

# North Maharashtra University, Jalgaon

**First year term I**  
**ME Civil Engineering (Environmental Engineering)**  
**Examination scheme and structure with effect from year 2010 – 11**  
**First Year Term – I**

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Environmental Engineering Microbiology	3	--	3	100	--	--	--
2	Design operation and maintenance of water supply and sewerage system	3	--	3	100	--	--	--
3	Air pollution	3	--	3	100	--	--	--
4	Environmental Engineering Chemistry	3	--	3	100	--	--	--
5	Elective-I	3	--	3	100	--	--	--
6	Laboratory Practice-I	--	6	--	--	100	--	50
7	Seminar-I	--	4	--	--	100	--	--
<b>Total</b>		15	10		500	200		50
<b>Grand Total</b>		<b>25</b>		<b>750</b>				

### Elective-I

- 1) Environmental Sanitation
- 2) Remote Sensing GIS and its environmental application
- 3) Rural water supply and sanitation

**ME Civil Engineering (Environmental Engineering)  
First Year Term – II**

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Advanced Water Treatment Technology	3	--	3	100	--	--	--
2	Advanced Waste Water treatment Technology	3	--	3	100	--	--	--
3	Industrial water and waste water Management	3	--	3	100	--	--	--
4	Water shed management	3	--	3	100	--	--	--
5	Elective-II	3	--	3	100	--	--	--
	Laboratory Practice-II	--	6	--	--	100	--	50
	Seminar-II	--	4	--	--	100	--	--
<b>Total</b>		15	10	--	500	200		50
<b>Grand Total</b>		<b>25</b>		<b>750</b>				

**Elective II**

- 1) Design of Water Supply and Waste Water structure
- 2) Environmental impact Assessment
- 3) Solid Waste and Management

**ME Civil Engineering (Environmental Engineering)  
Second Year Term I**

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Seminar – III	--	4	--	--	50	--	50
2	Project Stage – I	--	18	--	--	100	--	--
<b>Total</b>		--	22	--	--	150	--	50
<b>Grand Total</b>		<b>22</b>		<b>200</b>				

**ME Civil Engineering (Environmental Engineering)  
Second Year Term II**

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Progress Seminar	--	--	--	--	50	--	---
2	Project Stage - II	--	18	--	--	150	---	100
<b>Total</b>		--	18	--	--	200	--	100
<b>Grand Total</b>		<b>18</b>		<b>300</b>				

North Maharashtra University, Jalgaon  
**ME Civil Engineering (Environmental Engineering)**  
Examination scheme and structure with effect from year 2010 – 11

**First year term I**

**1) ENVIRONMENTAL ENGINEERING MICROBIOLOGY**

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
Term work 50 marks

Theory 100 marks  
Min passing 40 marks  
Duration - 03Hours

Role of microorganisms in environmental engineering. Microorganism classification, bacteria, Algae, Fungi, Protozoa, Crustacea, Rolifers, Oligochaeta, Parasites. Observation of microbes. Biochemical reactions. Metabolic activities. Role of enzymes. Pure and mix culture. Biodegradibility. Factors affecting biodegradability, ph, temperature, nutrition, salt concentration, toxicity, osmotic pressure etc. Optimum conditions for growth, oxygen requirement.

Bacterial metabolism- oxidation of carbohydrates Protein and fats under aerobic and anaerobic conditions, Carbon, Nitrogen and Sulfur cycles in nature.

Role and micro-organisms in the treatment of sewage and industrial wastes by different methods.

Synthesis, growth and death of microorganisms, population dynamics.

Role and significance of bacteria and viruses in potable water, occurrence of water borne diseases and their prevention, Bacterial indicators of pollution.

M. P. N. techniques and bacterial colony counting, M. F. technique – principle, procedure, limitation of test, Interpretation of analytical results. Bacteriological standards for raw and treated waters.

Applied microbiology of domestic sewage and industrial wastewater. Anaerobic and aerobic metabolic pathways.

Microbial inner look into various wastewater treatment systems including trickling filter, activated sludge process, oxidation ponds, anaerobic digesters.

Role of microorganisms in solid waste disposal, pathogenic aspects of landfilling and composting, microbiological factors affecting performance of landfills and composting plants.

Effect of radioactivity on microorganisms. Milk and food sanitation. Air born disease, spread and control of air born diseases. Biological indicators of pollution. Control of Algae and other Biological growth in water supplies.

**Term work:**

1. Determination of MPN index of a given sample of water.
2. Study of optical microscope and its setting.
3. Preparation of culture media.
4. Acclimatization of bio mass and its concentration under aerobic conditions.
5. Determination of B Coli count of water by membrane filtration method.
6. Study of microbes under microscope and staining of microorganisms.
7. Study of heavy metals on microorganisms.
8. Five Assignments based upon above syllabus.

**Books:**

1. Microbiology for sanitary engineer by McKinney.
2. Sanitary microbiology by Gaudy and Gaudy.
3. Microbiology by Pelzar.

## 2. ENVIRONMENTAL ENGINEERING CHEMISTRY

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

Basic concepts from general chemistry- elements, atomic weights, gram atomic weights, compounds, mole, avagadro's number, valancy, oxidation state, nomenclature, chemical equations and weight relationship, oxidation-reduction, gas laws, solutions, Le Chatelier's principal, , ionization, common ion effect, shifting chemical equilibria, amphotermic substances.

Basic concepts from physical chemistry- thermodynamic aspects, energy, enthalpy, entropy, Gibb's free energy, vapor pressure, surface tension, solution of solids in liquids, osmosis, dialysis, solvent extraction, electrochemistry, chemical kinetics, catalysis, adsorption,.

Basic concepts from organic chemistry- carbon atom, isomerism, hydrocarbons, alcohols, aldehydes, ketones, acids, esters, ethers, alkyl halides, amines, amides, cyclic aliphatic compounds, aromatic compounds, phenols, heterocyclic compounds, dyes, common foods, trace organics, detergents, pesticides.

Basic concepts from equilibrium chemistry- limitations of equilibrium calculations, ion activity coefficients, acids and bases, buffers, solubility, complex formation, oxidation-reduction, preliminary numerical treatment with these topics.

Basic concepts from colloid chemistry- colloid, methods of formation, dispersion of colloids in liquids, dispersion in air.

Basic concepts from biochemistry chemistry- enzymes, cofactors, temperature dependence, pH, trace elements, biochemistry of protines, biochemistry of fats, biochemistry of carbohydrates, energetics and bacterial growth.

Standard methods of examination of waters and wastewaters, standard solutions, primary and secondary standards, colorimetry.

### **LIST OF PRACTICALS:**

1. Preparation of standard solutions.
2. Determination of conductivity
3. Kijedahl Nitrogen determination.
4. Calcium, magnesium and total hardness.
5. Determination of Iron using spectro photometry
6. Determination of chromium using spectro photometry
7. Determination of fluoride using spectro photometry
8. Residual chlorine determination..
9. Determination of Dissolved oxygen of a given sample of water.
10. Determination of Biochemical oxygen demand of a given sample of wastewater using acclimatized bio mass..
11. Determination of TOC of a given sample of wastewater.
12. Determination of IOD of a given sample of wastewater.

Any ten experiments out of the twelve experiments given above must be performed.

#### **Books:**

1. Chemistry for environmental engineering: Sawyer and McCarty, TMC Publication N Delhi.
2. Physical chemical and organic chemistry by Bahal and Tuli, Khanna publication New Delhi.

### **3. DESIGN OPERATION AND MAINTENANCE OF WATER SUPPLY AND SEWERAGE SYSTEM.**

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

Importance of sewerage system. General History of water supply and sewerage system in India. Development in different five year plans, Future scope.

Estimation of water requirements and flow into sewers.

Sources of water, Surface and underground sources. Intake structures, construction and maintenances of wells and infiltration galleries. design of intake structures.

Transmission of water, Types and materials of conduits, Hydraulic characteristics, Water hammer appurtenances, Pumping of water, types, design and selection.

Types of pumps, Economics of pumps and rising main.

Distribution of water, Pressure and capacity requirement of systems. Field and office analysis of distribution network, Service reservoir. Maintenance of distribution system. Emergency disinfections of mains.

Sewerage System : Patterns of sewerage systems, kinds of sewer.

Design of sewerage systems : Hydraulics of sewers. Flow at sewer transitions. Length of side weirs and capacity of street inlets, Estimates of sewage flow. Storm water runoff.

Design and layouts of sanitary and combined sewerage systems. Maintenances of sewers.

Sewer Appurtenance : Manholes, flushing tanks. Inverted siphons, Regulators., design and working principal

Pumping of sewage: Necessity, Types and characteristics of pumps. Typical problems in sewage pumping.

Plumbing requirements of tall buildings: design of water supply and sewerage for houses, numerical treatment.



**Term work:** term work shall be based upon ten assignments based upon the above mentioned syllabus. The assignments should base upon following topics:

- a. Significance of sewerage and eater supply systems and their history. (one assignment)
- b. Design of intake structure. (one assignment)
- c. Design of pressure mains (one assignment)
- d. Materials, layout and maintenance of pipes network. (two assignments)
- e. Design of pipe network. (two assignments)
- f. Estimation of run off and sewerage (one assignment)
- g. Design of sewer (two assignments)
- h Lay out and maintenance of sewers (one assignments).

**Books:-**

1. Water & Wastewater Technology:- Mark J. Hammer
2. Pumping and collection of wastewater, Meclaf and eddy Inc.
3. Water supply & Wastewater engineering :-B.S.N. Raju
4. Water supply engineering :-Dr. P. N. Modi.

## 4. AIR POLLUTION

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

Definitions, energy environment relationship.

Importance of air pollution studies in modern world, elements of air pollution, sources of air pollution, effects of air pollution on human beings, plant, animals, property. Economic effects of air pollution. Global and local effects of air pollution. Case studies of India and world. Permissible air pollution. Ambient and effluent standards.

Nature's cleaning mechanism. Point source. Atmospheric conditions and dispersion of air pollution, various types of plume behaviors, Gaussian dispersion equations, their limitations, numerical treatment. Estimation of dispersion of air pollution from a given height of stack under given atmospheric conditions, plume rise estimation, estimation of maximum concentration under given conditions, calculation of required height for permissible concentration. Concept of line source.

Air pollution from thermal power plant, their characteristics and control.

Air sampling methods and equipments. Analytical methods for air pollution studies, smoke survey, planning an air pollution survey.

Particulate matter and its control by equipments. Working principal, advantages, Disadvantages, design and applications of various types of particulate control devices.

Concept of bio filters.

Automobile air pollution, types, control methods, effect of A/F ratio.

Photochemical smog formation, bad effects, control.

Control of air pollution : strategy, effect of town planning, road conditions, vehicle condition etc. history of air pollution legislation in India. Life style and air pollution.

Glance over present day global and Indian scenario of air pollution.

**Term work:**

1. Ten assignments based upon above syllabus.

The assignments shall be based upon following topics:

- a. Automobile air pollution and its control (one assignment)
- b. Meteorological factors and their influence on air pollution dispersion, plume behavior (two assignments)
- c. Life style and air pollution control (one assignment)
- d. Energy utilization and environmental degradation (one assignment)
- e. Estimation of effective height of stack (one assignment)
- f. Estimation of required height of stack for pollution control under given environmental conditions (two assignments)
- g. Global environmental phenomenon (two assignments).

2. Visit to a site where air pollution control device is working.

3. Practical:

- a. Air pollution sampling using high volume sampler.
- b. Automobile air pollution sampling using auto exhaust analyzer.
- c. Study of functioning of air pollution control devices installed at sites.

**Books:-**

1. Air pollution:- A C Stern.
2. Air pollution :-M N Rao & H V N Rao
3. Air pollution engineering by Perkins.
4. Air pollution control technology: Wark and Warner.

## **5. ELLECTIVE-I**

### **1. ENVIRONMENTAL SANITATION**

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

Definitions, environment and its effect on public health, global environmental sanitation history, problem of environmental sanitation in India.

Refuse Collection And Disposal: generation, storage and Composition of refuse, quantity, house treatment, Administration of collection and disposal. Socio economic and cultural aspect associated with refuse management problem.

House sanitation: importance of house sanitation, indoor pollution, importance of sun light, Heating, cooling, ventilation, air conditioning, lighting. Noise-hazards of noise, protection against noise, fly and mosquito control. Architectural aspects for house sanitation.

Communicable Disease: Disease and immunity, communicable, diseases source, Mode of transfer, Control of communicable diseases

Sanitation of public places: Problems of sanitation of the following public places and their solutions : Swimming pools and bathing places, Bus and railway station, Hospitals, Cinema houses, Campus, fairs and festival.

Milk Food Sanitation: Essentials of dairy farm and cattle shed sanitation. Tests for milk and dairy products. Food epidemics, food poisoning, Botulism.

Parasitology: Tropical health, Health problems of under develop countries. Disease due to parasite infestation. Physiological effects, specific examples of region. Engineering control.

**Term work:** Ten assignments based upon above syllabus as on following topics:

- a. Importance of environmental sanitation and historical back ground  
(one assignment)
- b. Traditional Indian practices for environmental sanitation and health protection. (one assignment)
- c. Refuse problem and its cultural aspects (two assignment)
- d. Refuse collection and socio economic aspects.(two assignment)
- e. Disease transmission and its prevention, role of individual and community (two assignments)
- f. Sanitation of public places (two assignment)

In addition to above, students must do a minor project based upon above syllabus the project must be a case study of field.

**Books:-**

1. Municipal & Rural Sanitation:- Ehlers &Steel
2. Environmental Management:- G.N. Pandey
3. Environmental Sanitation:- B.S. Kapoor

## **2. REMOTE SENSING, GIS AND ITS ENVIRONMENTAL APPLICATIONS**

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

Fundamental principals of remote sensing, electromagnetic energy and its atmospheric interactions, remote sensing systems.

Elements of remote sensing systems, Indian remote sensing program.

Principles of Ariel survey, ariel photography, scale, types of photographs, over lapping, drift and drag, air photo interpretation, equation of parallex, stereoscopic vision, air base distance, areil points.

Satellite imageries, stationary and geo-stationary satellites, global positioning system and its application in environmental engineering. Indian satellite program.

Geographical information system, fundamentals, applications, characteristics. Different types of sensors, data interpretation.

Integrated application of remote sensing and GIS in environmental engineering, resource management, monitoring and evaluation, modeling.

**Term work:**

1. Practice with GIS software.
2. Minor project using GIS
3. Study of areil photographs and satellite imageries.
4. Five assignments based upon above syllabus. The assignments should include following topics:
  - a. Principles of remote sensing (one assignments)
  - b. GIS, its scope and applications (Two assignments).
  - c. History and development of GIS (one assignment)
  - d. Digital data interpretation (one assignment).

**Books:**

1. Remote sensing, principles and interpretation by W H & Freeman & Co. NY.
2. Remote sensing by Gupta R P.
3. Introductory digital image processories by Jensen J R, Pentice Hall, NZ.

### 3. Rural Water Supply and Sanitation

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

Importance of village community in India , conditions of Indian villages with special regard to economic ,social and health aspect. Quality of water needed for village community. Sources of water for village water supplies. Types of wells of sanitary aspects in well construction. Disinfections of wells. Different types of pumps used for village wells. Treatment of water. Hydrological aspects of source and its impact on water quality. Strengthening of source.

Engineering project and role of engineer. Steps in project development report. Feasibility of the project both technical and financial. Alternative project construction. Cost comparison, scientific management and relationship , Rationalization, Qualities of good manager , office organization. Organization and management of stores. Present worth annuities, sinking funds, capitalized cost, annual expense, depreciation salvage value Rate structure, sources of money. General principles of financing, capital improvements and operating water works. Benefit cost ratio analysis, life of scheme, history, development and management of water supply and sanitary engineering projects in India. Design of rural water supply scheme. Cost estimation of rural water supply scheme.

**Term work:** Five assignments based upon above-mentioned syllabus. The above assignments shall include following topics:

- a. Importance, history and economic aspect of rural water supply in India. Five year development plans (one assignment).
- b. Project management techniques applied to rural water supply engineering (two assignments)
- c. Automation of small water supply schemes and limitation (two assignments)



In addition to above, the candidate must do a minor project based upon rural water supply schemes. It may be a case study or a design.

**Books:-**

1. Water supply Engineering:- S.K. Garg
2. Management of water projects:- Oxford &IBH publishing Co.
3. Pumping and Collection of water by MetCalf and Eddy TMC publications.

## **Laboratory Practice I**

All assignments are compulsory

1. Assignment No I – Environmental Engineering Microbiology
2. Assignment No 2 – Design operation and maintenance of water supply and sewerage system
3. Assignment No 3 – Air pollution
4. Assignment No 4 – Elective I

Experiment (Minimum Four)

1. Determination of Microbial quality of water by standard Plate count
2. Determination of coli form density by MPN method
3. Membrane Filter Test
4. Determination of  $\text{NO}_x/\text{SO}_x$
5. Determination of chloride content
6. Determination of C O D
7. Determination of Oil and Grease

## **ME Civil Engineering (Environmental Engineering)**

### **TERM II**

#### **1. ADVANCED WATER TREATMENT TECHNOLOGY**

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

Quality of water: Standards of raw and treated waters. Sources of water and their natural quality. Protection of sources. Effects of water quality. Water ecology, water demand, fluctuation, water supplies.

Water treatment: Requirements of water treatment facilities. Process design and hydraulic design.

Unit operations and process, kinetic theory of reactors, plug flow and completely mixed reactor, dye tracing, efficiency of reactors, reactors in series, partially mixed reactors.

Sedimentation and flotation: General equation for settling or rising of discrete particles. Hindered settling. Effect of temperature, viscosity. Efficiency of an ideal settling basin, Reduction in efficiency due to various causes. Sludge, Storage and removal. Design criteria of settling tanks.

Coagulation: theories of chemical coagulation, coagulation aids. Mixing arrangement design of mechanical flocculator. Mean velocity gradient, effect of temperature.

Filtration: Theory of filtration. Size & shape characteristics of filter media. Preparation of filter sand. Hydraulics of filtration through homogenous and stratified media.

Hydraulics of filter washing. Design of filter elements. Filter appurtenances, multimedia filters.

Disinfection: importance of disinfections, Methods of disinfections. Factors affecting disinfections. Destruction of bacteria, virus. Methods of dosing. Safety measures. Bad effect of chlorination.

Aeration: Principles of aeration methods.

Softening of water: types of hardness, effects, permissible limits, Langelier index, Methods of softening.

Miscellaneous water purification processes: Removal of Iron and manganese, Removal of taste and odor. Removal of Fluorides. Treatment of saline water.

Corrosion: Theory and principles of corrosion, Factors influencing corrosion. Methods of protection.

Latest methods of water treatment.

Complete design of water treatment plant as per prevailing Indian standard codes of practice with cost estimation.

**Term work:**

1. Five assignments based upon above-mentioned syllabus. The assignments should include following topics:

- a. Design of primary settling tank with all components
- b. Design of secondary settling tank with all components
- c. Design of coagulation units with all components
- d. Design of Filtration unit with all components
- e. Design of disinfection unit with all components.

2. Visit to a water treatment plant and its report.

3. Complete design of water treatment plant with all details, drawings and cost estimation.

**Books:-**

1. Water supply and sanitary engineering: E W Steel.
2. Water treatment technology: Walter J Weber
3. Water treatment manual by CPHEEO

## 2. ADVANCED WASTEWATER TREATMENT TECHNOLOGY

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

Sewage characteristics: Characteristics of domestic sewage, storm and combined sewage.

Constituents of Sewage. Sampling and storage of sewage. Decomposition of organic materials. Biodegradability. Biochemical oxygen demand. BOD satisfaction rate constant. Population equivalent. Chemical oxygen demand.

Monod's equation for substrate utilization. Kinetic coefficients of microbial decomposition of wastewater under aerobic and anaerobic conditions. Determination of kinetic coefficients. Mathematic relationship between coefficients. Kinetic theory applied to aerobic and anaerobic suspended growth mixed biological reactor, Kinetic theory applied to aerobic and anaerobic attached growth biological reactor.

Sewage disposal: Disposal methods. Self Purification of natural bodies of water. Oxygen balance and oxygen sag. Critical time and critical distance, mathematical treatment. Sewage farming.

Sewage treatment: Object of sewage treatment. Process design and hydraulic design.

Screening and Grit Removal: Design and operation of screens. Disposal of screening. Principles of sedimentation applied to grit chamber. Velocity control. Disposal of grit.

Oil and grease separation: Sedimentation Primary , intermediate and final clarification.

Design of tanks. Removal of sludge and scum . Sedimentation aided by chemical.

Principle and theory of biological methods of treatment. Design of facilities for biological treatment of wastewater, activated sludge process, trickling filters, anaerobic and aerobic lagoons, oxidation ditch, oxidation ponds, septic tanks.

Sludge production, removal, handling, disposal methods, bio gas generation, design of bio gas reactor, sludge drying beds and their design. Aerobic digesters.

Miscellaneous Treatment: Disinfections of sewage. Coagulation of sewage.

Non biodegradable organics, their occurrence, bad effects, conventional removal methods introduction to photocatalysis theory for non biodegradable organics.

Complete design of wastewater treatment plant with all components, details, drawings and cost estimation.

**Term work:**

1. Five assignments based upon above-mentioned syllabus. The assignments should include following topics:
  - a. Design of preliminary treatment system.
  - b. Design of primary treatment system.
  - c. Design of Biological treatment system
  - d. Design of tertiary treatment system
  - e. Design of advanced wastewater treatment methodology.
2. Visit to a wastewater treatment plant and visit report.
3. Complete design of wastewater treatment plant with all components, details, drawings and cost estimation.

**Books:-**

1. Wastewater treatment, disposal and reuse: Metcalf & Eddy Inc.
2. Wastewater treatment technology by S J Arceiwala.
3. Wastewater treatment system by Hammer.
4. Wastewater treatment manual by CPHEEO

### **3. INDUSTRIAL WATER AND WASTEWATER MANAGEMENT**

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

Special problems of Industrial wastewater, water quality index and its application for industrial wastewater recalculation and reuse, industrial ecology, integrated approach for industrial water and wastewater management.

Water requirements of various industries. General idea of manufacturing process in various industries. Sources of wastewaters.

Legal aspects of industrial wastewater management, Regulatory agencies, Standards for treatment.

Reuse and recovery of bye products from industrial wastewaters. Volume reduction and waste reduction approach for pollution control, concept of end of pipe and cleaner technology.

Combine effluent treatment plants, combined domestic and industrial wastewater treatment plants.

Acclimatization of bio mass for industrial wastewater treatment, addition of nutrients.

Case studies of various industries including textile industry, distilleries, sugar industry, paper and pulp mills, oil and petroleum, dairy, food processing industries.

#### **Books:-**

1. Liquid waste of industry- theory practice and treatment: Nelson J Nemerow
2. Industrial water pollution control: W W Eekenfelder
3. Industrial wastewater management by R Mahajan TMC publication
4. Manual of Industrial wastewater by NEERI

**Term work:**

Five assignments based upon above syllabus. The assignments shall include following topics:

- a. Characteristics of wastewater of major industries in India.
- b. Pollution impact of major industries on wet land and soil.
- c. Integrated water and wastewater management of major industries.
- d. Typical problems with wastewater treatment of major industries.
- e. Advance treatment methodology for major industrial wastewaters.

In addition to above, students should visit to at least three industrial wastewater treatment plants and submit a report.



## **4. WATERSHED MANAGEMENT**

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

Introduction: scope, objectives significance.

Water in the atmosphere: global distribution and availability of water, precipitation and evaporation, factors affecting them.

Hydrology and water resources development: analysis of runoff and rain fall, storage and regulation of run off, safe yield of streams, estimation of storage requirements. Pollution monitoring in watershed and its control, watershed hygiene.

Hydrology of ground water: common aquifers, exploration of ground water, hydraulics of ground water, measurement of permeability. Design construction and maintenance of wells and infiltration galleries. Salt water infiltration and prevention, ground water recharge.

Watershed development and management: definitions, need, scope, characteristics of watershed criteria survey, basic data collection and interpretation, establishment of watershed resource evaluation and management. Urban watershed management strategy and its necessity in present time. Town planning aspect for watershed management.

Irrigation technology: integrated farming system, prospects of watershed management, methodology for modifying water resource environment, watershed management and large scale changes.

Practice of watershed management: rehabilitation, protection and enhancement.

Rain water harvesting: necessity, methods of rainwater harvesting, community participation, role of NGOs, municipal corporation, Government. Limitations. Quality assurance of storage water. Traditional water harvesting techniques and their relevance.

Design of structures for watershed management including small bandhara, percolation tanks, minor dam.

**Term work:** Seven assignments based upon above-mentioned syllabus. Site visit to an existing rainwater harvesting site. The assignments should be based upon following topics:

- a. Water in the atmosphere
- b. Hydrology and water resources development
- c. Hydrology of ground water
- d. Watershed development and management
- e. Irrigation technology
- f. Practice of watershed management
- g. Rain water harvesting
- h. Design of structures for watershed management

In addition to above the candidate should do a case study or design of a watershed management scheme.

**Books:**

1. Watershed hydrology: Peter E Black.
2. Water resources systems: planning and management: R N Chaturvedi.
3. Watershed Management strategy by S P Shah TM C publication.

**ME Civil Engineering (Environmental Engineering)**

***ELLECTIVE II***

**1 DESIGN OF WATER SUPPLY AND WASTEWATER STRUCTURES.**

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

Introduction to IS codes for practice for steel and concrete tanks and pipes.

Conduits: Stresses in pipes, strength of conduits, Design of concrete and steel pipe for internal and external loads. Anchor blocks.

Tanks: Design of various types of underground tanks, safety analysis, retaining wall and floor junction. Surface resting rectangular and circular tanks in R.C.C. and steel. Over head rectangular and circular tanks in R.C.C. and steel. Intze tanks. Steel and concrete staging.

Treatment Units: Design clarifiers, flocculators, filter house, Hopper bottom tanks. Digesters.

**Books:**

1. Design of steel structures:- S. Ramamurtham
2. Design of concrete structures: S Ramamrtham
3. Design of concrete structures: Syal and Goel

Term work:

1. Design and detailing with drawings of circular water tank on surface.
2. Design and detailing with drawings of rectangular water tank on surface.
3. Design and detailing with drawings of bracings for overhead water tank.
4. Design and detailing with drawings of Intze type water tank.
5. Design and detailing with drawings of rectangular water tank under ground.
6. Design and detailing with drawings of flocculation unit.
7. Design and detailing with drawings of filtration unit.

Any five assignments of above.

## 2 ENVIRONMENTAL IMPACT ASSESSMENT

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

Development and environment, need for environmental impact assessment, concept of EIA, elements of EIA, environmental attributes, nature of impacts- primary, secondary, tertiary, short term and long term, local and regional, reversible and irreversible impacts.

Overview of impacts- directly and indirectly measurable impacts with respect to air, noise, water, land, biological and socio economic environment.

Screening and scoping in EIA: terms of reference for conducting EIA, methodologies of EIA- check list, matrices, overlays, cost benefit analysis adaptive environment and management network.

Frame work of EIA: scope of EIA, base line data collection, prediction of impacts, evaluation of impacts, Battelle environmental evaluation system, environmental management plan, green belt development, environmental quality monitoring, budgetary provisions for implementing control measures.

Environmental appraisal of project, MOEF questionnaire for environmental clearance, elements of public participation and hearing, case study on EIA of industrial, mining, highway and water resources projects, critical environmental issues and formulation of strategies for EMP for this project.

Environmental legislation- basic concepts, critical issues, civil liabilities, various enactments and their provisions- water act (1974, 1978), forest conservation act (1980), air pollution control act (1981, 1988), water (cess) act 1977, environmental protection act 1986, public liability and insurance act.

Environmental audit- definition, concept of EA, types of environmental audits, benefits of EA, scope and objectives, environmental statement, procedural aspects of conducting EA pre-audit phase, onsite audit phase and post audit phase, water audit,

energy audit, raw material audit and health & safety audit. Conservation of energy and water, waste minimization, economic benefits of EA.

Sustainable development and environmental management: concept of carrying capacity, assimilative and supportive capacity, carrying capacity based developmental planning process, regional EIA and preparation of regional EMP, , development of action plan for critical environmental areas, training needs in EM and Environmental Educational Programs. Environmental management in India.

Resource management: types of resources, terrestrial (soil) resource, mineral plants and animal (biotic) resources, marine fresh water, air and bio energy resources, resource utilization, renewable and non-renewable resources. Optimal use of resources. Depletion of resources, causes and effects.

Human resources: importance of socio economic studies in development projects.

**Books:**

1. Environmental Impact Assessment by Rau and Woofes.
2. Environmental Impact Assessment by W F Canter, TMC publication.
3. Hand books of pollution control act, central pollution control board, New Delhi.
4. The new environmental age by R K Sapra, S Bhardwaj, Ashish publication house New Delhi.

**Term Work:**

Five assignments based upon above syllabus. Assignments shall include following topics:

1. Development and environment
2. Overview of impacts
3. Frame work of EIA:
4. Environmental appraisal of project
5. Environmental legislation

In addition to this the candidate must do a minor project of EIA of any industry or any other development project.

### 3. SOLID WASTE AND MANAGEMENT

Lectures – 03 Hours / Week  
Tutorial - 01Hours/week  
term work 50 marks

Theory 100 marks  
min passing 40 marks  
Duration - 03Hours

General: Importance of solid waste, historical background. Over view of solid waste management

Generation of solid waste, quantity of solid waste, sampling of solid waste, characterization of solid waste, characteristics of solid waste, three phase diagram.

Storage systems, multi-bin storage system, levying on solid waste weight, climatic factors, cultural factors, removal of solid waste.

Transportation of solid waste, route optimization, numericals on route optimization and optimum number of transportation facility..

Recovery and reuse of solid waste, waste minimization. Numericals on chemical characteristics of SW.

Disposal methods of solid waste: land filling site selection, advantages and disadvantages of land filling, leachets control, fly and mosquito control at land fill side.

Composting of solid waste, Indore and Bangalore methods, future of composting, limitations of composting method.

Vermicomposting: introduction and significance.

Incineration of solid waste: application, design of incinerator.

Dumping of solid waste in sea, grinding and dumping into sewers, hog feeding.

Hazardous wastes.

Socio economic and cultural aspects in solid waste management.

Management of thermal power plant waste, reuse of flyash, economic considerations.

Biomedical waste management, safety precautions, standards, disposal methods.

**Term work:** ten assignments based upon above syllabus. Visit to a solid waste site.

#### **Books:-**

1. Handbook of solid waste management:- Frank Kreith
2. Management of solid waste in developing countries:- Frank Flintoff
3. Solid waste management:- D. Joseph Hagerty, Joseph L.Pavoni

## **Laboratory Practice II**

All assignments are compulsory

1. Assignment No I – Advanced Water Treatment Technology
2. Assignment No 2 – Advanced Waste Water treatment Technology
3. Assignment No 3 – Industrial water and waste water Management
4. Assignment No 4 – Water shed management
5. Assignment No 5- Elective II

Experiments (Minimum Three)

1. Estimation of Hardness
2. Estimation of Ammonia/Nitrogen
3. Estimation of Phosphate
4. Estimation of Heavy metal
5. Estimation of pesticide residue



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**CIVIL ENGINEERING DEPARTMENT**

**MASTERS OF ENGINEERING**

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**(ENVIRONMENT ENGINEERING)**

With effect from Academic year 2010 -2011

