Examinations, during summer vacation should be completed by the students and report to be submitted for valuation in B.E.(Env.Engg.) Part I.

Shivaji University, Kolhapur

SYLLIBUS/ STRUCTURE (REVISED from June- 2009)
B.E. (ENVIRONMENTAL ENGINEERING) (Semester – VII & VIII)

B.E. (ENVIRONMENTAL ENGINEERING) – I

Sr. No.	Subject	Teaching Scheme					Paper Marks	Examination Scheme			Total marks
		L	T	P	Dr.	Total		TW	POE	OE	
1	Air Pollution – II	4	-	2	-	6	100	25	-	25	150
2	Industrial Waste Treatment	3	1	-	-	4	100	25	-	-	125
3	Advanced Water & Wastewater Treatment	3	1	2	-	6	100	25	-	25	150
4	Environmental Impact Assessment	3	1	-	-	4	100	25	-	25	150
5	Elective –I	3	-	2	-	5	100	25	-	-	125
6	Seminar	-	-	2	-	2	-	50	-	-	50
7	Project	-	-	2		2	-	25		-	25
8	Vocational Training	-	-	-	-	-	-	25*		-	25
	Total (Part –I)	16	3	10	-	29	500	225	-	75	800

* Valuation of the report of vocational training completed after T.E. II in summer vacation.

B.E. (ENVIRONMENTAL ENGINEERING) - II

Sr. No.	Subject	Teaching Scheme					Paper Marks	Examination Scheme			Total marks
		L	T	P	Dr.	Total		TW	POE	OE	
1	Environmental Management System	3	-	2	-	5	100	25	-	25	150
2	Environmental Policy & Legislation	4	-	-	-	4	100	-	-	-	100
3	Industrial Health & Safety	3	-	2	-	5	100	25	-	-	125
4	Hazardous Waste Management	3	-	2	-	5	100	25	-	-	125
5	Elective – II	3	-	2	-	5	100	25	-	-	125
6	Project	-	-	6	-	6	-	75	-	100	175
	Total (Part- II)	16	-	14	-	30	500	175	-	125	800
	Grand Total										1600

List of Electives

Elective – I		Elective – II
1. Optimization Techniques		1. Managerial Techniques
2. Environmental Biotechnology		2. Watershed Management
3. Disaster Planning & Risk Analysis		3. Environmental Modeling & Simulation
4. Clean Development Mechanism		4. Occupational Health & Safety Management Systems

B.E. (Environmental Engineering) –Sem.-VII

1. AIR POLLUTION II

Teaching Schemes
Lectures – 4 Hours / Week
Practical – 2 Hours / Week

Examination Schemes
Theory Paper – 100 Marks
Term Work – 25 Marks
Oral Exam – 25 Marks

Section I: Air Quality Modeling

Unit 1: Meteorological Considerations in modeling
Dependence of pressure, temperature, wind, humidity on height, Dry and wet adiabatic lapse rates, Atmospheric Stability, Determination of Maximum mixing depth, Wind rose, General characteristics of elevated point sources, line sources, Plume Behavior, Use of Pasquill and Turners table
(6)

Unit 2: Atmospheric and Air Quality Modeling
Air Quality modeling and simulation, Atmospheric model, Air Pollution model, Point source, Line source, Puff source, multiple sources, Gaussian Stack and Line source Model, Street Canyon Model, Box Model, Multicell Model, Langrarian Model, Introduction to CALINE model, RAMS Model, Simulation soft wares like GMT, RWM models
(8)

Unit 3: Air Quality Monitoring
Air Quality Instrumentation, Dust Sampling, Gaseous Sampling, PM 2.5 Sampling, Greenhouse gaseous sampling, Ambient Air Quality Monitoring, Stack Air Monitoring, Sensors, Use of Remote sensing in Automobile Exhaust monitoring.
(6)

Section II: Air Pollution Control

Unit 4: Air Pollution Control
Necessity of Air Pollution control, Control Equipments, , Definition of collection efficiency and removal efficiency, In plant measures like Modify process, Modify feed stream, Shutdown source, Automobile Exhaust Control Mechanism
(6)

Unit 5: Particulate Contaminant Control
Particulate Control Mechanisms, Design and operations of Gravitational settling chambers, Centrifugal separators, Wet scrubbers, Fabric filters, Electrostatic precipitators
(8)

Unit 6: Gaseous Contaminant Control
Gaseous Control Mechanisms, Combustion stoichiometry, Adsorption, Absorption, Incineration **(6)**

Termwork – A journal consisting of practicals on following :

1. Determination of Ambient Air Quality
2. Determination of Stack Emission
3. Determination of Traffic Exhaust and other meteorological parameters for modeling
4. Design of Gravitational settling chambers, Centrifugal separators, Wet scrubbers, Fabric filters, Electrostatic precipitators
5. Visit to Industry having Control equipments & report

Reference Books –

1. Air Pollution - Wark and Warner
2. Air Pollution - Stern Vol I, II, III
3. Air Pollution - D. Nevers
4. Air Pollution -Ross

B.E. (Environmental Engineering) –Sem.-VII

2. INDUSTRIAL WASTE TREATMENT

Teaching Scheme
Lectures - 3 Hours / Week
Tutorial - 1 Hour / Week

Examination Scheme
Theory Paper - 100 Marks
Term work - 25 Marks

Section - I

Unit 1
Use of Water in industry, 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.
(5)

Unit 2
Waste volume and strength reduction, Inplant control measures, Good housekeeping, Process change, Leakage prevention, Segregation and Recycling.
(5)

Unit 3
Treatment techniques for removal of specific pollutants in industrial wastewaters, e.g., Oil and Grease, Cyanide, Fluoride, Calcium, Magnesium, Toxic Organics, Heavy Metals, Radioactive. **(5)**

Unit 4
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.
(5)

Section - II

Unit 5
Water requirements, Waste water sources, Characterization & composition of wastes, Manufacturing process & flow sheet and Treatment flow sheet in Major industries such as

a) Agrobased industries - Sugar, Distillery, Dairy, Textile, Paper & Pulp etc.
b) Chemical based industries – Fertilizer, Paints, Petroleum, Refinery, Pharmaceuticals, tannery etc.
c) Mechanical/Manufacturing industries – Steel, Foundry, Automobile, Plating etc.
d) Food Processing industries – Canning
(10)

Unit 6
Common Effluent Treatment Plant: Concept, Objectives, Methodology, Cost benefit analysis, Design concept, Operation and Maintenance, Grouping of Industries
(4)

Unit 7
Biological treatment for Toxic waste, Acclamatization of bacteria to Toxic waste, Process sensitivity
(3)

Unit 8
Water, Energy, Chemical balance, Feasibility Studies & Environmentally managed industrial areas.

(3)

Term Work -
A journal 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.

Reference Books -

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

B.E. (Environmental Engineering) –Sem.-VII

3. ADVANCED WATER AND WASTEWATER TREATMENT

Teaching Scheme	**Examination scheme**
Lectures - 3 Hours / Week	Theory Paper - 100 Marks
Tutorial - 1 Hour / Week	Term Work - 25 Marks
Practical - 2 Hours / Week	Oral Exam - 25 Marks

Section I

Unit 1

Review of conventional water treatment, Need for Advanced water and wastewater treatment, Reclamation and reuse of wastewater, Solids Separation: Types of Settling, Hindered and Compression Settling, Filtration: Design and operation of Dual media filter, Head loss calculations in depth filtration

(5)

Unit 2

Ion Exchange: Process, Ion exchange resins, exchange capacity, ion exchange chemistry and reactions, Design of ion exchange units

(3)

Unit 3

Membrane Filtration: Terminology, Process Classification, Membrane configuration, specific membrane problems such as fouling and its control, application of membranes,

Electro dialysis: Theory, Disposal of concentrate waste streams.

(6)

Unit 4

Adsorption: types of adsorption, adsorption isotherms, activated carbon adsorption kinetics, analysis and design of adsorption column,

Disinfection with ozone: Chemistry, UV disinfection: System components. **(5)**

Section II

Unit 5

Reactors and Reaction Kinetics: Types of Reactions and Reaction Kinetics, Types of reactors and Principles of Reactor Design

(2)

Unit 6
Microbial growth kinetics, Modeling suspended and attached growth treatment processes. Suspended growth processes for biological nitrification and denitrification, Nitrogen Removal by Physical and Chemical Processes, Biological phosphorous removal, Chemical precipitation for removal of phosphorous, Anaerobic sludge blanket processes, Design considerations for up flow Anaerobic Sludge Blanket process.
(8)

Unit 7
Chemical precipitation for removal of heavy metals and dissolved inorganic substances, Removal of Refractory organics, Removal of dissolved inorganic substances, Ultimate disposal of contaminants

(**4)**

Unit 8
Wetland and aquatic treatment systems; Types, application, Treatment kinetics and effluent variability in constructed wetlands and aquatic systems, Free water surface and subsurface constructed wetlands, Floating and emergent plants, Combination systems, Design procedures for constructed wetlands, Management of constructed wetlands and aquatic systems.
(5)

Term work –

A journal consisting of at least six experiments from following:

1. Settling column analysis
2. Development of break through curve for ion exchange process
3. Analysis of heavy metals viz. Cu, Cr, K, Mn, Zn, As, Sr, Ca
4. Development of adsorption isotherm
5. Analysis of Volatile Fatty Acids
6. Determination of MLSS & MLVSS
7. Determination of SVI
8. Determination of F/M ratio

Reference Books –

1. Wastewater Engineering treatment and reuse – Metcalf Eddy, Published by TMH.
2. Environmental Engineering – Peavy Row, Published by
3. Physico-chemical processes of water purification – W. J. Weber Published by Wiley Interscience
4. Wastewater Treatment for Pollution Control – Soli J. Arceivala, Published by
5. Theory and Practice of Water and Wastewater Treatment – Ronald Droste Published by

B.E. (Environmental Engineering) –Sem.-VII

4. ENVIRONMENTAL IMPACT ASSESSMENT

Teaching scheme
Lectures - 3 Hours / Week
Tutorial - 1 Hour / Week

Examination scheme
Theory Paper - 100 Marks
Term work - 25 Marks
Oral Exam - 25 Marks

Section - I

Unit 1
Introduction : 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
(4)

Unit 2
Components of EIA studies, 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.
(8)

Unit 3
Impact on air environment , 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.
(8)

Section II

Unit 4
Impact of water quality : 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.
(8)

Unit 5
Impacts on biological environment. Socioeconomic environment: background information, Existing condition.
(4)

Unit 6

Public participation in EIA, 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.
(8)

Term work –

A journal consisting of

1) Assignments on the above topics in the syllabus
2) Study of EIA report prepared.

Reference Books –

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

B.E. (Environmental Engineering) –Sem.-VII

5. Elective - I
OPTIMIZATION TECHNIQUES

Teaching Scheme
Lectures: 3 Hours / Week
Practical: 2 Hours / Week

Examination Scheme
Theory Paper: 100 Marks
Term work: 25 Marks

SECTION – I

Unit 1

Introduction: Birth of O. R., Methodology, Scope and Limitations. Types of O.R. Models , Applications, Use of computers in O. R.
(3)

Unit 2

Linear Programming: Formulation, graphical method, Simplex algorithm for maximization and minimization problems, sensitivity analysis, duality theory and its use in economic interpretation and decision making.
(7)

Unit 3

Transportation and Assignment Models: Structure, industrial and business applications.

a) Transportation problems: Use of various methods for solving transportation problems, degeneracy and its solution.

b) Assignment problems: Solution of various types of problems, Traveling Salesman problem.

(7)

Unit 4

Sequencing: Sequencing of n jobs and 2 and 3 machines, 2 jobs and m machines.

(3)

SECTION- II

Unit 5

Inventory Models: Various costs involved, classification of models, EOQ model with and without shortage, EOQ with uniform demand and production lot size model, Multi item inventory control models.

(7)

Unit 6

Decision Theory: Pay off and regret tables, decision rules, decisions under uncertainty and risk, decision tree.

(4)

Unit 7

Network Modeling: Fundamentals of CPM / PERT networks; CPM – construction of networks, critical path, forward and backward pass, floats & their significance, crashing for minimum cost and optimum and minimum duration, resource allocation and leveling. PERT – Time Estimates, Construction of Networks, Probability of completing projects by given date.

(7)

Unit 8

Replacement Analysis: With & without time value of money, single item and group replacement.

(2)

Term Work:

Assignments based on above units including two case studies.

Reference Books :

1) Introduction to O.R., 6/e (with floppy disk) – Hamdy A. Taha, (PHI)
2) Quantitative Techniques in Management, 2/e - N.D. Vora. (TMH)
3) Introduction to O.R., 7/e (with CD) – Hillier & Lieberman (TMH)
4) Operations Research – Hira & Gupta.
5) Operations Research – J.K. Sharma. (Mac Millan)
6) Operations Research – S.D. Sharma
7) Optimization in Operation Research – Ronald L. Rardin (Pearson education)

B.E. (Environmental Engineering) –Sem.-VII

5. Elective - I
ENVIRONMENTAL BIOTECHNOLOGY

Teaching Scheme
Lecture - 3 Hours / Week
Practical - 2 Hours / Week

Examination Scheme
Theory Paper - 100 Marks
Term work - 25 Marks

Section I

Unit 1
Introduction to Biotechnology, Concept of Environmental biotechnology, public perception of biotechnology, Role of biotechnology in Environmental Engineering **(3)**

Unit 2
Problems of Environmental Pollution, Sewage and Industrial wastewater, gaseous emissions, solid and semi solid wastes from residences as well as industries, problems associated with their disposals

(7)

Unit 3
Aerobic v/s Anaerobic degradation, Kinetics of Aerobic and Anaerobic biodegradation, Concept of bio remediation, various micro organisms involved, bioremediation processes and technologies **(7)**

Section II

Unit 4
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
(7)

Unit 5
Biotechnology in the reduction of carbon dioxide through biological calcification, heavy metal pollution 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 **(7)**

Unit 6
Role of biotechnology in conservation of species, organic farming, bio-fertilizers, biological control of pests, concept and types of bio-pesticides and their significance **(4)**

Term work -

The journal consist of following

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

References -

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

B.E. (Environmental Engineering) –Sem.-VII

5. Elective -I
DISASTER PLANNING AND RISK ANALYSIS

Teaching Scheme	Examination Scheme
Lecture - 3 Hours / Week	Theory Paper - 100 Marks
Practical - 2 Hours / Week	Term work - 25 Marks

Section –I

Unit 1

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

(2)

Unit 2

Natural disasters – 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

(9)

Unit 3

Disaster Management, 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

(9)

Section – II

Unit 4

Manmade Disasters, types and causes of occurrences, Industrial Disasters and their impacts, Environmental disasters, definition and causes of occurrence and their Impacts **(7)**

Unit 5

Disaster Management for Manmade Disaster, Identification and control of hazards,
Risk Analysis – Definition, Various Techniques of Risk Analysis for Industries- HAZOP, HAZAN, FMEA, Fault Tree Analysis, Event Tree Analysis **(7)**

Unit 6

Risk Analysis for Environmental Disasters, Dose- Response Relationship, Control of Environmental Risk, Case studies **(6)**

Term Work -

A journal consisting of

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

References -

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

B.E. (Environmental Engineering) –Sem.-VII

5. Elective – I

CLEAN DEVELOPMENT MECHANISM

Teaching Schemes	**Examination Schemes**
Lectures – 3 Hours / Week	Theory Paper –100 Marks
Practical – 2 Hours / Week	Term Work – 25 Marks

Section I

Unit 1

Introduction, Climate Change and Global Warming, Greenhouse Gases, Sources of Greenhouse Gases, The United Nations Framework Convention on Climate Change, The Kyoto Protocol, Developments Since Kyoto, The Kyoto Challenge, The Kyoto Mechanisms

(6)

Unit 2

The Clean Development Mechanism, The Size of the CDM Market, Clean Development Mechanism Working, Credits for Early Action, Organization of the CDM and its Functions, Legal and Institutional Issues in the Organization of the CDM, Governance of the CDM, Organizational Arrangements, Essential CDM Functions, Participation by Public and/or Private Entities in the CDM, Dispute Resolution

(8)

Unit 3

Types of Eligible Projects, Project Eligibility Criteria, Additionality, Supplementality, Transaction Costs, CER Accounting, CERs, Types of CERs, Types of Financing, Common Pricing Structures, Price for CERs, Main Costs, Selling and Buying, Technology Transfer Issues, Sustainable Development Criteria, Project Approval and Registration, Monitoring, Certification of Emissions Reductions, Tracking CER Transfers And Holdings

(8)

Section II

Unit 4

Secondary Trading, Joint Implementation (JI), Joint Implementation Supervisory Committee (JISC), Participant Countries, Designated Focal Points (DFP), Accredited Independent Entities (AIE), Voluntary Emissions Reductions (VER), VER Basics, Drives demand for VERs, Sources of VERs, Key principles of VERs, Project Technologies, Types of VER transactions executed, Quality labels available for VERs, Emission Trading

(8)

Unit 5

Operational Elements of the CDM, Sharing Project Value between Investors and Hosts, Risk Sharing and Liability Rules, Fungibility of the Tradeable Commodity under CDM, JI and ET, Financing Adaptation and CDM Administrative Expenses

(6)

Unit 6

Investment Incentives and Opportunities, Basic Sources of Private and Public Capital for CDM Investments, Project Risk Management – Special Considerations, Financing Tools for CDM Projects, Issues of Equity, Finance and Capacity-Building, Categorizing Host Countries by Market Capacity, Steps needed to promote funding of CDM Projects

(6)

Term Work

The journal consisting of at least two case studies from developing countries which are registered at CDM website of UNFCCC.

Reference Books

1. Clean Development Mechanism in China - Ensuring a Sustainable Approach by Jostein Nygard, Holger Liptow, Deshun Liu

2. Climate Change and the Kyoto Protocol's Clean Development Mechanism - Stories from the Developing World (South North: Stories from the Developing World) by Margie Oxford, Stefan Raubenheimer, Barry Kantor

3. Corporate Strategies and the Clean Development Mechanism - Developing Country Financing for Developed Country Commitments - Soren Ender Lutken, Axel Michaelowa

4. The Clean Development Mechanism - Dave, V. Wright

5. Carbon Finance - The Financial Implications of Climate Change (Wiley Finance) by Sonia Labatt and Rodney R. White

6. Emissions Trading: Principles and Practice - T. H. Tietenberg

B.E. (Environmental Engineering) –Sem.-VII

6. Seminar

Teaching Schemes	**Examination Schemes**
Practical – 2 Hours / Week	Term Work – 25 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.

B.E. (Environmental Engineering) –Sem.-VII

7. Project

Teaching Schemes	**Examination Schemes**
Practical – 2 Hours / Week	Term Work – 25 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.

B.E. (Environmental Engineering) –Sem.-VII

8. Vocational Training

Examination Schemes

Term Work – 25 Marks

Evaluation of the report on vocational training submitted by the students

B.E. (Environmental Engineering) –Sem.-VIII

1. ENVIRONMENTAL MANAGEMENT SYSTEMS

Teaching Schemes	**Examination Schemes**
Lectures – 3 Hours / Week	Theory Paper – 100 Marks
Practical – 2 Hours / Week	Term Work – 25 Marks
	Oral Exam – 25 Marks

Section I

Unit 1: Introduction to ISO 14001
Definitions, Purpose, Scope, ISO 14001 family, Deming's PDCA Cycle, General requirements, EMS Elements
(2)

Unit 2 : General Requirements and Planning
Environmental policy, Compliance, Continual improvement, Pollution prevention Planning, Aspects, Aspects Procedure**,** Aspects list, Significant determination information, Significant aspects/impacts list, Legal and other requirements, Listings of applicable legal and other requirements, Appropriate instructions for compliance, Permits, manifests, Objectives and targets, Minutes/notes of objectives and target development, List of objectives and targets, Related action plans
(9)

Unit 3: Implementation and Operation
Structure & Responsibility, Job descriptions, Organizational charts, Training, Training needs listings/matrix, Manuals, course materials, Sign-in sheets, Test records, certificate copies, Communications, Specific work instructions, Records of communication and correspondence, Document control, Documents, procedures, and manuals, Operational control, Critical operations/aspects listing/matrix, Specific work instructions, Emergency plans and protocols, Practice and drill results, Environmental issues and instructions within other work instructions, Contractor policies, work orders, Supplier requirements, Emergency response, Emergency plans and protocols, Practice and drill results
(9)

Section II

Unit 4: Checking and Corrective Action
Monitoring and measurement, - Objectives and target action plans, Function-specific procedures and work instructions, Records of monitoring and measurement data collected, including calibration records, Nonconformance and corrective/preventive action, Corrective action reports, Evidence of discussion and follow-up (meeting notes, etc.), Records, Control of records
(8)

Unit 5: EMS Auditing
EMS audit, Specific audit procedures, checklists, forms, schedule, EMS audit notes and working documents, EMS audit reports
(8)

Unit 6: Management Review
Meeting agendas and attendance, Meeting minutes and action items, Evidence of follow-up actions, reports
(4)

Term work

Case study of at least one large scale industrial unit covering eighteen article of EMS manual

Reference Books

ISO 14001 Standard Manual

B.E. (Environmental Engineering) –Sem.-VIII

2. ENVIRONMENTAL POLICY AND LEGISLATION

Teaching scheme
Lectures - 4 Hours / Week

Examination scheme
Theory Paper - 100 Marks

Section I

Unit 1

Introduction, 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, other policies related to environment
(6)

Unit 2

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

(6)

Unit 3

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.
(6)

Section II

Unit 4

Functions and powers of ministry of Environment and forest and pollution control Boards in centre and state, Energy Bureau of India, energy audit, Environmental audit, National River action Plan, National Lake action Plan
(6)

Unit 5

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
(6)

Unit 6

Environmental Ethics: 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.
(6)

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

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3. INDUSTRIAL HEALTH AND SAFETY

Teaching Scheme	**Examination Scheme**
Lecture - 3 Hours / Week	Theory Paper - 100 marks
Practical - 2 Hours / Week	Term work - 25 marks

Section - I Safety

Unit 1

Safety - Concept and Need of Safety, Safety and Industries - Definition, Various Hazards in Industries, Need of Industrial Safety, Safety Department and its Role **(2)**

Unit 2

Introduction to Risk Assessment & Management, Safety Management Systems, OSHAS 18001 management system and Auditing, , Product Safety **(4)**

Unit 3

Accidents in Industries, Definition and Various Causes, Accident Theory, Cost of Accidents, Accident Prevention Techniques, Accident Investigation and Reporting, Accident Statistics **(4)**

Unit 4

Safety in Industries-, Safe Design and Layout of Plants and Equipments, Machine Guarding, Safe Storage & Handling of Hazardous chemicals, MSDS, Good House Keeping **(5)**

Unit 5

Job Safety Analysis, Safety Checklists, Safety Inspections, Confined Space Entry, Work Permit System, Lock Out- Tag Out System **(5)**

Section - II Health

Unit 6

Occupational Health and Industrial Hygiene - Definition, Objectives, Need, Chronic and Acute Effects, Various Limits of Exposure-, LD_{50}, $LC_{50,}$ TLV(TWA), STEL, OSHA Limits etc. Effects of Various Physical, Chemical and Biological Hazards Present in Industries on Human Health. **(6)**

Unit 7

Various Occupational Diseases and Causative Agent, Occupational Diseases in Various Industries, Various Personal and Work Place Monitoring Systems **(4)**

Unit 8

Various Preventive Methods for Occupational Health Problems, Protection of Workers against Harmful Agents and Conditions, LEVs, PPEs, Ergonomics, Health Monitoring and Medicine **(5)**

Unit 9

Legal aspects of Safety, Safety in Engineering industries, Chemical industries, Construction industries, On site & Off site Emergency Management Plan **(5)**

Term work

A journal consisting of following -

1. At least six assignments based on above theory
2. At least one industrial visit report on
   a) Industrial Safety
   b) Occupational Health

Reference Books:

1. Occupational Safety and health -by David L. Goetsch, Prentice Hall, Ohio
2. Safety manual - EDEL Engineering consultancy Pvt. Ltd.
3. Hazardous Material and Hazardous Waste management - by Gayle Woodside, John Wiley & sons Inc.
4. Environmental Health and Safety Auditing Handbook - by Lee Harrison, Mac Graw Hill Inc.
5. Health Hazards of the Human Environment - World Health Organization , Geneva, 1972
6. Textbook of Preventive and Social Medicine - by K. Park, Banarsidas Bhanot Publishers.
7. Industrial and Occupational Safety, Health & Hygiene - by Dr. A.H. Hommadi
8. Introduction to Industrial Safety - by K.T. Kulkarni

B.E. (Environmental Engineering) –Sem.-VIII

4. HAZARDOUS WASTE MANAGEMENT

Teaching Schemes	**Examination Schemes**
Lectures – 3 Hours / Week	Theory Paper – 100 Marks
Practical – 2 Hours / Week	Term Work – 25 Marks

Section I

Unit 1

Introduction to Hazardous Wastes, Hazardous Waste Characterization and the Regulatory Process, Historical Perspective, Regulations: RCRA, CERCLA, Hazardous Waste Acts in India, Contaminant Characteristics & Partitioning, Fate and Transport of contaminants, NAPLs, Metals & Radioactive contaminants, Toxicology, Quantitative Risk Assessment

(6)

Unit 2

Waste Minimization and Resource Recovery Waste Reduction, Waste Tracking Systems, and Minimization Process Selection, Facility Development and Operations, Facility Types and Operations, Site Selection and Permitting, Chemical Spill Response Procedures, Major Spills, Minor Spills

(6)

Unit 3

Physico-Chemical Treatment Processes, Biological Treatment Processes, Remedial Design, Natural Attenuation & in situ bioremediation, Bioremediation, Phytoremediation

(8)

Section II

Unit 4

Stabilization and Solidification, Introduction to Thermal Processes: Chemistry and Thermodynamics of Incineration. Incineration Standards and Incineration Systems

(6)

Unit 5

Hazardous Waste Packaging and Labeling, Container Storage, General Waste packaging Instructions, Additional Waste Packaging Instructions for Solvents
(6)

Unit 6
Land Disposal: Disposal Site, Landfill Operations, Leachate Collection, Facilities Design and Development. Remedial Investigations, Containment and Alternative Analysis
(8)

Termwork
A journal consisting of at least six assignments on above mentioned units & case studies.

Reference Books:

Hazardous Waste Management - Charles Wentz
Hazardous Waste Management - Michael LaGrega, Phillip Buckingham, Jeffrey Evans,
Basic Hazardous Waste Management - William C. Jr. Blackman

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5. Elective -II
MANAGERIAL TECHNIQUES

Teaching Scheme	**Examination Scheme**
Lectures - 3 Hours / Week	Theory Paper - 100 Marks
Practical - 2 Hours / Week	Term work - 25 Marks

Section - I

Unit 1
Introduction to MT in Env. Engg. Industry importance, functional implementation, scope. Management functions, principles, various departments, importance, personnel marketing, finance, and production.
(7)

Unit 2
Personal management techniques, selection & recruitment, promotion, job analysis, labour welfare, factories act, workers participation in management.
(6)

Unit 3
Operation & maintenance of treatment plants, formation of Env. Engg. Management cell in industry. Case studies in personnel, marketing & business administration in related to Env. Engg. & management.

(7)

Section – I

Unit 4
Introduction to environmental consultancies, factories having environmental departments Importance, functions, scope, use, organizational chart. Various agencies supporting environmental consultancies.

(5)

Unit 5
Financial management technique- capital structure, budgeting, costing, working capital management, fund flow analysis. Managerial economics, demand, supply, market status, working of international banks, nationalised banks, co-operative banks, scheduled banks**.**
(6)

Unit 6
Production management technique- material management, manufacturing, installation, production, control, method study, introduction to IS 9001, 14000 certification.
(6)

Unit 7
Information technology in Environment Engineering, Management information systems, Softwares in Environmental Engineering. **(3)**

Term Work -

A Journal consisting of assignments based on above units and report on the industrial visit based on the syllabus.

Reference Books -

1. Principles of management - Koontz Odonell
2. Marketing management - Katler
3. Financial management - Khan & Jain
4. Production management - O.P.Khanna
5. Personal management - Memoria
6. Business organization - Sinha
7. Quality Control - Juran
8. Information technology - Balguru swamy.
9. management accounting - Khan & Jain

B.E. (Environmental Engineering) –Sem.-VIII

5. Elective – II
WATERSHED MANAGEMENT

Teaching scheme
Lectures - 3 Hours / Week
Practical - 2 Hours / Week

Examination scheme
Theory Paper - 100 Marks
Term work - 25 Marks

Section – I

Unit 1
Introduction: Place in environment, global effects, status in India, historical background. **(4)**

Unit 2
Watershed concept - Need, characteristics, proforma for basic data on watershed, watershed management, integrated multidisciplinary approach, administrative aspects. **(4)**

Unit 3
Land & soil conservation: land survey preparation and development, soil & soil moisture conservation, soil survey, conservation measures, rainwater management, reclamation of saline soils.
(6)

Unit 4
Water conservation: investigation, data & analysis, surface water, utilization of wasted flows, rainwater harvesting, groundwater, potential & harvesting, well construction, integrated water resources management.
(5)

Section – II

Unit 5
Role of greenery in wetland management: Agriculture, sustainable agriculture, dryland agriculture, selection of water use efficiency, crops, irrigation, water losses, pasture and silvipastures, horticulture, tree culture, farm forestry, afforestation.
(5)

Unit 6
Socio economics: peoples part, awareness, participation, state & integrated approach, sustainable society, role of NGOs, international agencies, future, economic viability.
(5)

Unit 7

Appropriate technology: farm equipment, contour methods, check dams, water catchments & harvesting, low cost technology, rural technologies. **(5)**

Unit 8

Impact of water shed management: Model watershed, Government watershed, Government projects national projects, World bank projects, ICRISAT, NGOs in water shed management. **(6)**

Term work -

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

B.E. (Environmental Engineering) –Sem.-VIII

5. Elective - II
ENVIRONMENTAL MODELING AND SIMULATION

Teaching Schemes	**Examination Schemes**
Lectures – 3 Hours / Week	Theory Paper – 100 Marks
Practical – 2 Hours / Week	Term Work – 25 Marks

Section I

Unit 1
Fundamentals: Mass balance principle, Reaction kinetics (types of reaction, rate and order of reaction, Effect of temperature), Analysis of experimental data, Determination of rate constants **(4)**

Unit 2
Mathematical model of physical systems- Hydraulic models of natural systems (Types of reactors), CFSTR, PFR Models, Ideal flow models, Mass balance applications **(5)**

Unit 3
Modeling Water quality in Environment: Transport phenomena, Advection, diffusion, dispersion, Dispersion and mixing in streams, Air/water interface, Gas transfer (agitated and stagnant), pH modeling.
(5)

Unit 4
Surface water quality modeling-, Water quality in rivers & streams, Point and non-point sources, BOD model, Point source Streeter –Phelp equation, Nitrogenous BOD modeling, Sediment oxygen demand, Stream quality modeling using QUAL2E
(6)

Section II

Unit 5
Water quality of lakes & reservoirs- Hydraulic behavior, Effect of physical processes on Water quality, Modeling of lakes & reservoirs, 1D model, Vertical modeling, Ecological modeling, Significance, Eutrophication in flowing water.
(6)

Unit 6
Subsurface water quality modeling: Transport of non reactive & reactive contaminant in Ground water, Gaussian plume model
(5)

Unit 7
Microbe / Substrate modeling: bacteria growth, substrate utilization, Microbial kinetics, batch and CSTR, toxicant modeling in flowing water. **(3)**

Unit 8
pH modeling, Toxics substance model in CSTR, Bio-concentration and Bioaccumulation model. **(3)**

Term Work -
A journal consisting of the following -

1. Assignments on each of the units
2. Study and application of QUAL2E model

Reference Books -

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

B.E. (Environmental Engineering) –Sem.-VIII

5. Elective - II
OCCUPATIONAL HEALTH & SAFETY MANAGEMENT SYSTEMS

Teaching Schemes	**Examination Schemes**
Lectures – 3 Hours / Week	Theory Paper – 100 Marks
Practical – 2 Hours / Week	Term Work – 25 Marks

Section I

Unit 1

Introduction to Occupational Health & Safety Management Systems, OHSAS 18001, Occupational Health and Safety Policy, Planning, Hazard Identification, Risk Assessment and Risk Control, Initial Hazard Analysis Strategy, Hazard Analysis Strategy, Legal and Other Requirements, Health and Safety Regulatory and Other Requirements, Objectives and OH&S Management Programs

(4)

Unit 2

Implementation, Structure and Responsibility, Organizational Chart Showing Key OH&S-MS Personnel, Training, Awareness, and Competence, Training Needs Analysis, Overall Analysis of Regulatory Applicability, Procedure, Consultation and Communication, Communications Procedure, OH&S Management System Documentation, OH&S-MS Manual, List of OH&S-MS Procedures, List of Key OH&S-MS Documents and Records, Control of Documents and Data, Document Control, Document Control Procedure for External Documents, New Documents, Document Revisions, Deletion of Documents

(8)

Unit 3

Records and Record Management, Health and Safety Records Retention Matrix, Record Control Procedure, Operational Control, Management of Change Procedure, Operational Control Procedures, Management of Change: Process Modification Request, Emergency Preparedness and Response, Emergency Contact Manual, Incident and Emergency Situation Review: Working Summary Table, Accident and Emergency Situation Prevention and Mitigation Matrix, Incident Report Form

(8)

Section II

Unit 4

Corrective Action, Performance Measurement and Monitoring, Regulatory Compliance Calendar, OH&S-MS Objective and Target Review Procedure, Calibration Procedures, Monitoring and Measurement, Accidents, Incidents, Nonconformance, Corrective and Preventive Action, Investigative/Root Cause Analysis Reports, Corrective Action Report Form, Root Cause Analysis Documentation Form

(8)

Unit 5

OH&S-MS Audit, OH&S-MS Audit Procedure, OH&S-MS Audit Schedule, Production Area Interview Checklist, OH&S-MS Audit Report and Supporting Documentation

(8)

Unit 6

Management Review, Management Review Procedure, Management Review Agenda and Minutes Record, Management Review Presentation, Certification

(4)

Term Work

A journal consisting of at least one assignment on each unit and one case study of large industrial unit

Reference Books

Manual of OHSAS 18001

B.E. (Environmental Engineering) –Sem.-VIII

6. PROJECT

Teaching Schemes	Examination Schemes
Practical – 6 Hours / Week	Term Work – 75 Marks Oral Exam – 100 Marks

The project decided in B.E. Part I will be continued in B.E. Part II for further study.

It may include

- Additional data collection
- Field visits
- Laboratory Analysis
- Computer Programming & modeling, if necessary

The submission of completed work in the form of a hard copy and soft copy per project group to the department and self copy for each project group member.

Replacement subject for Sanitary Chemistry & Microbiology to Repeaters and Class Improvement Candidates only

B.E. (Environmental Engineering) –Sem.-VIII

(Previous Course)

ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY

Teaching Scheme:	Examination Scheme:
Lectures: 3 Hours / Week	Paper: 100 Marks
Practicals: 2 hours / Week	Term work: 25 Marks
	Oral: 25 Marks

Section – I

Unit 1:

Importance of Chemistry in Environments Engineering Basic concepts from general Chemistry, Qualitative Quantitative, physical

Unit 2:

Basic concepts of organic Chemistry, Structural and Ring formulae of common organic compounds, their properties and significance.

Unit 3:

Biochemistry, Degradation, synthesis of carbohydrates, fats and proteins.

Unit 4:

Oxidation – Reduction potential, Half Reactions and coupling of Reaction.

Unit 5:

Analysis and Significance of various physical and Chemical characteristics of water and waste water.

Section – II

Unit 6:

Survey of microbial life, characteristics and classification of bacteria, cell morphology, Reproduction and growth of bacteria, Growth rate curve, culture Techniques, Gram staining, Microscopic methods, MPN and plate count, membrane filter techniques.

Unit 7:

Algae classification, factors affecting algal growth and control of algae, Fungi, molds, protozoa and their role in waste water treatment.

Unit 8:

Control of Microbial population, physical and chemical methods.

Unit 9:

Aerobic, Anaerobic metabolisms, energy transfer processes in metabolism, energy Rich compounds.

Term work:

Laboratory work consisting of

1. Determination of Heavy Metals in water and waste water samples.
2. Microscopic Examinations, Identification of Micro flora.
3. M. P. N. and Plate count Tests.
4. Gram staining Techniques.
5. Atomic Absorption Spectrophotometer.

Reference Books:

1. Chemistry for Environmental Engineers – C. N. Sawyer & M. C. Carty.
2. Outlines of Biochemistry: Conn and Stump.
3. Microbiology of Sanitary Engineers: Ross E. Mc-Kinney.
4. Microbiology: Pelzer and Reid.
5. O/ S. Codes for water and waste water.
6. Standard methods of Examination of: APHA water & waste water.

Replacement subject for Environmental Risk Assessment to Repeaters and Class Improvement Candidates only

B.E. (Environmental Engineering) –Sem.-VIII

(Previous Course)

ELECTIVE –II

ENVIRONMENTAL RISK MANAGEMENT

Teaching Scheme:
Teaching - 3 Lectures/Week
Practicals - 2 Hrs./Week

Examination Scheme:
Theory Paper - 100 Marks
Term Work - 25 Marks
Oral -25 Marks

Section - I

Unit 1 Environmental Risk

Environmental risks & types, the management risk, need of environmental risk management.

Unit 2 Establishing an overview of the problem

Models, boundaries and contexts, modeling the problem, setting boundaries to the risk system, putting the risk into comparative context.

Unit 3 Identifying and estimating risk

Selection of techniques, environmental monitoring and health surveillance, testing and screening, modeling, environmental models

Section - II

Unit 4 Risk evaluation and national policies

Policy considerations, legislative considerations, legal considerations, economic considerations.

Unit 5 Managing environmental risks

Developing a national risk profile, institutional arrangements, risk management tasks.

Unit 6 Risk management in National Context

Environmental links, socio-economic links, common national problems, emerging needs and suggested actions.

Term Work

The term-work shall comprise of a minimum of six Exercises/Tutorials, one each on the units mentioned above.

Reference Books

1. Environmental Risk Assessment (Scope 13-18) – Anne V. Whyte and Ian Burton.

List of Equivalent Subjects

BE Environmental Engineering –Sem.-VII

Sr. No.	Subjects from prerevised course	Equivalent Subjects
1.	Design of Concrete Structure - II	Design of Concrete Structure – I of existing BE Civil part – I course
2.	Quantity Surveying & Valuation	Quantity Surveying & Valuation of existing BE Civil part – I course
3.	Air Pollution & Control	Air Pollution – II of revised BE Env. Engg. - I
4.	Sanitary Chemistry & Microbiology	# Environmental Chemistry & Microbiology
5.	Elective – I (previously offered) - Solid Waste Management - Disaster Planning & Risk Analysis	* Solid Waste Management of Revised TE Env. Engg. II Course Disaster Planning & Risk Analysis of Revised BE Env. Engg – I Course (Elective – I)

Sem.-VII

1.	Design of Concrete Structure - III	Design of Concrete Structure – II of existing BE Civil – II course
2.	Industrial Waste Treatment	Industrial Waste Treatment of revised BE Environmental Engg. – I Course
3.	Advance Water & Wastewater Treatment	Advance Water & Wastewater Treatment of revised BE Environmental Engg. – I Course
4.	Environmental Policy and Law	Environmental Policy and Legislation of revised BE Environmental Engg. – II Course
5.	Elective –II (previously offered) - Environmental Risk Assessment - Environmental Sanitation	# Environmental Risk Management * Ecology & Env. Sanitation in Revised SE Env.Engg. – I Course

Note –

New concepts & specialized areas are developing in the field of Environmental Engineering. For acquainting students to them, new subjects are included in the curriculum. Therefore wherever possible an equivalent subjects are given in revised course to the subjects of prerevised course.

* Some of the subjects of previous BE Environmental Engg. Course are now at lower classes. Hence they are recommended as equivalent subjects.

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- Syllabus attached