

SHIVAJI UNIVERSITY , KOLHAPUR
STRUCTURE OF THE B.E. (ENVIRONMENTAL ENGINEERING) COURSE
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	Programing Laboratory	2	-	2	-	4	-	50	-	-	50
	Total (Part I)	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	-	-	050
	Total (Part II)	18	2	8	2	30	500	225	25	50	800
	Grand Total										1600

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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	Wastewater Engg.	3	1	2	-	6	100	50	-	25	175
2	Urban & Rural Planning	4	1	-	-	5	100	50	-	-	150
3	Water Resources Engineering	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	-	-	050
Total (Part I)		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	-	-	050
Total (Part II)		18	1	10	-	29	500	225	-	75	800
Grand Total											1600

S.E. (Environmental Engg.) Part I

1. ENVIRONMENTAL CHEMISTRY

Teaching Scheme:

Lectures: 3 Hrs/week

Practical: 2 Hrs/week

Examination Scheme:

Theory : 100 marks

Term work: 50 marks

Oral : 25 marks

SECTION I

Unit 1.

Significance of Chemistry in Environmental Engineering, Basic concepts from general chemistry, gas laws, Chemical equilibrium 3

Unit 2

.Basic Concepts from physical chemistry, Thermodynamics – Heat & work, energy, enthalpy, entropy, Vapour pressure of liquids, Binary mixtures, Solutions of solids in liquids, Osmosis, Dialysis, Principles of solvent extraction, Electro Chemistry, Chemical Kinetics Catalysis, Adsorption. 4

Unit 3.

Basic Concepts from Organic Chemistry, Sources and properties of organic compound, structural and ring formulae of common organic compounds, their properties and significance Aliphatic compounds, Aromatic compounds, Heterocyclic compounds, common food and related compounds – Carbohydrates, Fats, Oils & Waxes, Proteins, Trace organics, Detergents, Pesticides. 5

Unit 4.

Basic Concepts from equilibrium and Colloidal Chemistry, Equilibrium Problems, Acids & Bases, Buffers, Solubility of Salts, Oxidation-reduction reactions, introduction to colloidal chemistry, Colloidal dispersion in liquid & air. 4

Unit 5.

Basic Concepts from Biochemistry, Introduction, Enzymes, Co-factors, Biochemistry of carbohydrates, Proteins, Fats & Oil, Biochemistry of human. 4

SECTION II

Unit 6.

Basic Concepts from Nuclear Chemistry, Introduction, Atomic structures, stable & Radio active nuclides, Nuclear reactions, Nuclear fission & fusion. Effects of radiation on man. 5

Unit 7.

Basic Concepts from quantitative chemistry, Significance of quantitative measurements, Standard methods of analysis, Gravimetric analysis, Volumetric analysis, Colourimetry, Physical methods of analysis. 5

Unit 8.

Instrumental methods of analysis, Optical methods, electrical methods, Gas chromatography 5

Unit 9.

Pollution parameters of water & waste water, Definition & estimation of Turbidity, pH, Acidity, Alkalinity, Hardness, Chlorides, DO, BOD, COD, Nitrogen, Solids, Fluorides, Sulphate, TOC 5

Term Work:

A Journal consisting of Experiments based on following practicals.

1. Determination of pH, Turbidity, Colour
2. Determination of Solids (SS,DS,VS,TS)
3. Determination of Conductivity.
4. Determination of Chloride.
5. Determination of Hardness (Total, Permanent, Temporary)
6. Determination of Iron & Manganese
7. Determination of Ammonia, Nitrite, Nitrate
8. Determination of Sulphate & Phosphorous

Reference books:

1. Chemistry for Environmental Engineering
By-C.N. Sawyer & P.L. McCarty
McGraw-Hill Book Company
2. Aquatic Chemistry
By-Stumm & Morgan

3. Environmental Chemistry
By-A.K. De
Wiley Estern Ltd.
4. A text book of Environmental Chemistry & Pollution Control
By- S.S. Dara
S. Chand Publications, New Delhi
5. APHA – AWWA – WPCE Standard methods for Examination of Water & Waste water
6. NEERI Manual on Water & Waste Water analysis
7. IS Codes 2490, 3306, 3307, 10500

S.E. (Environmental Engg.) Part I
2. ENGINEERING MATHEMATICS – III

Teaching Scheme
Scheme

Lectures: 4 Hrs/week
marks
Tutorial : 1 Hr/week
marks

Examination

Theory :100
Term Work : 25

SECTION – I

Unit 1

Linear Differential Equations: Linear Differential Equations with constant coefficients, Homogenous Linear differential equations
[6]

Unit 2

Partial differential equations: Four standard forms of partial differential equations of first order.
[6]

Unit 3

Vector Calculus: Differentiation of vectors, Velocity and acceleration, Gradient of scalar point function, Directional derivative, Divergence of vector point function, Curl of a vector point function.

[6]

Unit 4

Vector Integration: The line integral, Surface integral, volume integral, Gauss's Divergence theorem, Stoke's theorem, Green's theorem (Without proof). Irrotational and solenoidal vector field.

[6]

SECTION – II

Unit 5

Curve Fitting: Fitting of Curves by method of Least-squares, Coefficient of correlation, Spearman's rank correlation coefficient and lines of regression of bivariate data.

[6]

Unit 6

Probability: Random variable, Discrete and continuous random variable. Probability mass function and probability density function, Probability distribution for random variables, Binomial, Poisson and Normal distributions.

[6]

Unit 7

Test of Significance: Hypothesis, Statistic, Sampling distribution, Critical region. Z-test for mean, equality of means, proportion and equality of proportion. t-test for mean, equality of means, Paired t-test. Chi-square test for goodness of fit and for independence of attributes.

[7]

Unit 8

Convergence of Series: Ratio test, integral test, comparison test, Cauchy's root test, Raabe's test, Logarithmic test. Absolute and uniform convergence (Weirstrass's M- test).

[7]

Term Work:

1. Batchwise tutorials are to be conducted.
2. Minimum number of assignments should be 8 covering all topics.

Reference Books:

1. A text book of Applied Mathematics: Vol. I, II and III by J. N. Wartikar & P. N. Wartikar , Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics by Dr. B. S. Grewal.
3. Advanced Engineering Mathematics by Erwin Kreyszig.
4. Probability and Statistics for Engineers by Douglas Montgomeri.

S. E. (Environmental Engg.) Part I
3. SURVEYING, REMOTE SENSING AND GIS

Teaching Scheme

Scheme
 Lectures: 3 Hrs/week
 Practical: 2 Hrs/week
 Tutorial: 1 Hr/week

Examination

Theory : 100 Marks
 Termwork: 25 Marks
 POE : 50 Marks

SECTION I: SURVEYING**Unit 1:** Introduction to Surveying

Definition of Surveying, Principles, Classification, Types, Plain and Geodetic Surveying, Application in Environmental Engineering, Basics of Angle, Distance and Height measurements 3

Unit 2: Leveling and Traversing

Leveling, Terms, Principles, Dumpy and Auto Levels, Reduction of Levels, Precision Leveling, Contouring, Application of contouring, Theodolite, Types and parts, Measurement of Horizontal and Vertical Angles, Theodolite traverse, Electronic Theodolite and its advantages over conventional Theodolite, Tachometry, Principle, Tachometry Survey 6

Unit 3: EDM and Total Station

EDM, Principles, Types, Angle measurements, Total Stations, Principle, Propagation of Electromagnetic Energy (EME) in the atmosphere and its application to EME ranging, Total Station Surveys 5

Unit 4: Global Positioning System (GPS)

GPS Definition, Principles, Types, Applications in Land, Water and Air, Satellite Positioning; Differential GPS; Kinematic GPS; Accuracy of Differential GPS; Surveys by GPS, Introduction to MAPSEND, Exercises

SECTION II : REMOTE SENSING AND GIS

Unit 5: Introduction to Remote Sensing

Definition, Physics of Remote Sensing, Electromagnetic Radiation and its Interactions with atmosphere, Platforms and Sensors, Aerial Photographs, Active and Passive Sensors, Data Products, Various Satellites in Orbit and their sensors

8

Unit 6: Image Processing and Interpretation

Data analysis - Visual Interpretation and Digital Image Processing, classification

4

Unit 7: Introduction to Geographical Information Systems

Overview of GIS, Definitions, Components, Applications GIS Data, Models Projections and Coordinate Systems, Digitizing, Attribute Data, Spatial Data, Spatial Analysis, Implementation Issues and the Future of GIS, Introduction to IDRISI and CARTALINX Software, Exercises

8

Term work: Consisting of any eight practicals given below.

1. Introduction to Surveying Engineering; Types of land surveys; Instruments.
2. Measurements and Errors; Units; Significant Figures; Types of Errors; Precision and Accuracy; Error Propagation.
3. Distance Measurements: Taping; Electronic Distance Measurement.
4. Leveling; Differential Leveling; Trigonometric Leveling; Adjustments.
5. Field Operations with Transits, Theodolite and Total Stations.
6. Traversing. Computations and Adjustment of Measurements.
7. Area Calculations: Closed polygons, Irregular boundaries, Circular boundaries.
8. GPS Survey and Use of MAPSEND software
9. Visual Interpretation of imagery and aerial photographs
10. Digital Interpretation of imagery and aerial photographs
11. Image Processing on IDRISI and CARTALINX
12. Preparation of Thematic maps

Reference Books

1. Advanced Surveying by Satish Gopi, R. Sathikumar and N. Madhu
2. Remote Sensing and GIS by Anji Reddy

3. Advanced Surveying by Agor R.
4. Future Trends in Remote Sensing by Prebel Gudmandes
5. Scale in Remote sensing and GIS by Dale A. Quattrochi
6. Sensors and Environmental applications of Remote Sensing by Jam Askne
7. Surveying by Kanitkar, Kulkarni
8. Surveying by Duggal
9. Surveying by Arora

S.E. (Environmental Engg.) Part – I
4. FLUID MECHANICS

Teaching scheme:

Lecture: 3 Hrs/ week
 Practical: 2 Hrs/ week
 Tutorial: 1 Hr/ Week

Examination Scheme

Theory :100 marks
 Term Work:25 marks
 Oral :25 marks

SECTION I

Unit 1: Introduction

Scope and importance of subject, properties of fluid and units of measurements, Ideal fluid and Real fluid (3)

Unit 2: Fluid Statics

Hydrostatic pressure forces: Pressure, pressure head, atmospheric-gauge and absolute pressure, pressure measurement by manometers and gauges, Total pressure forces on plane and curved immersed objects, concept of pressure diagram. (7)

Unit 3: Fluid Kinematics

Fundamentals of Fluid flow, Velocity and acceleration of fluid particle, Types of flow, Discharge and continuity equations (4)

Unit 4: Fluid Dynamics

Equations of motion, Bernoulli's theorem, Types of hydraulic energy and energy head, concept of HGL and TEL Applications of Bernoulli's equation viz. orifice, mouthpiece, venturimeter, orifice meter (6)

SECTION II

Unit 5: Flow through pipes

Laminar and turbulent flow, Reynold's experiment, major and minor losses through pipe, pipes in series and parallel, two-three reservoir problem, Hagen-Poisculle and Darcy-Weischbach equation, water hammer phenomenon, Hydrodynamic ally smooth and rough surfaces, introduction to Moody's chart and monograms. (8)

Unit 6: Flow through open channel

Difference between open channel flow and flow through pipes, classification of open channel flow, uniform flow formulae and their application, specific energy curve, hydraulically most efficient channel sections. Introduction to Hydraulic jump, uses of Hydraulic jump. (6)

Unit 7: Flow measurement in open channel flow

Measurement of velocity by Pitot tube, current meter, surface float and velocity rods, Measurement of discharge by notches and weirs, Flow through venturimeter, parshall flume. Measurement of discharge by slope-area, velocity-area method. (6)

Term Work

At least six experiments from the following

1. Study of pressure measurement devices
2. Verification of Bernoulli's Theorem
3. Calibration of an orifice
4. Calibration of an orifice meter / Venturimeter
5. Study of factors affecting coefficient of friction for pipe flow
6. Determination of head loss due to sudden expansion, contraction, elbow, bend,
7. Study of Monogram / Moodys' Chart
8. To study the flow through a horizontal contraction in a rectangular channel.
9. To calibrate a rectangular / triangular/ broad-crested weir.
10. To study the characteristics of free hydraulic jump.

Reference Books

1. Hydraulics and fluid mechanics- Modi Seth-Standard Book House, Delhi
2. Fluid Mechanics-A. K. Jain – Khanna Publication, Delhi
3. S. Nagrathanam - Khanna Publication, Delhi
4. Garde Mirajgaokar- Nemchand & Brothers, Roorkee
5. Hydraulics and fluid mechanics Bansal

S. E. (Environmental Engg.) Part I

5. ECOLOGY AND ENVIRONMENTAL SANITATION

Teaching Scheme

Scheme:

Lecture: 3 Hrs. / Week

Marks

Tutorial: 1 Hr / Week

Marks

Examination

Theory :100

Term Work: 25

SECTION –I

Unit 1: Ecology

Definition, Ecosystem, Classification of ecosystems on the basis of source and level of energy, Components of an ecosystem, Different ecosystem existing in nature, Energy flow in ecosystem, Food chain, Food web, Trophic levels, Biogeochemical cycles, Population dynamics, Population distribution and growth forms. Interaction such as competition, co-existence, prey predator among different species, Effect of pollution and human activities on ecological balance.

...6

Unit 2: Environmental Sanitation:

Public health activities of WHO, Government, Municipalities, Health care system in India, Role of environmental engineer in sanitation. Building byelaws for sanitation requirements of Market, Slaughter house, Theater, Swimming pool, Institutional buildings and other places.

...4

Unit 3: Communicable Diseases:

Epidemics, Transmission of diseases, General measures to control disease, Phelp's principle, Diseases transmitted through air, water, food, contacts and preventative measures

...4

Unit 4: Insects vector & Rodent Control:

Life cycle of mosquitoes, housefly and other carriers of diseases, Prevention and control of insect vectors, rodents and diseases transmitted by them such as malaria, plague etc.

...3

Unit 5: Milk & Food Sanitation:

Milk and food as vehicles of infection. Essential of milk sanitation, Pasteurization and its methods. Food poisoning, types, prevention and control

...3

SECTION II

Unit 6: Housing

Housing, Concept of healthful housing, Blighted area and causes of slum development, Criteria for good housing, Housing standards.

Ventilation, Effects of occupancy, Standards of ventilation, Types of ventilation & Air conditioning, fire suppression & protection systems.

...5

Unit 7: Plumbing & House drainage

Plumbing, Principles, Plumbing fixtures requirements, materials for plumbing, Definition of common terms, Types of trap, layout and system of plumbing, Two pipe and One pipe system, Single stack system, Piping installation and testing. Maintenance & repairs of plumbing fixtures & facilities

...6

Unit 8: Industrial Hygiene and Safety:

Concept of occupational health, ergonomics, Occupational environment, Occupational Hazard, General, Medical and Engineering measures for health protection of worker, Legislation.

...5

Unit 9: Vital Statistics:

Uses and sources of vital statistics, birth and death certification, indicators of community health, morbidity & mortality rates, causes and factors affecting morbidity, infants mortality rates.

...4

Term Work:

A Journal consisting of

- a) At least five assignments based on above units.
- b) A field visit for study of an ecosystem and its report.

Reference Books:

1. Municipal Sanitation- Ethler & Steel
2. Environmental Sanitation – Salvato
3. Fundamentals of Ecology: M. C. Dash (TMH publication)
4. Ecology: Odum
5. Preventive & Social Medicine: J. E Parks
6. Concept of Ecology: E. J Kormondy (PHI Publication)
7. Plumbing- Design & practice: S.G.Deolalikar, TMH
8. Plumbing Engineering- Theory & practice: Prof. S.M.Patil, Seema publications Mumbai.

S.E (Environmental Engg.) Part I
6. PROGRAMMING LABORATORY

Teaching Scheme

Lecturer : 2 Hrs / Week
Practical : 2 Hrs / Week

Examination Scheme:

Term work: 50 Marks

SECTION I

Unit 1

Matrix Algebra on Computers: Linear combination, Multiplication, Inversion, Memory management for symmetric matrices, banded matrix 2

Unit 2

Numerical techniques: 1) Solution of equations by Regular false method, Bisection method, Newton Raphson Method.
2) Solution of linear simultaneous equations by Gauss elimination, Gauss Jordan, Gauss Jacobin, Gauss Siedel method. 4

Unit 3

Numerical solution of Differential Equation by Euler's method and Runge- Kutta method. 5

Unit 4

Numerical Integration – Trapezoidal rule, Simpsons rule, Weddles rules. 3

SECTION II

Unit 5

Level survey project to estimate RL of point by Collimation plane method, Rise& Fall method. Adjustments of closed Travers- GALES Table 4

Unit 6

Water flow analysis in pipe network. 2

Unit 7

Study of Auto-CAD basic commands with focus on 2-D drawing 3

Unit 8

Auto CAD: Elementary concept of Blocks & layers 5

Term Work:

1. All topics from unit 1 to unit 6 shall be looked upon from the view of programme development in any convenient language either C, VB, FORTRAN or other & Term work shall include minimum six assignments based on these 6 units.
2. Termwork consisting of about ten assignments & at least one assignment on each unit.

Reference Books:

1. Computer Fundamentals by Oka Milind M. Everest publishing house, Pune.
2. Fundamentals of Computer by Rajaraman V. PHI (India), New Delhi.
3. Basic Computer Programming by Jain V.K, Pustak Mahal.
4. Visual Basic 6 by Thayer Rob, Technomedia , New Delhi.
5. Teach Yourself Visual Basic 6 by Warner Scott, TMH New Delhi
6. Surveying & Leveling by Duggal.
7. Surveying by Punmia.

S.E. (Environmental Engg.) Part II
1. ENVIRONMENTAL MICROBIOLOGY

Teaching scheme:

Lectures: 3 Hrs/week

Tutorial: 1 Hr/week

Practical: 2 Hrs/week

Examination scheme:

Theory :100 marks

Term Work: 25 marks

Oral Exam : 25 marks

SECTION I

Unit-1: General Microbiology:

Microscopic flora and fauna concerned to Environmental Engineering, Classification and characteristics of bacteria, Morphology of bacteria, Reproduction and growth of bacteria, Culture techniques, Gram staining, Microscopic methods, MPN and Plate count, Membrane filter techniques. (7)

Unit-2: Algae, Fungi & Moulds

Classification of Algae, Fungi, Moulds, Protozoa, Role of algae in symbiosis, factors affecting algal growth, their role in Waste water treatment, Eutrophication. (5)

Unit-3: Metabolism and Principles:

Nutritional requirements of bacteria, Autotrophic and Heterotrophic nature, concept of anabolism, catabolism, metabolic cycles in bacteria. Dependence of metabolism on enzymes, structure of enzymes, types, factors affecting enzyme reactions, Michaelis Menton Equation, inhibition, activation and specificity of enzymes, Aerobic, Anaerobic Metabolisms, energy transfer process in metabolism, structure of NAD,NADP,ATP & their role in metabolism. (8)

SECTION II

Unit-4: Microbiology of Air, Water and Soil:

Indicator organisms (Bioindicators) of various pollutions E-Coli & other bacteria polluted water, their significance in Environmental Engineering, isolation of E-coli from polluted water, biogeochemical cycles and roles of soil microorganisms. (6)

Unit-5: Virology:

Types of virus, characteristics and enumeration methods,. Lysogeny & Lytic cycles of bacteria & characters governed by viruses to bacteria. (2)

Unit-6: Microbial metabolism

Microbial metabolism of heavy metals and pesticides, general interaction between Microbes and metals, microbial transformation of Arsenic, Mercury, Lead, Cadmium, Selenium, Tin, Tellurium. Metabolism of hydrocarbons, pesticides, Petroleum, Benzene, Toluene, Xylem, DDT, BHC. Concepts of Bio concentration, Bio Magnification, Bio accumulation, Bio leaching of ores. (8)

Unit-7: Industrial Microbiology:

Screening, stock culture, Inoculum preparation, Medium formation and scale up procedures, Types of fermentation, SCP production. (4)

Term work

A Journal consisting of any eight practicals from the following

1. Microscopic examination of sample, Gram Staining.
2. Spread plate technique, poured plate technique.
3. Methods of maintenance of stock culture.
4. Membrane filter technique.
5. MPN test.
6. Bacteriological examination of recreational water.
7. Isolation of E-coli from given sample.
8. Detection of fungi & protozoa.
9. Gas chromatography.
10. Spectrophotometer.
11. Atomic absorption.
12. Bacteriological analysis of drinking water.

Reference books:

- 1 Microbiology- Pelzer and Reid.
- 2 Microbiology for Sanitary Engineer – McKinney R.E., McGraw Hill.
- 3 Outlines of Biochemistry – Conn and Stumpf.
- 4 Standard methods for examination of water and wastewater – 16th or later editions of AWWA, APHA.
- 5 Biological processes in pollution control – Pichai R and Govindan V.S. Anna University, Chennai.
- 6 Waste water Engg – Metcalf and Eddy, T M H publication.

**S.E. (Environmental) Part II
2.ENVIRONMENTAL GEOLOGY**

Teaching Scheme

Lectures – 3 Hrs/Week
Practical – 2 Hrs/Week

Examination Scheme

Theory – 100 Marks
Term Work – 25 Marks
POE – 25 Marks

SECTION I

Unit-1: Introduction to Geology & Environmental Geology.

Subdivisions of Geology, scope of Environmental Geology outer zone's & interior of the earth, continents & ocean floors, isostasy.

3

Unit-2: *Physical Geology:* -

Weathering, erosion & denudation.

Geological work of River – Processes and features of erosion and deposition, River meandering, environmental impact of the work of river.

Geological work of wind – Processes and features of erosion and deposition, causes of desertification, remedial measures.

Types of mountains.

5

Unit-3: Mineralogy and Petrology -

Mineralogy –Definition, Physical properties and classification of minerals.

Petrology – Igneous Rocks – Textures and Structures, Concordant and discordant intrusions, Classification of igneous rocks, important types.

Sedimentary rocks – Textures and Structures, Formation of Sedimentary rocks, Classification, Residual rocks.

6

Unit 4: Structural Geology –

Importance of structural Geology, Types of structures such as Joints, Folds, Faults and their types, Importance of structures for Engineering students, Unconformity and its types.

3

Unit 5 – Mineral Resources -

Metallic and nonmetallic minerals, mineral resources of India, Impacts of Mining activities on the environment, Environmental Management in mining.

4

Section II

Unit 6: Natural Hazards –

Nature, environmental security and hazard zoning, Risk assessment analysis, strategies for hazard mitigation.

Earthquakes – Causes, Effects, Recording of earthquake.

Landslides – Causes and remedial measures.

Volcanoes – Types & Environmental effects.

Floods – Causes, Flood Management.

4

Unit 7: Preliminary Geological Investigations;

Various steps in the geological studies of a project site, Engineering consideration of structural features like dip, strike, joints, fractures, faults, folds, dyke etc, Exploratory drilling observations during the process of drilling, Preservation of cores, core logging, core recovery, R.Q.D., Graphical representation of core log, Limitations of exploratory drilling method, Remote Sensing and GIS applications.

8

Unit No. 8- Dams and Reservoirs

Geotechnical consideration and environmental impact, effects of geological structures, Seismicity conditions, Reservoir Induced seismicity (RIS), Environmental impact of water impoundment, alternatives to big dams.

5

Unit No. 9 – Environmental laws and regulations

Environmental Policy in India, Laws regarding mining, groundwater exploitation. Protection and improvement of natural environment in India.

3

Practical and Term work

1. Study of Identification and Physical properties of the following minerals.
Varieties of Silica, Orthoclase, Plagioclase, Zeolite, Muscovite, Biotite, Augite, Hornblende, Olivine, Talc, Chlorite, Kyanite, Asbestos, Beryl, Garnet, Calcite, Gypsum, Fluorite, Corundum, Hematite, Magnetite, Limonite, Pyrite, Psilomelane, Chromite, Chalcopyrite, Galena, Malachite, Graphite
2. Study of Identification and Physical properties of the following Rocks.

Igneous Rocks: Plutonic Rocks: Granite, Pink Granite, Porphyritic Granite, Syenite, Diorite, Gabbro, Hypabyssal Rocks: Pegmatite, Dolerite, Volcanic Rocks: Rhyolite, Pumic, Trachyte, Andesite, Varieties of Basalt, Obsedian, Secondary Rocks: Laterite, Bauxite, Conglomerate, Braccia, Sandstone, Grit, Shale, Limestone, Oolitic, Fossil ferrous Limestone, Metamorphic Rocks: Slate, Phyllite, Mica Schist, Biotite schist, Chlorite Schist, Kyanite Schist, Granite Gneiss, Augen Gneiss, Marble, Quartzite

3. Study of different Types of Geological Maps, Sections and Their Engineering

Significances

4. **Determination average annual rainfall**
5. Educational Visits from Environmental Geology point of view. Submission of visit report is mandatory.
6. Term work consisting of practical record in the form of journal

Reference Books -

- 1) Environmental Geology – Donald Coates.
- 2) Holmes Principles of Physical Geology.
- 3) A test book of Engg. and General Geology – Parbin Singh
- 4) Environmental Geology – Indian Context – K.S.Valdiya, TMH Publication.
- 5) Natural Environment and Constitution of India – P.R.Trivedi, Ashish Publishing, New Delhi.
- 6) Textbook of Geology by P. K. Mukharji
- 7) General Geology by Radhakrishnan
- 8) Geomorphology and Hydrology by Small R. J.
- 9) Remote Sensing and Image Interpretation by Kiefer and Lilleesand
- 10) Environmental Geology by Edward A Keller
- 11) Rutley's Elements of Mineralogy by H. H. Read
Principles of Petrology b G. W. Tyrrell

S. E. (Environmental Engg.)Part-II
3. WATER SUPPLY ENGINEERING

Teaching scheme:

Lecture : 3 Hrs/ week

Practical: 2 Hrs/ week

Examination Scheme

Theory : 100 marks

Term Work:50 marks

Oral Exam: 25 marks

SECTION I

Unit – 1

Water Supply Engineering: Quantity of water, population forecasting, rate of consumption for various purposes, factors affecting consumption, fluctuation in demand.

(3)

Unit – 2

Sources of water: Surface water sources, Ground water Sources, estimation of yield from various ground water sources, Quality of water, drinking water standards, Physical, Chemical and Bacteriological analysis of water.

(4)

Unit – 3

Collection and conveyance of water, Intake works, conveyance of water, Economic size of rising main, friction formulae.

(3)

Unit – 4

Pumping stations: Classification of pumps, selection of pumps, location of pumping station, head discharge characteristics, pump in series and pumps in parallel operation

(3)

Unit – 5

Treatment of water – Necessity, Development of flow sheet for different sources of water, aeration, two film theory of gas transfer, types of aerators, theory of coagulation and flocculation, Rapid mix and slow mix units, Design of mechanical flocculator, Theory of settling, Design of sedimentation tank, filtration process, Hydraulics of flow through porous media, classification of filters. Design of rapid sand filter.

(8)

SECTION II

Unit – 6

Disinfection, Methods of disinfection, physical & chemical disinfectants, factors affecting disinfection, chemistry of chlorination.

(3)

Unit – 7

Water softening- Lime soda process, recarbonation, ion exchange.

(3)

Unit – 8

Miscellaneous treatments, removal of colour, taste and odour, iron and manganese.

3) (

Unit – 9

Water supply schemes – gravitational, pumping and combined schemes, Pumps, Pumping stations, transmission of water, materials of water supply pipes, design of gravity and pumping main, distribution systems, different layout of pipe networks, network analysis, house connection from mains, different valves, meters and hydrants, storage reservoirs, balancing reservoir, detection and prevention of leaks in the distribution systems, maintenance of distribution systems.

8) (

Unit – 10

Pre-feasibility and Feasibility report, Preparation of DPR

(2)

Term Work:

1. Analysis of parameters like pH, Alkalinity, Hardness, Chlorides, DO
2. Design & Drawing of various units based on above theory.
3. A visit to water treatment plant & report.

Reference Books:

1. Manual of Water Supply and Treatment (3rd ed)- Ministry of Urban Development, New Delhi, 1991.
2. Water Treatment plant Design – American Society of Civil Engineering, McGraw-Hill Publisher, 1997.
3. Water Supply and Sewerage - Steel and McGhee, McGraw Hill NY, latest ed.
4. Water Quality and Treatment Handbook -American Water Works Association, McGraw-Hill Pub. 1999.
5. Mark J. Hammer & Mark J. Hammer Jr., *Water and Waste Water Technology*, Prentice Hall of India Pvt. Ltd., 1998, New Delhi.
6. Fair, Geyer & Okun, *Water & Waste Water Engineering*, John Wiley, 1966, New York.
7. Ernest W. Steel & Terence J. Mc Ghee, *Water Supply & Sewage*, McGraw Hill, 1990, New York.
8. Water Resources Engineering – Larry W Mays, Wiley Text Books, 2000 .

S.E. (Environmental Engg.) Part II

4. ENVIRONMENTAL CHEMO DYNAMICS

Teaching scheme:

Examination scheme:

Lectures: 3 Hrs/week
Practical: 2 Hrs/week

Theory :100 Marks
Term Work: 50 Marks

SECTION- I

Unit 1

Chemo dynamics :- Definition, Introduction, Routes of Entry of Anthropogenic Chemicals to Human 2

Unit 2

Transport Fundamentals :- Diffusion, Dispersion, Advection, Basic Transport Equation, Mass Transfer, Mass Transformation, Intraphase and Interface Transport 5

Unit 3

Equilibrium – Definition, Chemical Equilibrium at Environmental Interfaces, Thermal Equilibrium at Environmental Interfaces, Various Chemical Equilibrium Models 5

Unit 4

Intraphase Transport and Fate of Chemicals : – Chemical Transport and Fate in Surface Water, Chemical Transport and Fate Within Atmospheric Boundary Layer, Chemical Transport and Fate Within Subterranean Media 8

SECTION- II

Unit 5

Air – Water Interface :- Exchange of Gases Across Air –Water Interface, Re-aeration of Natural Streams, Exchange of Chemicals Across Air –Water Interface, Heat Transfer Across Air –Water Interface 7

Unit 6

Water – Soil Interface :- Benthic Deposits, Movement of Chemicals Across Water - Soil Interface, Movement of Gases Across Water - Soil Interface, Heat Transfer Across Water - Soil Interface 6

Unit 7

Air – Soil Interface :- Thermal Turbulence Above Air –Soil Interface, Exchange of Gases Across Air –Soil Interface, Exchange of Chemicals Across Air –Soil Interface, Heat Transfer Across Air –Soil Interface

7

Term work :

A journal consisting of:

- 1) Practicals based on above theory.
- 2) At least one assignment on each unit.

Reference Books

1. Thibodeaux, L.J., "Chemodynamics : Environmental Movement of Chemicals in Air, Water, and Soil ", John Wiley & Sons, New York, 194.
2. Cussler , E.L. "Diffusion : Mass Transfer in Fluid Systems ", Cambridge University Press, 1994.
3. Trapp, S. and Matthies, M. "Chemodynamics and Environmental Modeling", Springer, 20, Berlin, Germany, 1998.
4. Tinsley, I. J. "Chemical Concepts in Pollutant Behavior"; John Wiley and Sons, Inc., New York, USA, 1979.
5. Hemond, H. F. and Fechner, E. J. "Chemical Fate and Transport in the Environment". Academic Press, San Diego, California, USA, 1994.
6. Schnoor, J. L. "Environmental Modeling - Fate and Transport of Pollutants in Water, Air, and Soil". John Wiley and Sons, Inc., New York USA, 1996.
7. Logan, B. E. "Environmental Transport Processes", John Wiley and Sons, Inc., New York, USA, 1999.
8. Steven C. Chapra, "Surface Water Quality Modelling", McGraw Hill International Edition Publication, 1998
9. Noel De Nevers "Air pollution Control Engg." McGraw Hill International Publication, 1988
10. Peavy S.H., Rowe R. D., Tchobanoglous G., "Environmental Engineering", McGraw Hill International Edition, 1985

SE (Environmental Engg.) Part II 5. ENERGY & ENVIRONMENT

Teaching Scheme:

Lecture: 3 Hrs/ Week
Tutorial: 1 Hr/ Week

Examination Scheme

Theory Paper: 100 Marks
Term Work: 25 Marks

SECTION I

UNIT 1:

(2)

Introduction: Energy chains, Energy demand, Energy crises. Worlds production & consumption of energy resources. Renewable energy resources, types & potential

UNIT 2: (8)

Solar Energy: Introduction, utilization methods, merits & demerits of solar energy utilization, potential of solar energy, solar radiation, data for India, solar thermal collectors, concentrators & reflectors, collector efficiency, application of solar energy, solar cooker, solar water heating, solar dryer, solar distillation, solar photovoltaic systems, solar pond.

UNIT 3: (4)

Wind Energy: Introduction, potential & scope, classification & types of wind machines, application of wind energy, merits & limitations of wind energy. Site selection for wind farm, wind map of India, wind energy station in India.

UNIT 4: (3)

Geothermal Energy: Introduction, types of geothermal resources, potential of geothermal resources in India & world. Environmental problems in utilization of geothermal resources.

UNIT 5: (3)

Tidal Energy: Tides, tidal range, tidal power, suitably sites & prospects. Types of tidal power plants, single basin, modulated single basin & double basin schemes, main equipments, energy storage.

SECTION II

UNIT 6: (3)

Ocean thermal energy conversion: Introduction, principle of OTEC, open cycle & closed cycle OTEC schemes, potential & prospects in India.

UNIT 7: (5)

Wave Energy: Introduction, power of wave, wave data collection, wave machines(wave energy converters), forces on wave machines and associated structures, merits & demerits of wave energy.

UNIT 8: (6)

Biomass Energy Resources: Biomass energy, biomass energy from cultivated crops & from waste organic matter, biomass conversion processes, incineration & thermo chemical, biochemical conversion of biomass, urban solid waste to energy by incineration & from landfill biogas projects, pyrolysis plants, biogas plants.

UNIT 9: (3)
Hydro Energy: Introduction, India's Hydro reserves, merits & limitations, low head, medium head, high head schemes, hydro turbines, economics.

UNIT 10: (3)
Energy Management & planning: Energy management principles, Energy & pollution trade off, objectives of energy management, energy strategy & energy planning, Energy audit.

Reference Books:

1. Environmental studies: Benny Joseph
2. Environmental Biology: K. C. Agarwal
3. Environmental Encyclopedia: Cunningham, W. P. Cooper, T. H. Hepworth (Jaico Pub.)
4. Energy & Ecology : David M.Gates (Sinaur Associates)
5. Non Conventional Energy Sources: G.D.Rai
6. Power Technologies : Stephenson
7. Energy Technology: S.Rao & B.B.Parulekar

S.E. (Environmental Engg.) Part II
6. BUILDING SERVICES

Teaching scheme:

Scheme

Lectures : 3 Hrs. /week

Marks

Drawing : 2 Hrs./week

Examination

Term Work- 50

Unit 1:

Classification of Buildings- Residential and public buildings, Different types of Residential buildings – Bungalows, Row houses, Apartments, Complex, Different types of Public buildings – Institutional, Assembly, Business, Offices, Commercial centers, Industries, Store houses and Hazardous structures 12

Unit 2:

Building Services- (a) Plumbing systems – Internal Plumbing works and external plumbing works

(b) Water supply systems (hot and cold)-Selection, quality control and Economics

(c) Rain water Management - Drainage, Collection, water Harvesting and Ground water Recharging

(d) Drainage & Solid Waste Disposal and Systems

(e) Introduction to Piped gas system

8

Unit 3

Building Services- Electrification – Power requirements of buildings, Open and Concealed wiring systems, concepts of earthing, Protection Devices, Emergency Power Supply.

8

Unit 4

Ventilation & Air Conditioning- Methods of Ventilation & Types of Air Conditioning systems, Heating & cooling system components & installation.

8

Term work (Full Imperial Sheets)

Sheet - 1 Line plans of any two Residential buildings

Sheet – 2 Line plans of any two Public Buildings

Sheet – 3 Plumbing Services – Water supply and Drainage key plan with enlarged Plan and Section of one Utility Room (Industrial Unit only)

Sheet – 4 Ceiling Plan of Electrification with Plan and Section of any Industrial Building unit

Site visit to any one of Residential, Commercial, Public, Industrial and Institutional Building and report on the same.

Reference books:

1. Building construction by B. C. Punamia
2. Planning of Residential Buildings by Nageshwar Rao and Kumarswamy
3. Building Drawing by Shah, Kale and Patki
4. Time savers Standards
5. A to Z of Building Construction by Maruti S.K.
6. Water Supply and Drainage by S.K. Garg
7. Building Drawing by Y.S.Sane
8. National Building Code – SP7 : 2005
9. Plumbing – Design & practice by S.G Deolalikar, TMH publications.

BOS in Environmental Engineering

S. E. I & II

Sr. No.	Subjects in pre-revised curriculum of S.E. Environmental Engineering. I	Equivalent subjects in revised course structure of S.E. Civil Engineering I	Class in revised curriculum
1	Engineering Maths –III	Engineering Maths –III	S.E. Civil I
2	Structural Mechanics I	Structural Mechanics I	S.E. Civil I
3	Surveying I	Surveying I	S.E. Civil I
4	Building, Construction and Drawing	Building, Construction	S.E. Civil I
5	Fluid Mechanics I	Fluid Mechanics I	S.E. Civil I
6	Computer Programming	There is no equivalent subject in the revised curriculum. Since the students have learnt C programming in the revised F.E., therefore those who have failed in Computer Programming in pre-revised course may be given additional two chances	
Sr. No.	Subjects in pre-revised curriculum of S.E. Environmental Engineering. II	Equivalent subjects in revised course structure of S.E. Civil Engineering II	Class in revised curriculum
1	Structural Mechanics II	Structural Mechanics II	S.E. Civil II
2	Surveying II	Surveying II	S.E. Civil II
3	Building Construction and Design	Building Construction and Design	S.E. Civil II
4	Engineering Geology	Engineering Geology	S.E. Civil II
5	Fluid Mechanics I	Fluid Mechanics I	S.E. Civil II
6	Water Resources Engineering I	Water Resources Engineering I	T.E. Civil I