SHIVAJI UNIVERSITY, KOLHAPUR

S.E. (Environmental Engineering) Part I (Semester 3) Revised

Sr. No.	Subject	Teaching Scheme (Hours)					Paper Marks	Examination Scheme			Total Marks
		L	T	P	Dr	Total		TW	POE	OE	
1	Engineering Mathematics-III	4	1	-	-	5	100	25	-	-	125
2	Environmental Chemistry & Microbiology	4	-	2	-	6	100	50	-	25	175
3	Fluid Mechanics	3	-	2	-	5	100	25	-	25	150
4	Surveying, Remote Sensing & GIS	3	-	2	-	5	100	25	50	-	175
5	Ecology & Environmental Sanitation	3	1	-	-	4	100	25	-	-	125
6	Building Drawing& Services	3	-	-	2	5	-	50	-	-	050
	Total (Part –I)	20	02	06	02	30	500	200	50	50	800

S.E. (Environmental Engineering) Part II (Semester 4) Revised

Sr. No.	Subject	Teaching Scheme (Hours)					Paper Marks	Examination Scheme			Total Marks
		L	T	P	Dr	Total		TW	POE	OE	
1	Water Resources Engg	4	1	-	-	5	100	50	-	-	150
2	Environmental Geology	3	-	2	-	5	100	50	-	-	150
3	Environmental Hydraulics	3	-	2	-	5	100	50	-	25	175
4	Structural Mechanics –I	3	-	2	-	5	100	25	-	-	125
5	Construction Technology	3	-	2	-	5	100	25	-	25	150
6	Programming Laboratory	2	-	2	-	4	-	50	-	-	050
	Total (Part- II)	18	1	10	-	29	500	250	-	50	800
	Grand Total of Part I & II										1600

SHIVAJI UNIVERSITY, KOLHAPUR

T.E. (Environmental Engineering) Part I (Semester 5) Revised

Sr. No.	Subject	Teaching Scheme (Hours)					Paper Marks	Examination Scheme			Total Marks
		L	T	P	Dr	Total		TW	POE	OE	
1	Water Supply Engineering	3	-	2	-	5	100	50	-	25	175
2	Engineering Management & Economics	3	1	-	-	4	100	25	-	-	125
3	Infrastructure Planning &Design	4	-	2	-	6	100	25	-	-	125
4	Geotechnical Engineering	3	1	2	-	6	100	50	-	25	175
5	Building Planning & Design	3	-	-	2	5	100	25	-	25	150
6	Structural Mechanics - II	2	-	2	-	4	-	50	-	-	050
	Total (Part –I)	18	2	8	2	30	500	225	-	75	800

T.E. (Environmental Engineering) Part II (Semester 6) Revised

Sr. No.	Subject	Teaching Scheme (Hours)					Paper Marks	Examination Scheme			Total Marks
		L	T	P	Dr	Total		TW	POE	OE	
1	Wastewater Engineering	3	-	2	-	5	100	25	-	25	150
2	Air & Noise Pollution	4	-	2	-	6	100	50	-	-	150
3	Solid & Hazardous Waste Management	4	-	2	-	6	100	50	-	-	150
4	Design of Structures I	3	-	2	-	5	100	50	-	-	150
5	Environmental Management	3	1	-	-	4	100	25	-	25	150
6	Design & Drawing of Environmental. Systems	2	-	-	2	4	-	50	-	-	050
	Total (Part- II)	19	1	8	2	30	500	250	-	50	800
Grand Total of Part I & II											1600

SHIVAJI UNIVERSITY, KOLHAPUR

B.E. (Environmental Engineering) Part I (Semester 7) Revised

Sr. No.	Subject	Teaching Scheme (Hours)					Paper Marks	Examination Scheme			Total Marks
		L	T	P	Dr	Total		TW	POE	OE	
1	Air Pollution & Control	3	-	2	-	5	100	25	-	25	150
2	EIA & Environmental Legislations	3	1	-	-	4	100	25	-	-	125
3	Advanced Water & Wastewater Treatment	3	1	2	-	6	100	25	-	25	150
4	Design of Structures II	4	-	2	-	6	100	25	-	25	150
5	Elective I	3	1	-	-	4	100	25	-	-	125
6	Seminar	-	-	2	-	2	-	50	-	-	050
7	Project	-	-	2	-	2	-	25	-	-	025
8	Vocational Training Presentations	-	1	-	-	1	-	25	-	-	025
	Total (Part –I)	16	4	10	-	30	500	225	-	75	800

B.E. (Environmental Engineering) Part II (Semester 8) Revised

Sr. No.	Subject	Teaching Scheme (Hours)					Paper Marks	Examination Scheme			Total Marks
		L	T	P	Dr	Total		TW	POE	OE	
1	Environmental Management Systems	3	-	2	-	5	100	25	-	-	125
2	Industrial Waste Treatment	3	-	2	-	5	100	25	-	-	125
3	Quantity Surveying & Valuation	3	-	2	-	5	100	50	-	25	175
4	Industrial Health & Safety	3	-	2	-	5	100	25	-	-	125
5	Elective II	3	1	-	-	4	100	25	-	-	125
6	Project Work	-	-	4	-	4	-	75	-	50	125
	Total (Part- II)	15	1	12	-	28	500	225	-	75	800
Grand Total of Part I & II											1600

General Instructions : 1. Vocational /Industrial Training of three to four weeks during summer vacation is to be completed.

2. For project work, batch will be of nine students and minimum three and maximum five students in a group

List of Elective I

1. Optimization Techniques
2. Environmental Bio Technology
3. Renewable Energy / Technologies
4. Environmental Modeling & Simulation
5. Groundwater Engineering,
6. Transport processes in environmental systems,

List of Elective II

1. Managerial Techniques
2. Atmospheric sciences
3. Energy audit, Conservation & Management
4. Disaster Planning & Risk Analysis
5. Watershed Management
6. Geo-Environmental Engineering (Environmental Geosynthetics)

SHIVAJI UNIVERSITY

S.E. (Environmental Engineering) Part I, Semester-3 (Revised)

1. ENGINEERING MATHEMATICS – III

Teaching Scheme
Lectures: 4 Hrs/week
Tutorial: 1 Hr/week

Examination Scheme:
Theory: 100 marks
Term work: 25 marks

Course Objectives:

1. To provide the student with basic mathematical tools.
2. To help students to acquire skills in vector calculus and linear differential equations enabling them to devise engineering solutions for given situations which may encounter in their profession.
3. To impart knowledge about probability theories and statistical techniques to practical engineering problems.
4. To produce graduates with mathematical knowledge and computational skill and the ability to deploy these skills effectively in the solving problems in the area of engineering.

SECTION – I

Unit 1 Linear Differential Equations:
(10)

Linear Differential Equations with constant coefficients Definition, Complementary function and Particular integral (without method of variation of Parameters), Homogenous Linear Differential Equations, Applications of Linear Differential Equations with constant coefficients (Cantilever, Strut, Beam)

Unit 2 Vector Differential Calculus: (7)

Differentiation of vectors, Gradient of scalar point function and Directional derivative, Divergence of vector point function and Solenoidal vector fields, Curl of a vector point function and Irrotational.

Unit 3 Curve Fitting: (8)

Correlation coefficient, Rank correlation coefficient, Lines of regression of bi-variate data, Fitting of Curves (Straight lines, Parabola, exponential) by method of Least-squares.

SECTION – II

Unit 4 Probability Distributions: (7)
Random variable, Binomial Distribution, Poisson Distribution, Normal Distribution

Unit 5 Test of Significance: (9)
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.

Unit 6 Calculus of Complex Functions (9)
Functions of complex variable, Analytic function, necessary and sufficient conditions for f (z) to be analytic (without proof), Cauchy-Riemann equations in polar coordinates, Milne- Thomson method to determine analytic function f (z), Harmonic function, orthogonal trajectories, Complex integration, Cauchy's theorem and Cauchy's integral formula (without proof)

General Instructions:
1. Tutorials are to be conducted batch wise. Batch size should be as per University norm.
2. Minimum eight assignments covering all topics.

Nature of Question paper:
1. There will be two sections carrying 50 marks each.
2. Each section should have three questions having internal option.

Reference Books:

1. A text book of Applied Mathematics: Vol. I, II and III by J. N. Wartikar & P N. Warlike, Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics by Dr. B. S. Grewal.
3. Advanced Engineering Mathematics by Erwin Kreyszig.
4 Advanced Engineering Mathematics, by H. K. Das (S. Chand Publication.)
5. Advanced Engineering Mathematics, by Merle C. Potter (OXFORD University Press)

SHIVAJI UNIVERSITY

S.E. (Environmental Engineering) Part I, Semester-3 (Revised)

2. ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY

Teaching Scheme:
Lecture: 4 Hrs/Week
Practical: 2 Hrs/Week

Examination Scheme:
Theory :100 Marks
Term Work: 50 Marks
Oral Exam : 25 Marks

Course Objectives:

1. To study in detail the broad expects of chemistry related to Environmental Engineering.
2. To study and determine different parameters in chemistry to solve environmental problems.
3. To study significance of microbiology in Environmental Engineering.
4. To study different laboratory techniques of microbiology related to the field of Environmental Engineering.

SECTION I

Unit: 1

(8)

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

b. Membrane processes: Osmosis and Dialysis, Principles of solvent extraction, Electrochemistry, Chemical Kinetics Catalysis, Adsorption.

Unit: 2 **(11)**

a. Basic Concepts from equilibrium and Colloidal Chemistry, Buffers, Solubility of Salts, Oxidation-reduction reactions, introduction to colloidal chemistry, Colloidal dispersion in liquid & air.
b. Basic Concepts from quantitative chemistry, Significance of quantitative measurements, Gravimetric analysis, Volumetric analysis. Physical methods of analysis.

c. Method of Sampling**:** ISI Methods for Collecting Samples of Water**,** Preservation of Samples, Permissible Limits According to ISI & WHO.

Unit: 3 **(6)**

Instrumental Methods of analysis: a) Optical: Ultraviolet Spectroscopy, Infrared spectroscopy, atomic emission spectroscopy, atomic absorption spectroscopy and b) Chromatographic methods of analysis: gas chromatography and liquid chromatography

SECTION II

Unit: 4 **(4)**

Pollution parameters of water & waste water, Definition & estimation of BOD, COD, Nitrogen, Solids, Fluorides, Sulphate

Unit: 5 **(10)**

a. Characteristics and classification of bacteria, algae classification, factors affecting algae growth and control of algae, molds, protozoa and higher animals and their role in waste water treatment.

b. Enzymes: Nature of enzymes , mode of action , temperature and pH, salts and heavy metals, colloidal nature, extracellular and intracellular enzymes, hydrolytic enzymes, oxidation and reduction enzymes, classification , sources of enzymes , enzyme formation

Unit 6 **(11)**

a. Metabolic reactions: Chemical structure, key radicals, saturated hydrocarbon, acetate alcohols aromatics carbohydrates proteins other nitrogen groups sulphur groups miscellaneous groups general metabolic reactions.

b. Energy: Energy transfer, oxidation, hydrogen removal, $DPNH_2$ regeneration – aeration metabolism, anaerobic metabolism, autotrophic metabolism, biological energy-heat energy and free energy, Warburg respirometer.

Term Work:

A Journal consisting of Experiments based on following practicals :

1. Determination of pH, Turbidity, Color.
2. Determination of Solids (SS,DS,VS,TS)
3. Determination of Conductivity.
4. Determination of Hardness (Total, Permanent, Temporary)
5. Determination of Sulphate & Phosphorous
6. Determination of Heavy metals in water and waste water samples
7. Preparation of 1.00N and0.002N H_2SO_4 and 1.00N and 0.002N NaOH standard solution
8. MPN and Plate count techniques
9. Gram staining techniques
10. Microscopic examinations, Identification of Micro flora

Reference Books:

1. Chemistry for Environmental Engineers: C.N Sawyer and M.C Carty.
2. Microbiology of Sanitary Engineers: Rose E. Mc-Kinney.
3. Microbiology: Pelzer and Reid,
4. Standard Methods o Examination of APHA water and waste water
5. Quantitative Analysis–R. A Day, A.L Underwood, (6th Edition) Prentice-Hall
6. Standard Methods for Examination of Water & Wastewater – Andrew D Eaton, Lenore S Clesceri, Eugene W Rice, Arnold Greenberg, (21st Ed) 2005, APHA (USA)
7. Environmental Chemistry - A. K. De , New Age international (P) Ltd.

SHIVAJI UNIVERSITY

S.E. (Environmental Engineering) Part I, Semester-3 (Revised)

3. FLUID MECHANICS

Teaching Scheme: **Examination Scheme:**

Lectures: 3 Hrs/week — Theory : 100 Marks

Practical: 2 Hrs/week — Term work: 25 Marks

Oral Exam: 25 Marks

Course Objectives:

1. To acquire knowledge of fluid properties and its behavior through engineering point of view.
2. To impart knowledge about rational approach consistent with general laws of physics and experimental evidence, scientific and engineering fundamentals. required to solve engineering problems
3. To enhance student's skill with good physical descriptions, hydraulic illustrations, different flow phenomena, underlying principles so as to analyze, design and create better solutions.
4. To provide students with guidelines and lifelong learning needed for successful career in major areas of Civil and Environmental Engineering.

SECTION I

Unit 1 **(8)**

a) Introduction: Scope and importance of Fluid Mechanics, Physical Properties of fluids
(density, Specific weight, specific volume, sp. gravity, Viscosity-Newtons law of viscosity,Newtonion and Non-Newtonion fluids. Compressibility, Surface tension and Capillarity Vapour pressure- Cavitation), Ideal fluid, Real Fluid

b) Fluid Statics: Pressure, Pascal's Law, Hydrostatic Law, pressure measurement devices –piezometer, Manometers, Mechanical gauges. Forces on Plane and Curved Surfaces, Centre of pressure And Pressure diagram.

Unit 2 **(5)**

Fluid Kinematics:

Concept of control volume, Velocity and acceleration of fluid Particle, Classification of fluid flow (Steady- Unsteady, Uniform-Nonuniform, Rotational-irrotational, turbulent laminar, I-D, 2-D, 3-D Flow, Compressible-incompressible flow) Streamlines, Equipotential lines, Stream Function and Velocity Potential, Flow Net-(Properties, engineering applications). Continuity equation – (differential & integral form)

Unit 3 **(8)**

a) Fluid Dynamics:

Forces acting on fluid in motion, Euler's equation along a streamline, Bernoulli's Theorem limitations, Applications -Pitot tube, Venturimeter, Orificemeter, Orifices and Mouthpieces, Concept of HGL & TEL.

b) Dimensional analysis & Model studies:

Dimensions & Dimensional homogeneity, Importance & use of Dimension analysis, Buckingham's pie theorem- Statement & application, Non-dimensional numbers & their
significance. Hydraulic similitude- Importance & use. Geometric, Kinematic & dynamic
similarities.

SECTION II

Unit 4 **(7)**

Flow through pipes:

Laminar flow Reynolds's Experiment, Hazen Poisulle's Equation for viscous flow.

Turbulent flow Nikurade's Experiment, Introduction to Moody's Chart, Nomograms and Other pipe Diagrams.

Losses in pipes: Darcy - Wiesbach Equation of loss due to friction, factors affecting friction, Minor Losses in pipes, Concept of Equivalent length of pipe for different pipe fittings, Equivalent diameter of pipes, Hydraulic Power Transmission by pipe.

Unit 5

Boundary layer theory (**5)**

Concept, Boundary layer along thin plate- Characteristics, Laminar, Turbulent Boundary Layer, Laminar sub layer, Various Thicknesses- Nominal, displacement, Momentum, Energy. Hydraulically smooth and rough boundaries, Separation of Boundary layer, control of Separation, Introduction to Drag and Lift on submerged bodies (like Flat plates, Sphere, Cylinder, aerofoil)
Stokes law

Unit 6

a) Flow through open channel : **(8)**

Introduction, Difference between pipe flow and open channel flow. Types of open Channels, Types of flows in open channel, Geometric elements, Velocity distribution, Measurement of Velocity, Pitot tube, current meter, surface floats, velocity rods.

b) Steady & Uniform Flow

Chezy's & Manning's formula, Uniform Flow computations, hydraulically Efficient section (Rectangular, Triangular, Trapezoidal), Design of channels

c) Depth energy relationship in open channel flow

Specific energy (definition & diagram, Critical, Sub-critical, Super-critical flow), Specific force, Specific Discharge.

TERM WORK : Journal consist of laboratory work on -

a) Measurement of discharge - Calibration of measuring tank, measurement of pressure (Piezometer, Manometers, Pressure gauges) Use of hook or point gauge.

b) At least SIX experiments from the following.

1. Verification of Bernoulli's Theorem
2. Plotting of streamlines, flow nets
3. Calibration of an orifice / mouthpiece
4. Calibration of venturimeter / orificemeter
5. Study of factors affecting coefficient of friction for pipe flow (at least for two different materials and two different diameters)
6. Determination of loss of head due to i) Sudden expansion, ii) contraction iii) elbow iv) bend v) globe Valve etc.
7. Study of Laminar flow
8. Study of Moody's charts,
9. Study of nomograms for pipe design.

RECOMMENDED BOOKS

1. Fluid Mechanics – A.K. Jain – Khanna Pub., Delhi
2. Fluid Mechanics – Hydraulic & Hydraulic Mechanics -Modi / seth – Standard Book House, Delhi
3. Fluid Mechanics – S. Nagrathanam – Khanna Pub., Delhi
4. Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland
5. Elementary Fluid Mechanics – H. Rouse – Toppan C. Ltd. Tokyo
6. Fluid Mechanics – Garde-Mirajgaonkar – Nemchand & Bros., Roorkee
7. Fluid Mechanics – Shames - McGraw-Hill International Book Co., Auckland
8. Fluid Mechanics – Arora

SHIVAJI UNIVERSITY

S.E. (Environmental Engineering) Part I, Semester-3 (Revised)

4. SURVEYING, REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week	Theory :100 Marks
Practical: 2 Hrs/week	Term work : 25 Marks
	POE Exam: 50 Marks

Course Objectives:

1. To apply principles of surveying, levelling & Remote sensing for Environmental Engineering works.
2. To use the various methods of surveying & remote sensing in respective fields.
3. To learn wide range of applications of remote sensing to earth system questions and to recognize problems for which remote sensing is well suited.
4. To acquire skills in storing, managing digital data for planning and development.
5. To perform various activities of surveying & Remote Sensing using different instruments skillfully.

SECTION I: SURVEYING

Unit 1: Surveying & Leveling (8)

Introduction to Auto level, Field procedure in leveling, longitudinal or profile leveling. Study of theodolite, Measurement of Horizontal and Vertical Angles by theodolite, theodolite traversing. Electronic theodolite and its advantages over conventional theodolite. Contours, characteristics of contours, use of contour maps, Application in Environmental Engineering.

Unit 2: Tacheometry, EDM and Total Station (7)

Tacheometry:
Principle, methods of tacheometry with special emphasis on Fixed hair method & Tangential methods only. Measurement of gradient of line by tacheometry.

Electronic Distance Measuring instruments (EDM):
Principle, Types, Angle measurements.

Total Station: Principle, Features of Total Station and applications.

Unit 3: Global Positioning System (GPS) & DGPS (5)

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

SECTION II: REMOTE SENSING AND GIS

Unit 4: Introduction to Remote Sensing (8)

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.

Unit 5: Photogrammetry & Image Processing and Interpretation (7)

Terms, Types, vertical photographs, scale, ground coordinates, relief displacement, Flight planning Photomaps and Mosaics. Stereoscopy and photo interpretation.

Data analysis - Visual Interpretation and Digital Image Processing, classification.

Unit 6: Introduction to Geographical Information Systems (7)

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 any GIS Software.

Term work: Consisting of any six practicals given below -

1. Determination of Reduced levels using auto level.
2. Determination of horizontal & vertical angles using Theodolite.
3. Determination of gradient of line using Tachometer.
4. Study of Topo sheets.
5. Determination of position & altitude using GPS.
6. Visual Interpretation of imagery and aerial photographs.
7. Determination of distance between two points by using GIS software.
8. Digital Interpretation of imagery and aerial photographs.

Projects: Any one

1) Theodolite Traversing Project.
2) Block Contouring.

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 S.K.DuggaL- Vol. I & II
9. Surveying by Arora- Vol. I & II
9. Surveying by B.C. Punmia - Vol. I & II

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S.E. (Environmental Engineering) Part I, Semester-3 (Revised)

5. ECOLOGY AND ENVIRONMENTAL SANITATION

Teaching Scheme: **Examination Scheme:**

Lecture: 3 Hrs /week — Theory :100 Marks

Tutorial : 1 Hr/week — Term Work : 25 Marks

Course Objectives:

1. Study of Ecological aspects, interactions and influence of human activities
2. Study of byelaws for sanitation & role of various agencies
3. Study of requirements of healthful housing & sanitation aspects
4. Study of necessity & provisions for rural sanitation

SECTION I

Unit 1: Ecology (12)

Definition, Ecosystem, Classification of ecosystems on the basis of source and level of energy, Components of an ecosystem, Food chain, Food web, Trophic levels, Different ecosystem existing in nature, Habitats in the ecosystem: Fresh water (NRCD , National River Conservation Directorate Program), marine, estuarine, terrestrial, deserts, Arid and Semi Arid Habitats of India and their Conservation. Energy flow in ecosystem, Biological Magnification

Bio-geochemical cycles: Sulfur, Carbon, Nitrogen, Phosphorus, Oxygen

Population Ecology : .

Ecological pyramids; limiting factors, laws and combined concept of limiting factors, Population dynamics, Population distribution and growth forms. Interaction such as competition, co-existence, pray predator among different species, Effect of pollution and human activities on ecological balance.

Wetlands: Definition, Classification and Types of wetlands, Importance of wetland, Present status of wetlands in India, RAMSAR convention ,Conservation of wetlands, National Lake Conservation Program (NLCP)

Unit 2: Environmental Sanitation: (4)

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.

Unit 3: a)Communicable Diseases & Health: (3)

Epidemics, Transmission of diseases, Diseases transmitted through air, water, food, contacts& insects, General measures to control disease and preventative measures

b) Vital Statistics: **(2)**

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.

SECTION II

Unit 4: a) Milk & Food Sanitation: **(4)**

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

b) Housing **(4)**

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

Ventilation - Necessity, Types of ventilation, Effects of occupancy, Standards of ventilation & Air Conditioning

Unit 5: Plumbing & House drainage **(8)**

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.

Unit 6 : Rural Sanitation **(4)**

Necessity & Importance, Various aspects of rural sanitation – Water Supply, Sewage disposal, Community cleanliness, Application & Implementation of Waste to Energy concept, Government policies & programs for rural sanitation.

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.

c) Half imperial Drawing sheet on plumbing system, fixtures etc

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

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S.E. (Environmental Engineering) Part I, Semester-3 (Revised)

6. BUILDING DRAWING & SERVICES

Teaching Scheme:
Lectures : 3 Hrs/week
Drawing : 2 Hrs/week

Examination scheme:
Term work : 50 marks

Course Objectives:

1. To visualize, accurately plan and design buildings to meet with the requirements of the occupants.
2. To interpret, design, produce and evaluate a variety of residential buildings using the knowledge of building bye laws, rules and regulations.
3. To develop the skill to integrate aesthetics and functions in planning and design of variety of residential buildings with due consideration of economical aspects.
4. To understand the importance of interior designing in variety of buildings as per needs and requirements of the occupants.

SECTION I

Unit : 1 **(6)**

Principles of planning, introduction to Bye-Laws regarding building line, height of building, open space requirements, F.S.I., setbacks, ventilation, sanitation as per municipal corporation area requirement.

Unit : 2 **(8)**

Elements of Building Drawing: Contents in Building drawing, plan, elevation, sections, site plan block plan, proforma as per IS SP-7 from part 1 to 5. Scale to be considered in drawing, various working drawings, sanitary plan, electrification plan, furniture drawings

Unit : 3 **(6)**

Significance Sun diagram. Wind Diagram. Orientation, Factors affecting, criteria under Indian condition. Building Planning and regulations, municipal drawing criteria, working drawing.

SECTION II

Unit : 4 **(8)**

Introduction to rainwater harvesting. Concept of rain water Gutters. Rainwater outlet & Down Take Systems. Electrification: - Concealed & Open Wiring, Requirements & Location of various points, Concept of Earthing. Introduction to Piped gas system

Unit : 5 **(8)**

Ventilation: - Definition and necessity of Ventilation, functional requirement, various system & section criteria, function of A.C.

Thermal Insulation: - General concept, Principles, Materials, Methods, Computation of Heat loss & heat gain in Buildings. Types of doors and windows.

Unit: 6 **(4)**

Checklist for planning: site plan, utilities available, rules and documents, requirements of owner, budget restriction, structural data. Procedure for submitting plan for sanctioning, completion certificate. Structural engineers work.

TERM WORK:

1. Preparation of 2D Auto-CAD drawing of Project prepared in the term work of subject Building Design.
2. Imperial size sheet based on actual measurement of existing residential building consisting of plan, elevation, section passing through staircase. Site plan. Area statement & brief specifications.
3. Project report giving details of following systems
   - Stair Case
   - Drainage System
   - Water Supply System
   - Water Tank
   - Septic Tank
   - Design of terrace Drainage System

REFERENCE BOOKS:

1. Building Drawing – Shah, Kale, Patki (Tata McGraw- Hill)
2. Building Design and Drawing – Y. S. Sane (Allied Book Stall, Pune)
3. SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi
4. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
5. MJP manuals for various water supply and sewerage works.
6. Manual of water supply and treatment
7. Manual on sewerage and sewage treatment

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S.E. (Environmental Engineering) Part II, Semester-4 (Revised)

1. WATER RESOURCES ENGINEERING

Teaching Scheme:
Lecture**:** 4 Hrs/week
Tutorial **:** 1Hr/week

Examination scheme:
Theory paper : 100 Marks
Term Work : 50 Marks

Course Objectives:

1. To emphasize the importance of study of Hydrology and necessity of conservation of Water Resources.
2. To develop the ability among students to synthesize data & understanding technical concepts of Water Resource Engineering
3. To build up the skills to analyze, design, interpret data to find out the discharge of flood; Runoff, to understand relationship between Rainfall & Runoff.
4. To study National & State Level Policies on Water Management, Role & Responsibilities of Government Agencies, Water Harvesting Techniques, Groundwater contamination; its control & treatment, River Basin Development.

SECTION I

UNIT 1:
Basic Hydrology **(9)**

a) Introduction of Hydrology: Definition, Importance and scope of hydrology, the Hydrologic cycle, Weather and its precipitation potential.

b)Precipitation: Forms and types of precipitation, Methods of measurement, Factors affecting precipitation at location, Estimating missing data, and Mass rainfall
curves, Hyetograph, double mass analysis (Correcting precipitation data) Determination of Average precipitation over the catchment

c) Evaporation and Evapotranspiration: Factors affecting evaporation, measurement and control of evaporation upon reservoirs, Evapotranspiration - definition and Measurement.

d) Infiltration: Process of infiltration, Factors affecting infiltration, Infiltration indices, Effect of infiltration on runoff and ground water recharge.

UNIT 2: **(8)**
Surface Water Hydrology

a) Runoff: Factors affecting runoff, catchment yield calculations, SCS curve number, Rainfall-runoff relationship.

b) Hydrograph: Storm hydrograph, Base flow and Separation of base flow, direct runoff hydrograph, Unit hydrograph – theory – assumptions and limitations, Derivation and use of unit hydrograph, S-curve hydrograph.

c) Floods: Definition, Factors affecting, Estimation of peak flow, Design flood hydrograph – components, recurrence period.

UNIT 3 **(8)**

a) Ground water hydrology: Occurrence and distribution of ground water, Specific yield of aquifer, Movement of ground water, Darcy's law, Permeability, Safe yield of basin. Hydraulics of well under steady flow conditions in confined and unconfined aquifers, Specific capacity of well, Well irrigation – Tube wells, Open wells-design and construction.

b) Contamination of groundwater: Sources of contaminants in groundwater Contaminant plumes in aquifer, Transport of reactive and non reactive contaminants in groundwater, Advection and Dispersion, Sorption and diffusive mass transfer, Control of groundwater pollution, Pump and treat system, In-situ methods, Physical, Chemical and Biological parameters for organic & Inorganic contaminants polluting groundwater.

SECTION II

UNIT 4 **(9)**

a) Introduction to irrigation: Definition and necessity of irrigation, Types of Irrigation, Different systems of irrigation, - Flow, lift, inundation, bandhara, storage, Methods of application of water to soil - Sprinkler, Drip, basin, Furrow, Necessity of Drainage

b) Minor Irrigation works: General layout and main components of - Percolation tanks, K.T.Weir and Lift irrigation

c) Soil-water relationship: Classes and availability of soil water, depth and frequency of irrigation, principal crops and crop seasons, cropping pattern and crop rotation, Command area-calculations

d) Water requirement of crops: Duty, delta, factors affecting duty, methods, Improving duty, consumptive use of water, assessment and efficiency of irrigation Water.

UNIT 5 **(7)**

Watershed Management: Need of watershed management, Importance of soil Conservation measures, Rainwater management, methods and techniques of Rainwater harvesting and groundwater harvesting.

Wetland: Concept, types, wetland ecosystem, planning & pollution abatement, and conservation

UNIT 6 **(8)**

Soil Erosion and Conservation: Soil erosion agents, Types of soil erosion due to water, Estimation of soil erosion by soil Loss method, Sediment Outflow models, Sedimentation Models of water storage structures, Soil conservation practices, Erosion control structures for agricultural and non agricultural lands.

Water logging & Salinity: Causes (Natural & artificial), effects, remedial Measures, soil efflorescence, drainage arrangement, Management of Saline & alkaline soils.

TERM WORK:

Numerical Problems of the following topics

1. Determination of average annual rainfall and determination of yield of Catchments
2. Determination of abstraction losses – phi index calculation, effective rainfall Hyetograph
3. Stream flow measurements – Area velocity and slope-area method
4. To develop a unit hydrograph from a total runoff hydrograph resulting from a given 2 or 3 successive storms,
5. Alteration of base period of given unit hydrograph using s-curve technique
6. Estimating depth and frequency of irrigation on the basis on soil moisture Regime concept
7. Determination of Crop water requirement using consumptive use formulae
8. Yield calculations of open well and tube well.
9. A Case study / report of a watershed management
10. Site visit to meteorological station.

RECOMMENDED TEXT BOOKS:

1. Irrigation Engineering – S. K. Garg – Khanna Publishers, Delhi.
2. Irrigation, Water Resources and Water power Engineering – Dr P.N. Modi
3. Irrigation and Water power Engineering – Dr Punmia and Dr. Pande – Laxmi Publications, Delhi
4. 'Engineering Hydrology' - Subramany K., -Tata McGraw Hill, New Delhi.
5. 'Engineering Hydrology' - Raghunath H.M. - New Age International Publishers
6. Watershed Management in India – J.V.S.Murthy – Wiley Eastern Publications,Delhi

REFERANCE BOOKS:

1. R.K.Sharma, 'Hydrology and water resources', Dhanpatrai and sons, New Delhi.
2. Varshney, Gupta and Gupta, 'Theory and design of irrigation structures vol. I and II and III', Newchand and Brothers.
3. Michael, 'Irrigation Theory and practice', Vikas Publications House
4. Jaspal Sing, M.S.Acharya, Arun Sharma, 'Water management', Himansh Publications.
5. Design of M.I. and Canal Structure – Satyanarayan and R. Murthy
6. Water and Soil Conservation – Ghanshyam Das

SHIVAJI UNIVERSITY

S.E. (Environmental Engineering) Part II, Semester-4 (Revised)

2. ENVIRONMENTAL GEOLOGY

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week	Theory : 100 Marks
Practical: 2 Hrs/week	Term Work : 50 Marks

Course objective:

1. To understand basics of Environmental geology, different types of Rocks Minerals
2. To understand Responsibilities of Environmental engineers and geologist regarding dynamics of structural features of rocks like fold, fault, joints and Unconformities.
3. To understand the importance of probing Earth's interior in engineering application along with soil erosion and desertification.
4. To understand dynamics of Earthquakes and Natural hazards
5. To understand Environmental impact assessment of dams and reservoirs

SECTION I

Unit 1: **(4)**

I**ntroduction:** Geology and Environmental Geology. Scope of Environmental Geology, interior of the earth. Weathering, erosion and denudation. Geological work of River – Processes and features of erosion and deposition.

Unit 2: **(7)**

Mineralogy and Petrology:

Mineralogy –Definition, Physical properties of minerals.

Petrology – Igneous Rocks –Structures, Classification of igneous rocks—on the basis of mode of occurrence, silica percentage and colour index. Igneous intrusions.

Secondary rocks– classification, Formation of Sedimentary rocks, structures and classification.

Metamorphic rocks--agents, types and structures.

Unit 3: **(9)**

a. **Structural Geology :** Strike, Dip, Unconformity and its types. Joints, Folds, Faults - their mechanism, types and engineering significance. Geological profile of unconformable series of beds with igneous intrusions.

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

SECTION II

Unit 4: **(6)**

Natural Hazards: Nature, environmental security and hazard zoning, Risk assessment analysis, strategies for hazard imitigation.
Earthquakes – Causes, Effects, Recording of earthquake.
Landslides – Causes and remedial measures. Volcanoes - Types and Environmental effects.
Floods – Causes, Flood Management. Laws of groundwater exploitation

Unit 5: **(8)**

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.

Unit 6: **(6)**

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.

Practical and Term work

1. Study of Identification and Physical properties of the following minerals**.**
2. Megascopic study of rock forming minerals like Varieties of Silica, Orthoclase, Plagioclase, Zeolite, Muscovite, Biotite, Augite, Hornblende, Olivine, Talc, Chlorite, Kyanite, Asbestos, Beryl, Garnet, Calcite, Gypsum, Fluorite, Corundum,
3. Megascopic study of ore forming minerals Hematite, Magnetite, Limonite, Pyrite, Psilomelane, Chromite, Chalcopyrite, Galena, Malachite, Graphite
4. Study of Identification and Physical properties of the following Rocks. Megascopic study of 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, Megascopic study of Secondary Rocks**:** Laterite, Bauxite, Conglomerate, Braccia, Sandstone, Grit, Shale, Limestone, Oolitic, Fossil ferrous Limestone, Megascopic study of Metamorphic Rocks**:** Slate, Phyllite, Mica Schist, Biotite schist, Chlorite Schist, Kyanite Schist, Granite Gneiss, Augen Gneiss, Marble, Quartzite
5. Study of different Types of Geological Maps, Sections and Their Engineering Significances
6. Educational Visits from Environmental Geology point of view. Submission of visit report is mandatory.
7. Term work consisting of practical record in the form of journal

Recommended Reading:

a) Basic Reading :-

1. Environmental Geology – Indian Context – K.S.Valdiya, TMH Publication
2. Environmental Geology by Edward A Keller
3. The Engg. and General Geology – Parbin Singh
4. Rutley's Elements of Mineralogy by H. H. Read
5. Principles of Petrology b G. W. Tyrrell
6. Engineering geology – D Venkat Reddy
7. A text book of Engineering Geology – Dr.R.B.Gupte
8. Principles of Engineering Geology – K.M.Bangar

b) Additional Reading :-

1. Environmental Geology – Donald Coates.
2. General Geology by Radhakrishnan
3. Holmes Principles of Physical Geology.
4. Environmental Geology – Indian Context – K.S.Valdiya, TMH Publication.
5. Environmental Geology – Donald Coates.

c) References :-

1. Natural Environment and Constitution of India – P.R.Trivedi, Ashish Publishing, New Delhi.
2. Textbook of Geology by P. K. Mukharji
3. Geomorphology and Hydrology by Small R. J.
4. Remote Sensing and Image Interpretation by Kiefer and Lilleesand

SHIVAJI UNIVERSITY

S.E. (Environmental Engineering) Part II, Semester-4 (Revised)

3. ENVIRONMENTAL HYDRAULICS

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

Examination Scheme:
Theory paper: 100 Marks
Term work : 50 Marks
Oral Exam : 25 Marks

Course Objectives:

1) To enhance knowledge of students about behavior of uniform and nonuniform flow of fluid.
2) To provide students knowledge of measuring flow of liquid through open channel, dimensional analysis.
3) To enhance student's skill of with good physical description of design of channel, measurement of velocity, hydraulic jump, and hydraulic machinery like pumps and turbines etc.
4) To provide students guidelines and lifelong learning for successful carrier in major areas of Water Supply and Sanitation, Irrigation Engineering, astewater treatment and air pollution.

SECTION I

UNIT 1 **(7)**

Pipe Networks and Distribution System

Methods of Distribution, Layout of Distribution pipes, Pipes in parallel, Series, Syphon, two reservoir problems, Types of Networks, Hardy Gross Method, Hydraulic Statements, Water hammer in pipes- Surge Tanks - (Function, location and Uses)

UNIT 2 **(6)**

Design of Sewerage system:

Components of sewerage system, Peak Drainage discharge Sewage and sewerage systems, sewer apparatunces Hydraulic design of sewers, Estimate of Sanitary sewage, Design period, Per capita sewage flow, Ground water infiltration, Storm Runoff, Velocity of flow, velocity at minimum flow, minimum sewer size, limiting velocity, Use of tables and nomograms in design of sewers.

UNIT3 **(8)**

Hydraulic Machinery:

a) Impact of jet

Impulse momentum principle, Impact of jet on Vanes-flat, curved (stationary and, moving), Inlet & outlet velocity triangles, Series of flat, curved vanes mounted on wheel.

b) Hydraulic Turbines

Importance of hydro-power, Classification of turbines, description, Typical dimensions and working principle of Pelton, Francis & Kaplan turbine (Detailed design need not to be dealt With), Unit quantities, Specific speed, Performance Characteristics, Selection of type of Turbine, description & function of Draft tube.

c) Centrifugal pump

Classification, Component parts, working of centrifugal pump, Performance Characteristics and efficiency curves, Selection of pump, Common pump troubles & remedies, Introduction to Reciprocating pumps, Gravity main and its design, pumping(Rising main) and its design, Water hammer calculations, Thrust blocks.

SECTION II

UNIT:4 **(7)**

Measurement of Flow in Open Channel

Notches & Weirs: Types, derivation of discharge equation, Velocity of approach, Francis Formula, Calibration of notch & weir, errors in measurement. Hydraulic design of Ogee spillway and Proportional weir, calibration of weir, Parshall flume and Venturi Flume, Slope-area method, Velocity area method.

UNIT:5 **(6)**

Transmission of water, Piping Systems, Use of Softwares in Water Distribution and Sewerage Systems, Software programs for Distribution and Sewerage system.

UNIT:6 **(7)**

Transport phenomenon of water Conduction, Advection and Dispersion, Sorption and diffusive mass transfer, Ground water movement and Ground water hydraulics, Estimation of Reservoir capacity such as ESR, GSR

TERM WORK

A) Any four of the following:
1) Study of different pipe networks
2) Calibration of V notch / Rectangular notch.
3) Calibration of Ogee Weir.
4) Calibration of Proportional weir
5) Study of hydraulic jump

B) Study of Hydraulic Machinery
1) Impact of jet
2) Study of Turbines (Demonstration)
3) Test on centrifugal pump
4) Study of charts for selection of pumps

C) Mini project on

1) Water distribution system
2) Sewerage system of specific area
3) Design of pumping station with pumping main

RECOMMENDED BOOKS

1) Fluid Mechanics – A.K. Jain – Khanna Pub., Delhi
2) Fluid Mechanics – K. L. Kumar – Eurasia Publication House, Delhi
3) Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland
4) Open Channel flow – Rangaraju – Tata McGraw-Hill Pub. Co., Delhi
5) Fluid Mechanics – K. Subramanyam – Tata McGraw-Hill Pub. Co., Delhi
6) Fluid Mechanics – Hydraulic & Hydraulic Mechanics -Modi / seth – Standard Book House, Delhi
7) Flow in open channel – V. T. Chaw - McGraw-Hill International Book Co., Auckland
8) Flow in open channel - K. Subramanyam – Tata McGraw-Hill Pub. Co., Delhi

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S.E. (Environmental Engineering) Part II, Semester-4 (Revised)

4. STRUCTURAL MECHANICS - I

Teaching Scheme:

Lecture: 3 Hrs/week
Tutorial: 2 Hrs/week

Examination Scheme:

Theory : 100 Marks
Term Work : 25 Marks

Course Objectives:

1. To understand the effect of external action on elastic body.
2. To understand the different engineering properties of the materials.
3. To analyze stress, strain and deformation of elastic bodies under external actions.
4. To develop ability to compute design forces.

SECTION I

Unit 1: **(9)**

Engineering properties of different materials, St. Venant's principle, Hooke's law, Behavior of matter subjected to uni-axial loading – Simple Bars, Compound Bars and Composite Bars with respect to Stresses, strains, change in dimensions and change in volume. Behaviour of simple bars subjected to Shear Force, concept of complimentary shear stresses. Behaviour of simple bars subjected to multi-axial loading, elastic constants, strain in three dimensions.

Unit 2: **(6)**

Analysis of statically determinate beams S.F. and B.M. diagrams, virtual work approach for computation of shear force and bending moment.

Unit 3: **(5)**

Behaviour of thin walled cylinders subjected to net internal pressure, study of stresses, strains, change in dimensions and change in volume.

SECTION II

Unit 4: **(8)**

Stresses in beams due to Bending Moments, Bending stress variation diagrams, Stresses in beams due to Shear Forces, Shear Stress variation diagrams, Contribution of resistances by web and flange in case of flanged sections.

Unit 5: **(4)**

Stresses in shafts due to Torsional Moments, Torsional Stress variation diagrams, Study of shafts rotating about their longitudinal axis and used in power transmission

Unit 6: **(8)**

Study of stresses in sections subjected to combined effects of Axial Forces and Bending Moments, Eccentrically loaded columns, Core of a section Dams, Chimneys and Retaining Walls

Term Work:

Term work shall comprise of –

A) Any Seven of following experiments
   1. Study of Universal Testing Machine .
   2. Tensile test on Mild steel and TMT steel.
   3. Compression test on M.S. and C.I, cement bricks or paving blocks
   4. Compression test on timber.
   5. Direct shear test on M.S.
   6. Charpy or Izod Impact test on different metals.
   7. Bending test on M.S. bar and Timber.
   8. Water absorption and compression test on burnt bricks.
   9. Hardness test on metals.
   10. Torsion test Mild steel.

B) At least one assignment on each unit.

References:

1. “Mechanics of Structure” (Vol. I and II) - Junnarkar S.B. and Advi, Charotar Publication.
2. “Mechanics of Materials” - R.C. Hibbler, Pearson Education.
3. “Mechanics of Materials” - Gere and Timoshenko, CBS publishers.
4. “Mechanics of Materials” Vol I and II - Punmia, Jain, Laxmi Publications.
5. “Strength of Materials” - S Ramamrutham, DhanapatRai Publications.
6. “Strength of Materials” - Bhavikatti S.S., New Age Publications.
7. “Strength of Materials” - R.K.Rajput., S.Chand Publications.
8. “Strength of Materials” - R.K.Bansal., Laxmi Publications.
9. “Structural Analysis” - Bhavikatti S.S, Vikas Publications house New Dehli.
10. “Introduction to Mechanics of Solids” - J.B. Popov, Prentice – Hall publication.
11. “Strength of Material” - F. L. Singer and Pytel, Harper and Row publication.
12. “Mechanics of Material” - Beer and Johnston, M.

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S.E. (Environmental Engineering) Part II, Semester-4 (Revised)

5. CONSTRUCTION TECHNOLOGY

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

Examination Scheme:
Theory : 100 Marks
Term work : 25 Marks
Oral Exam: 25 Marks

Course Objectives:

1. Familiarize the student with a wide range of building materials, their properties and its use in architectural design and construction.
2. Aware the student about various building component, its strength, function and formwork.
3. Aware the student about methods of construction and quality required for various building components.
4. To develop a practical approach in choosing architectural and construction materials based on use, desired results, durability, availability and cost.

SECTION I

UNIT 1 **(7)**

Engineering properties of following materials:

Stones – Requirements of good building stone, uses of building stones,

Bricks – Manufacturing, Types and Engineering Properties,

Aggregates - Fine Aggregates and coarse aggregates - Origin, types, particle size and shape, mechanical and physical properties, grading, sieve analysis, Recycled and artificial aggregates,

Timber – Natural & Artificial wood and their application in Civil Engineering,

Steel – Standard sections, steel as reinforcement. High Yield Strength Steel and high tensile steel, uses of steel in Building Construction. Anti-corrosive treatments,

Cement- Types of cement and their main properties.

Concrete: Requirements of concrete, Grades of concrete, Admixtures in concrete, Ready mix concrete

UNIT 2 **(8)**

Basic requirements of a building as a whole: strength and stability, Dimensional stability, comfort and convenience, damp prevention, anti termite treatment, water-proofing techniques, heat insulation, day lighting & ventilation.,

Building components and their basic requirements : Foundations, plinth, walls and columns in superstructure, floors, doors & windows, sills, lintels and weather sheds, roofs, steps and stairs, utility fixtures,

Temporary supporting structures

Formwork : Necessity, Ideal Requirements & types.

Scaffolding: Necessity, Various types and advances in scaffolding.

Shuttering : Necessity and types, Shoring, Strutting, its purpose and types.

Centering : Purpose, necessity, various forms of shuttering, Underpinning.

UNIT No. 3 **(6)**

Lintel: Necessity, Materials: wood, stone, brick, steel, R.C.C. and reinforced brick lintels,

Doors – Classification, T.W. Paneled Door, Flush Door, Aluminum Glazed Doors, Steel Doors, fixtures and fastening,

Windows - Classification, T.W. Glazed Windows, Aluminum Glazed Windows, Steel Windows, fixtures and fastening.

Stairs: Technical terms, requirements of a good stair, uses, types, materials for construction. Design of stairs (Dog Legged and Open Well)

Roofs and Roof coverings: Terms used. Roof and their selection, pitched roofs and their types, Timber Trusses (King Post and Queen Post), Steel Trusses types and their suitability, roof coverings and their selection.

SECTION II

UNIT 4 **(8)**

Ventilation & Air Conditioning: Need, Types & requirements

Electrification of building: - Concealed & Open Wiring, Requirements & Location of various points, Estimation of Power/Electrical requirements, Concept of Earthing.

Fire resistant construction & safety: Types of fire, Detection of fire, fire suppression methods, Fire protection precautions, confining of fire, fire hazards, Characteristics of fire resisting materials, building materials and their resistance to fire.

House Drainage : Concept of Plumbing, Drainage facilities & plan, Need of Septic Tank, &, introduction to rainwater harvesting. Concept of rain water Gutters. Rainwater outlet & Down Tank Systems.

UNIT 5 **(8)**

Thermal Insulation: - General concept, Principles, Materials, Methods, Computation of Heat loss & heat gain in Buildings.

Introduction to Acoustics: Absorption of sound, various materials, Sabine's formula, optimum Reverberation time, conditions for good acoustics.

Sound Insulation: Acceptable noise levels, Noise prevention at its source, Transmission of noise. Noise control -general considerations.

UNIT 6 **(4)**

Building Finishes: Paints: Different types and application methods. Varnishes & application methods. Plaster of Paris, Plastering, Pointing & various techniques.

TERMWORK:

1. Testing of following Building materials
   A) Tests on Bricks:
      1. Water absorption Test
      2. Crushing Strength
   B) Tests on Aggregates
      1. Crushing Strength
      2. Specific Gravity
      3. Silt Content
      4. Bulking of Sand

C) Tests on Cement and concrete
   1. Initial and Final Setting Time
   2. Consistency Test
   3. Soundness Test
   4. Workability (Slump) test
   5. Compressive Strength Test

2. Drawing not to scale (minimum five), draw in sketch books following building items-
   A. Foundations: - Isolated, Combined Footing, Under Reamed Piles/Stepped footing. (With reinforcement details)
   B. Stone Masonry: UnCourse Rubble (UCR) , Course Rubble
   C. Brick masonry: English bond, Flemish bond
   D. Doors: T.W. Paneled Door.
   E. Windows: T.W. Glazed Window.
   F. Stairs: Dog legged and Open well.
   G. Timber Trusses: King Post and Queen Post.
   H. Scaffoldings, Formworks and strutting

REFERENCE BOOKS:

1. Building Construction – B.C.Punmia (Laxmi Publications)
2. Basic Civil Engineering – G. K. Hiraskar (Dhanpat Rai Publications)
3. A Text Book of Building Construction – Arora&Bindra (Dhanpat Rai Publications)
4. Construction Technology (Volume 1 to 4) – R. Chudley (ELBS)
5. A to Z of Practical Building Construction & its Management- Sandeep Mantri (Satya Prakashan, New Delhi)
6. SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi
7. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
8. A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons)
9. Civil Engineering Drawing – M. Chakraborty.
10. Engineering Materials – R.K.Rajput (S. Chand)
11. Handbook of Building Construction- M. M. Goyal (Amrindra Consultancy (P) Ltd.)
12. Building Drawing – Shah, Kale, Patki (Tata McGraw- Hill)
13. Building Design and Drawing – Y. S. Sane (Allied Book Stall, Pune)

SHIVAJI UNIVERSITY

S.E. (Environmental Engineering) Part II, Semester-4 (Revised)

6 PROGRAMMING LABORATORY

Teaching Scheme
Lecture: 2 Hrs/ Week
Practical: 2 Hrs/ Week

Examination Scheme:
Term work: 50 Marks

Course Objectives:

5. To learn basic concepts of programming language C.
6. To understand mathematical formulation based on C programming
7. To design and develop programs based on environmental problem & solutions
8. To acquaint with theory related to Mathematical modelling and its Environmental Engineering applications.

SECTION I

Unit 1 **(5)**

Introduction to C Programming basics, Matrix Algebra on Computers: Linear combination, multiplication, Inversion, Memory Management for symmetric matrices, banded matrix

Unit 2 **(4)**

Numerical Techniques: Solution of Equations by Regula false method, Bisection method, Newton Raphson method. Solutions of linear simultaneous equations by Gauss elimination, Gauss Jordon, Gauss Jacobin, Gauss Siedel method

Unit 3 **(3)**

Numerical solution of Differential Equations by Euler's method and Runge Kutta Method

Unit 4 **(3)**

Numerical Integration: Trapezoidal rule, Simpsons rule, Weddles rule, prizmoidal rule, guass quadratal technique.

SECTION II

Unit 5 **(4)**

Introduction to types of interpolation (linear and quadratic), extrapolation, langranges theorem

Unit 6 **(4)**

Level survey project to estimate RL of a point by Collimation plane, Rise & Fall method, Adjustments of closed Traverse- Gales Table

Unit 7 **(5)**

Water flow analysis in pipe network

Term work:

1) Minimum Six Assignments based on each topic
2) Design project to develop environmental facility/ design/ parameters/ quality measurement in C Programming.

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. C Programming by Balguruswamy, McGrawHillPublication.
5. Visual Basic 6 by Thayer Rob, Technomedia , New Delhi.
6. Teach Yourself Visual Basic 6 by Warner Scott, TMH New Delhi
7. Surveying & Leveling by S K Duggal.
8. Surveying by B.C.Punmia.

SHIVAJI UNIVERSITY

Board Of Studies in Environmental Engineering

Subject Equivalence in Proposed Revised Structure for 2014-15

SE Environmental Engineering

S.E. (Environmental Engineering) Part –I	
Subject in Old syllabus	**Subject in Proposed revised syllabus**
Environmental Chemistry	Environmental Chemistry & Microbiology at SE-I
Engineering Mathematics – III	Engineering Mathematics – III at SE-I
Surveying Remote Sensing & GIS	Surveying, Remote Sensing & GIS at S.E-I
Fluid Mechanics	Fluid Mechanics at S.E-I
Ecology & Env. Sanitation	Ecology & Env. Sanitation at S.E-I
Programming Laboratory	Programming Lab at S.E-II
S.E. (Environmental Engineering) Part –II	
Environmental Microbiology	Water Resources Engg. At S.E-II
Environmental Geology	Environmental Geology at S.E-II
Water Supply Engg.	Structural Mechanics I at S.E-II
Environmental Chemo dynamics	Environmental Hydraulics at SE-II
Energy & Environment	Construction Technology at SE-II
Building Services	Building Drawing & Services at SE-I