



SHIVAJI UNIVERSITY, KOLHAPUR

A Revised syllabus of
(T.E. Environmental Engineering)

Structure (S.E. To B.E.)

and

Syllabus of

T.E.Semester (V and VI)

To be introduced from Academic Year 2015-16

i.e. from June 2015 Onwards

(Subject to the modifications will be made from time to time)

S.E. (Environmental Engineering) Part I (Semester III) 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 IV) 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 V) 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	Transportation Engineering & Town Planning	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

* Theory paper of 4 hours duration

T.E. (Environmental Engineering) Part II (Semester VI) 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

Vocational/Industrial Training of 3 to 4 weeks during summer vacation is to be completed.

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B.E. (Environmental Engineering) Part I (Semester VII) 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 VIII) 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	1	-	-	4	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	2	10	-	27	500	225	-	75	800
Grand Total of Part I & II											1600

Elective I

1. Optimization Techniques
2. Clean Development Mechanism
3. Disaster Planning & Risk Analysis
4. Renewable Energy Engineering
5. Environmental Bio Technology

Elective II

1. Managerial Techniques
2. Watershed Management
3. Environmental Modeling & Simulation
4. Operation & Maintenance of Environmental Systems
5. Occupational Health and Safety Assessment

SHIVAJI UNIVERSITY

T.E. (Environmental Engineering) Part I, Sem - V (Revised)

1. 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

Course Learning Objectives

At the end of the course students will

1. Know sources and characteristic of raw water, quantity and quality of water for drinking purpose.
2. Understand concepts of collection and conveyance of water from source
3. Acquire an understanding of the fundamental concepts and detailed technical knowledge of the technologies required for water treatment.
4. Understand the hydraulic concepts and design of water distribution system.

SECTION – I

Unit 1 : Introduction, quantity and quality of Water: (5)

Quantity of water, population forecasting, rate of consumption for various purposes, factors affecting consumption, fluctuation in demand, Surface water sources, Ground water Sources, Quality of water, drinking water standards (IS10500), Physical, Chemical and Bacteriological characteristics of water.

Unit 2 : Collection and conveyance of water: (4)

Intake works-types, design, Economic size of rising main, friction formulae, location and design of jack well and pump house.

Unit 3 : Treatment of water: (10)

Objectives and Necessity of treatment, 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, types of settling, design of sedimentation tank, filtration process, Hydraulics of flow through porous media, classification of filters, design of rapid sand filter, introduction to multimedia filters and pressure filters.

SECTION – II

Unit 4 : Disinfection: (4)

Methods of disinfection, physical & chemical disinfectants, factors affecting disinfection, chlorination- types, break point chlorination, point of application, introduction to UV and ozone disinfection.

Unit 5: Miscellaneous treatments: (5)

Water softening: Lime soda process, recarbonation, ion exchange process. Removal of colour, taste and odour, iron and manganese, fluoridation and defluoridation.

Unit 6: Water supply schemes: (10)

Gravitational, pumping and combined schemes, materials of water supply pipes, 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.

Rural water supply: principles, selection of sources, quantitative requirements, low cost treatment techniques, Pre-feasibility and Feasibility report, Preparation of DPR

Term Work:

1. Laboratory Experimentation for
 - a. Solids Conductivity
 - b. Jar Test –Turbidity, Alkalinity & pH
 - c. Hardness – Lime Dosage determination
 - d. Fluoride
 - e. DO
 - f. Residual Chlorine
 - g. Fe & Mn
 - h. MPN
2. Design of various treatment 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 Quality and Treatment Handbook -American Water Works Association, McGraw-Hill Pub. 1999.
3. Mark J. Hammer & Mark J. Hammer Jr., Water and Waste Water Technology, Prentice Hall of India Pvt. Ltd., 1998, New Delhi.
4. Fair, Geyer & Okun, Water & Waste Water Engineering, John Wiley, 1966, New York.
5. Ernest W. Steel & Terence J. Mc Ghee, Water Supply & Sewage, McGraw Hill, 1990, New York.
6. Physico Chemical Processes for Water Quality Control – Walter J. Weber Jr. Wiley 1st ed.

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T.E. (Environmental Engineering) Part I, Sem - V (Revised)

2. ENGINEERING MANAGEMENT AND ECONOMICS

Teaching Scheme

Lectures: 3 Hrs/week

Tutorial: 1 Hr/week

Examination Scheme

Theory: 100 Marks

Term work: 25 Marks

Course Learning Objectives:

At the end of course, Students will

1. Understand role of Environmental Management in post graduate programme and industries.
2. Understand components & principles of Environmental Management.
3. Understand importance of Environmental organizations & information systems.
4. Identify Environment Management essential in decision making process in the field of Environmental Engineering.

SECTION I

Unit 1

(07)

Principles of Management (by Henry Fayol).

Functions of Management: a) Planning – Nature, Process and Importance of Planning, b) Organizing – Types, Organization Charts, Site Layout, c) Staffing – Introduction, d) Directing, Co-Ordination, Communication, Motivation and Controlling.

Decision Making- process; Linear Programming – Graphical Method, Transportation Problem.

Unit 2

(07)

Project Management: Introduction, steps in Project Management – Work Break Down Structure. Project Planning - Bar Chart, Mile Stone Chart, Development, Critical Path Method (CPM): Introduction, Time Estimates, Floats, Critical Path.

Unit 3

(06)

Performance Evaluation and Review Techniques (PERT) - Concept of Probability, Normal and Beta Distribution, Time Estimates and Calculations of Project Duration, Slack, Probability of Project Completion, Precedence Network concept.

SECTION II

Unit 4

(07)

Engineering Economics – (a) Introduction, Importance. (b) Time Value of Money, Equivalence, Tangible and Intangible Factors, Economic Comparisons- (a) Present Worth Method, Equivalent Annual Cost Method, Net Present Value, Rate of Return, Benefit Cost Ratio, Payback Method.

Unit 5

(06)

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

Unit 6

(07)

Material Management – Purchasing Principles, Stores: Coding System, Function, Responsibilities, Record and Accounting, Inventory Control – An Introduction, Inventory Cost, EOQ Analysis, ABC Analysis, Safety Stocks. Quality Circle – Implementation steps.

TERMWORK:

At least one assignment based on each unit.

RECOMMENDED BOOKS :

1. Engineering Management – Stoner
2. Principles of Management – Davar
3. A Text book of Management – A.S.Deshpande
4. Essentials of Management – Koontz, Dounell and Weigrick
5. Management and Organization by Kast and Rosinweig – Tata McGraw Hill publication.
6. Operation Research – S.H.Deshpande
7. Operation Research – Wagner Wikey Easter Ltd., new Delhi
8. Quantitative Techniques in Management – Vol. I, L.C.Zhamb
9. Material Management – Gopal Krishnan, Sdueshan

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T.E. (Environmental Engineering) Part I, Semester - V (Revised)

3. TRANSPORTATION ENGINEERING AND TOWN PLANNING

Teaching Scheme

Lectures : 4 Hrs/week

Practical : 2 Hr/week

Examination Scheme:

Theory: 100 marks

Term work: 25 marks

Course Learning Objectives (CLOs)

At the end of course students will

1. Understand scope of highway engineering & geometric design of roads.
2. Learn properties of highway construction materials and different methods of pavement design.
3. Study the necessity & elements of traffic engineering for the safe movement of traffic.
4. Understand the basics of construction & geometric design of railway track
5. study the objectives and principles of town planning in the past and modern time
6. Understanding the present trend of urbanization and its various impacts
7. Learn the various concepts of effective urban and rural planning and related legislations

SECTION - I

Unit: 1 Highway Engineering

(08)

a) Introduction Scope of highway engg., Road development plans, Recent developments- NHAI, NHDP, PMGSY, MSRDC, Highway finance –BOT, BOT, Annuity, PPP, DBFO. b) Terrain classification, Highway Alignment-Definition, requirements, factors controlling alignment, alignment of hill roads.

b) Highway Geometric Design: Requirement of geometric design, Surveys Involved, Cross Section Design, Elements of geometric Design, Design Speed, Horizontal Alignment, Vertical Alignment, Sight Distance, Overtaking Lanes, Turning Radius, Super Elevation, Space Standards for Rural & Urban Roads

Unit: 2 Pavement Design

(10)

a) Pavement Design: Pavement types, components, functions, design factors, Design of flexible pavements, CBR Method, IRC: 37-2001. Design of rigid pavement: Westergaard's analysis of wheel load stress, temperature stresses. Types of joints and their functions, IRC: 58-2002 method of design.

b) Highway Construction: a) Highway materials, WMM roads, bituminous roads-BC, SDBC, DBM; concrete roads-DLC, PQC; soil stabilized road, MOST specifications.

Highway Drainage: Necessity, surface and subsurface drainage, maintenance and repairs.

c) Transport and Environment: Traffic safety, Accident reporting and recording systems, factors affecting road safety. Transport planning for target groups children adults, handicapped and women. Norms and guidelines for highway landscape. Street lighting types, standards and design considerations. Accessibility and priority index in traffic network planning. Concept of PCU and level of service.

d) Traffic Engineering: traffic characteristics, traffic studies and analysis, traffic control devices – road marking, traffic sign, traffic signal, intersections.

Unit: 3 Railway Engineering

(06)

a) Introduction: Permanent Way, Components, coning of wheels b) Geometric design: Alignment, gradient, horizontal curves, super elevation, design problems on above. c) Points & Crossing: Terms used, standard points and crossings, design of simple turnout various types of track junctions. d) Stations and yards: purpose, location, site selection, types and general layouts of terminus, Junction.

b) Signaling and interlocking—Introduction, Construction and maintenance of railway track, Modern trends in railways.

SECTION- II

Unit : 4 Town planning- history & present

(06)

a) Brief history- Greek and Roman towns, planning in ancient India - Indus Valley civilization, Necessity, scope and principles of Town Planning, Pre- independence, town planning in India pre and Post independence period, Concepts- town, city, metropolis. Megalopolis

Unit: 5 Planning process

(10)

Urbanization process, global scenario, impact of urbanization on - society, economy environment, of towns, influence on surrounding peri-urban(peripheral areas) area, Planned decentralization-concepts of Garden city, satellite town, high rise city etc., Growth patterns, Elements of town planning- types & Layout of residential units, open space planning, infrastructure & utility planning, Rehabilitation of slum and urban renewal.

Unit: 6 Planning & Legislation

(06)

Planning laws & regulations, M.R.T.P. Act , Types of plan by UDPFI, Development control rules, zoning regulations, Environmental planning- principles, Rural developments, Village planning

Term Work:

1. Test on Aggregates
 - a. Specific Gravity and Water absorption test
 - b. Impact Test
 - c. Abrasion Test
2. Tests on Bituminous Materials
 - a. Penetration Test
 - b. Softening point test
 - c. Flash and fire point test
 - d. Ductility test
 - e. Viscosity Test
3. Recent developments in the planning, designing of Highway/Airways systems, major projects - A report are expected.
4. Planning & drawing of layout of residential colony based on neighborhood principles
5. Visit to township designed based on environmental planning.
6. At least One Assignment on each unit of Section –I

References:

1. Bandyopadhyay, A, 2000, The text Book of Town Planning, Books and Allied (P) Ltd., Calcutta
2. Canter, Larry W, 1977, Environmental Impact Assessment, Mc Graw Hill Pub. New York.
3. Baldwin, John H, 1985, Environmental Planning and Management, International Book Distributors, Dehra Dun
4. KeebJe; Lewis (1976); "Principles & Practice of Town and Country Planning": The Estate Gazette Limited, London (Copyright 1969).
5. Delhi Development Authority; " Master Plan for Delhi"; 1962.
6. Chattopadhyay; B.C.: "History of Human Settlements": Institute of Town Planners, India; New Delhi.
7. Gallion; A.B. and Eisner; S.; (1969), " The Urban Pattern — City Planning and Design": Affiliated East-west Press Pvt. Ltd.: New Delhi (Copyright 1963).
8. Khanna S.K. and C.E.G. Justo (2000): Highway Engineering, NemChand & Bros., Roorkee 2. IRC: 85-1983 – Code of Practice for Accelerated Strength Testing and Evaluation of Concrete Road and Air field
9. C Khanna SK and Justo CEG (2005) Highway Engineering, Nem Chand Jain & Bros Delhi
10. Railway Engineering – K. F. Antia
11. A Course in Railway Engineering - Saxena and Arora, Dhanpat rai & Sons, New Delhi

SHIVAJI UNIVERSITY

T.E. (Environmental Engineering) Part I, Sem - V (Revised)

5. GEOTECHNICAL ENGINEERING

Teaching Scheme:

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

Examination Scheme:

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

Course Learning Objectives (CLOs)

At the end of course students will

1. Learn the methods for determination of Soil properties.
2. Understand the mechanism of soil behavior & performance.
3. Understand concepts of earth pressure estimation and slope stability.
4. Understand the concepts of foundation analysis and design.

SECTION I

UNIT1: (08)

Properties of Soil: Introduction to Geotechnology, formation of soil, three phase soil system, weight- volume relationships, Index & Engineering properties of soil, Determination of index properties and its significance, field identification of soils, Soil classification and Soil structure.

UNIT2: (05)

Soil hydraulics: Modes of occurrence of water in soil, Darcy's law & its validity, Coefficient of permeability & its determination methods, Factors affecting permeability, Permeability of layered soils. Seepage analysis: Quick sand condition, Uplift pressure, exit gradient, failure due to piping, general flow equation (Laplace equation). Flow net - properties, construction and applications, Concept of effective, neutral & total stress in soil mass.

UNIT3: (03)

Compaction: Theory, Methods of compaction, Standard Proctor test and Modified Proctor test as per IS – 2720. Field compaction equipments and methods, Field control of compaction, Factors affecting compaction, Effect of compaction on soil properties

UNIT4: (05)

Consolidation: Consolidation process - Spring analogy, Terzaghi's theory of one dimensional consolidation, Lab consolidation test ;Determination of coefficient of consolidation-square root of time fitting method and logarithm of time fitting method. Consolidation settlement, Rate of settlement, normally consolidated and over consolidated soils, Determination of pre consolidation pressure

SECTION II

UNIT5: (07)

Shear Strength: Concept of shear, Coulomb's theory and failure envelope, Principal stresses, stress analysis (Total stress approach and effective stress approach), representation of stresses on Mohr's circle for different types of soil such as cohesive and cohesion less, Application of shear stress parameters in the field.

Measurement of Shear Strength: Unconsolidated undrained, consolidated undrained and consolidated drained, Type of test – Direct (box) shear test, Triaxial compression test, Unconfined compression test.

UNIT6: (04)

Earth Pressure: Concept, Area of application, earth pressure at rest, active and passive

Condition, Rankine's and Coulomb's theory of earth pressure, Graphical solution-Trial wedge methods, Culmann's method – Rebhann's construction and modification.

Unit 7: (04)

Stability of Slope: Slope classification, slope failure modes, Infinite slopes, Finite slope and analysis of stability, Methods of analysis, Taylor's stability number.

Unit 8 (06)

Foundation Engineering:

Bearing Capacity Estimation: Terzaghi's bearing capacity equation, I.S. Code method of bearing capacity evaluation, Effect of various factors on bearing capacity, Plate load test,

Standard Penetration Test

Foundation Settlement: Immediate settlement- computations from I.S. 8009-1976 (Part I) approach and from Plate load test observations, consolidation settlement computations, total, differential settlement, Tolerable settlement, Angular distortion.

Types of foundation: Shallow & Deep, Design concepts & considerations.

Geosynthetics / geotextile: Types, Functions, applications in Civil - Environmental Engineering.

Termwork consisting of:

A) Laboratory experiments on:

1. Specific gravity determination.
2. Water Content determination
3. Grain size analysis
4. Consistency limits (Liquid, Plastic & Shrinkage Limit)
5. Field density determination by core cutter, sand replacement method
6. Standard proctor compaction test

B) Demonstrations of:

- Permeability Test
- Direct shear test
- Unconfined Compression Test
- Triaxial test
- One dimensional consolidation test

C) Tutorials based on numerical problems and foundation design problems**TEXT BOOKS & REFERENCE BOOKS**

1. "Text book of Soil Mechanics - Theory and practice" by Dr. Alam Singh
(Asian Publishing House, Bombay)
2. "Soil Mechanics and Foundation Engineering" by V. N. S. Murthy.
(U. B. S. Publishers and distributors New Delhi)
3. "Soil Mechanics and Foundation Engineering" by B. C. Punmia.
(A Saurabh and Company Pvt. Ltd., Madras)
4. "Geotechnical Engineering" by P. Purushottam Raj.
(Tata Mcgraw Hill Company Ltd. New Delhi)
5. "Soil Mechanics" by Terzaghi and Peak. (John Willey and Sons, New- York)
6. "Soil Testing" by T.W. Lambe. (Willey Eastern Ltd., New Delhi)
7. Geotechnical Engineering by Venkatramiah

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5. BUILDING PLANNING AND DESIGN

Teaching Scheme

Lectures: 3 Hrs/week

Drawing: 2 Hrs/week

Examination Scheme

Theory: 100 Marks

(Theory paper 4 hrs duration)

Term work: 25 Marks

Oral Exam: 25 Marks

Course Learning Objectives (CLOs)

At the end of course students will

1. Study the principles of building planning and requirements of drawing.
2. Understand the requirement and concepts of building services.
3. Study the functional requirements of building.
4. Understand the requirements of owner and its fulfillment in accordance with guidelines.

SECTION - I

Unit 1: Site, Building and Building Drawings

(06)

Categories of buildings, Types of Residential buildings, Site selection, Factors influencing selection of site, guidelines for planning and drawing of buildings, Positions of various building components, types of drawings and relevant scales

Unit 2: Climatology and Building design

(07)

Elements of climate, Climatic zones, Comfort indices, Effects of various climatic elements on building, Sun path diagram, Circulation diagrams and sun shading devices. Orientation of buildings, Day lighting and various components of day lighting

Unit 3: Building rules and bye laws

(06)

Necessity of building rules and bye laws, plot sizes, road widths, open spaces, floor area ratio of (FAR), marginal distances, building line, control line, heights regulations, room sizes, Area calculations for Built up area, floor area, carpet area, rules for ventilation, lighting, drainage, sanitation and parking of vehicles, rules for layout plans

SECTION - II

Unit 4: Functional planning and design of residential building (08)

- a) Owner's requirements, principles of planning, Design of various building units as per requirements of buildings .Design of various building components as per energy consciousness.
- b) Various active and Passive methods of obtaining comfort conditions Preparation of line plan for residential structures of all types such as bungalows, row houses, duplex, apartment houses etc
- c) Development of floor plan, elevations, sections, schedule of openings and construction notes/specifications for the given line plan of residential buildings such as for: Individual building, apartments and twin bungalows.

Unit 5: Planning and design of building services (08)

- a) Design Of: 1) Rainwater harvesting system 2) Individual treatment of waste water
3) Various solar systems 4) solid waste disposal alternatives.
- b) Preparation of plumbing and electrical plans showing all the necessary details.

Unit 6: Perspective Drawing (04)

Elements of perspective drawings, parallel perspective and angular perspective

Termwork

1. Planning and designing of a Residential building project for which minimum 5 imperial size drawings shall be prepared covering scope of a) Municipal drawing, b) Layout plan, c) Plan giving details of water supply, drainage, Electrification, furniture layout etc. d) Elevation treatment
2. Imperial size sheet/s for perspective view of the buildings planned above.
3. A3 size sheets for plumbing and sanitary accessories (5 sheets).
4. Visit to a building complex and a report based on that.

Reference Books

- Building Construction – B.C.Punmia (Laxmi Publications)
- Basic Civil Engineering – G. K. Hiraskar (Dhanpat Rai Publications)
- A Text Book of Building Construction – S.P. Arora, S.P. Bindra (Dhanpat Rai Publications)
- Construction Technology (Volume 1 to 4) – R. Chudley (ELBS)
- A to Z of Practical Building Construction and Its Management- Sandeep Mantri (Satya Prakashan, New Delhi)
- SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi
- I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
- A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons)
- Civil Engineering Drawing – M. Chakraborty.
- Engineering Materials – R.K.Rajput (S. Chand)
- Handbook of Building Construction- M. M. Goyal (Amrindra Consultancy (P) Ltd.)

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6. STRUCTURAL MECHANICS - II

Teaching Scheme

Lecture: 2 Hrs/week
Practical: 2 Hrs/week

Examination Scheme

Theory: ----
Term Work: 50 Marks

Course Learning Objectives (CLOs)

At the end of course students will

1. Learn the use and applications of steel section in construction.
2. Understand the concept indetermination and analysis method.
3. Study design of different sections and connections.
4. Learn design of flexural members.

Structural Analysis

Unit 1: (7)

Strain Energy and related theorems, Slope and Deflection of beams, Double integration method, Macaulay's Method, Unit load Method

Unit 2: (8)

Concept of Indeterminate Beam - Propped cantilever, Fixed beams & continuous beams, Analysis by method of consistent deformation, Clapeyron's theorem (three moment method) & moment distribution method

Structural Design

Unit 3: (8)

Steel structures – Advantages & Limitations, Permissible Stresses, Types of loads, Factor of Safety, Types of connections & standard rolled sections. Design of axial members by Limit State method

Tension members – common sections, net effective area of angles; tees; flats, connection to gusset plate using welds / bolts.

Compression members – Struts, Columns, Column Connections and Column bases

Unit 4:**(7)**

Design of flexural members: Beams – Laterally supported, Unsupported, Design of simple beams, built up beams

Note: Refer IS 800-2007, IS 875 and steel table

Term Work:

Term work shall comprise of at least two assignments on each unit.

References:

1. "Mechanics of Structure" (Vol. I & II) - Junnarkar S.B.&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.

SHIVAJI UNIVERSITY

T.E. (Environmental Engineering) Part II, Sem - VI (Revised)

1. WASTEWATER ENGINEERING

Teaching scheme:

Lecture: 3 Hrs/ week

Practical: 2 Hrs/ week

Examination Scheme

Theory: 100 marks

Term Work: 25 marks

Oral Exam: 25 marks

Course Learning Objectives (CLOs)

At the end of course students will

1. Study sources and flow rates of wastewater and Characteristic of Municipal waste water.
2. Understand of the fundamental concepts and detailed technical knowledge of the technologies required for domestic wastewater treatment.
3. Learn the principles involved in the treatment of sludge.
4. Understand the effects of wastewater discharges on the aquatic environment.

SECTION I

Unit 1: Introduction, Quantity & Quality of Wastewater (7)

Components of Wastewater Flows, Wastewater Sources & Flowrate, Variations in Flowrates & Strength, Characteristics of Wastewater, Quantity of Wastewater, Sewer Design Considerations- Minimum Size of Sewer, Limiting Velocities, Peak Factor

Sewage Pumping, Location, Capacity, Pumping Station Design

Unit 2: Primary Treatment of Wastewater (5)

Physical Unit Operations- Screening, Grit Removal, Oil & Grease Removal, Primary Sedimentation

Unit 3: Secondary Treatment of Wastewater (8)

Fundamentals of Biological Treatment, Microbial Metabolism, Bacterial Growth & Kinetics, Suspended & Attached Growth Processes, Activated Sludge Process & its Modifications, Trickling Filters, Aerated Lagoons, Oxidation Ditch

SECTION II

Unit 4: Anaerobic Treatment of Wastewater (5)

Anaerobic Suspended & Attached Growth Processes, Factors affecting Anaerobic Processes, Anaerobic Lagoons, UASB, Septic Tank

Unit 5: Sludge Treatment**(6)**

Solid Sources, Characteristics & Quantities, Sludge Pumping, Treatment-Thickening, Stabilization, Design of Sludge Digester, Conditioning, Dewatering, Drying, Ultimate Disposal of Sludge Solids

Unit 6: Disposal of Wastewater**(7)**

Need of Disinfection, Self Purification, DO Sag Curve, Streeter Phelp's Model, Stream Classification, Effluent Standards for Discharge into Surface Water & on Land

Term work shall consist of the following:

- a) A Journal containing experiments carried on characterization of Municipal Wastewater for pH, BOD, COD, Solids, Acidity & Alkalinity.
- b) Design of treatment units based on above theory.
- c) Visit to sewage treatment plant & preparation of report.

References:

- 1. Peavey, H.S. Rowe, D.R., and Tchobanoglous, Environmental Engineering, McGraw-Hill Book Company.
- 2. Viessman W. and Hammer M.J. Water supply and pollution Control, Harper Collins College publishers.
- 3. Hammer M.J. Water and Waste water Technology, Prentice-Hall of India P.Ltd.
- 4. Manual on sewerage and sewage Treatment systems – CPHEEO, Government of India in collaboration with JICA.
- 5. Metcalf & Eddy, Waste Water Engg. Treatment & Disposal, Tata McGraw Hill

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T.E. (Environmental Engineering) Part II, Sem - VI (Revised)

2. AIR AND NOISE POLLUTION

Teaching Scheme

Lectures: 4 Hrs/week

Practical: 2 Hrs/week

Examination Scheme

Theory: 100 Marks

Term Work: 50 Marks

Course Learning Objectives (CLOs)

At the end of course students will

1. Study the atmosphere & meteorology and its importance in Air Pollution
2. Understand global issues like Greenhouse Emissions, Global Warming, Asia Brown cloud, Acid Precipitation in detail
3. Know effects of noise on human, animals, plants and structures and procedure of conducting audiogram.
4. Learn the various techniques of noise measurement and control for community and industries sources.

SECTION I : AIR POLLUTION

Unit 1: Introduction (2)

Definition, Atmosphere- Structure and Composition

Unit 2: Air quality (6)

Definition of Air Pollution, History of air pollution, Sources and types of air pollutants, units of measurement

Unit 3: Effects of Air Pollution (6)

Effects of Air Pollution on human, vegetation, Animals, Property, Acid rain, Global Warming, Climate Change and Greenhouse Effect, Ozone Layer Depletion, air pollution episodes e.g. London smog, MIC gas leak at Bhopal

Unit 4: Meteorology (heat, pressure, wind and moisture) (8)

Scales of motion, wind speed and direction, wind rose diagram, Lapse rate and atmospheric stability, plume behavior, maximum mixing depth, Cyclones & Anticyclones, moisture and relative humidity, influence of meteorology on air quality

SECTION – II : NOISE POLLUTION

Unit 1 : Introduction (4)

Engineering definition of noise and sound, Characteristics of sound - pressure, power, intensity, sinusoidal sound wave, sound transmission and factors influencing it, decibel level

Unit 2 : Effects of noise pollution (4)

The menace of noise pollution in India, Sources and types of noise, Anatomy of ear and mechanization of hearing, Effects of noise, effects on health, effects on wild life, effects on plants, hazards of noise – physiological and psychological hazards

Unit 3: Community noise- sources and measurement (7)

Definition of community noise, characteristics and sources, measurement, equivalent noise levels, noise survey and noise monitoring Day and Night average noise levels, noise pollution index, instruments for noise measurements, common noise levels and permissible noise levels- 6 hrs.

Unit 4: Industrial noise- sources and health monitoring (7)

Sources and types of noise in industries, noise monitoring in industries, safe exposure levels and health monitoring, control of noise- at source, along path and at receiving end, Active Noise Reduction, Noise Pollution (Regulation and Control) rules 2000

Term Work:

A Journal consisting of the following practicals and assignments based on theory

1. Determination of Wind velocity and construction of Wind rose diagram
2. Study of air pollution problem in local area and preparation of report
3. Study of noise measuring equipments & their use.
4. Study of Noise pollution problems in following areas & its report.
a) Industry b) Traffic c) Public places.
5. Assignments based on above theory.

Reference books :

1. Industrial Pollution by N. Irving Sax (Van Nostrand Reinhold Company)
2. Environmental Engineering by G.N.Pandey and G.C. Carney, TMH
3. IS code for practice for noise reduction in industrial buildings IS: 3483, 1965
4. Noise Pollution – S.K.Agrawal- APH Publishing corporation, New Delhi.
5. Air Pollution by Wark and Warner
6. Air Pollution by Stern Vol I, II, III
7. Air Pollution by D. Nevers
8. Air Pollution by Ross

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T.E. (Environmental Engineering) Part II, Sem - VI (Revised)

3. SOLID AND HAZARDOUS WASTE MANAGEMENT

Teaching scheme:

Lecture: 4 Hrs/ week

Practical: 2 Hrs/ week

Examination Scheme

Theory: 100 marks

Term Work: 50 marks

Course Learning Objectives (CLOs)

At the end of course students will

1. Understand components of Municipal solid Waste management.
2. Study methods for collection & transportation of Waste.
3. Learn the fundamental concepts and detailed technical knowledge of the technologies required for Municipal solid & Hazardous Waste treatment & disposal.
4. Learn environmental legislation & guidelines to develop legal & safe solutions

SECTION - I

Unit 1**(8)**

Introduction, principles of municipal solid waste management, composition and quantity of solid waste, Sorting and material recovery, storage of waste at source, primary collection of waste, street cleansing, waste storage depots, transportation of waste

Unit 2**(8)**

Processing and disposal of waste: composting, landfills, Energy recovery from municipal solid waste, Emerging processing technologies

Unit 3**(4)**

Construction and demolition waste, Slaughter house waste and dead animals, biomedical waste management

SECTION - II

Unit 4**(8)**

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

Unit 5**(9)**

Waste Minimization and Resource Recovery Waste Reduction, Waste Tracking Systems, and Minimization, Stabilization and Solidification, Physico-Chemical Treatment Processes, Biological Treatment Processes, Bioremediation, Phytoremediation, Introduction to Thermal Processes: Chemistry and Thermodynamics of Incineration. Land Disposal: Disposal Site, Landfill Operations, Leachate Collection, Facilities Design and Development. Remedial Investigations, Containment and Alternative Analysis

Unit 6**(3)**

Introduction to Legislation in solid, hazardous, E waste and biomedical waste management

Term Work:

- Analysis of Solid Waste- Physical properties.
- Design of refuse collection & disposal system for medium size town/ part of a city
- Assignments based on above topics.

Reference Books:

1. Manual on Municipal Solid Waste Management by Ministry of Urban Development, Govt. of India.
2. Solid Waste Management – Dr. A. D. Bhide
3. Solid Waste Management Hand Book – Pavoni
4. Composting – Gottas
5. Handbook and Solid Waste Disposal – George Tchobanoglous
6. Hazardous Waste Management - Charles Wentz
7. Hazardous Waste Management - Michael LaGrega, Phillip Buckingham, Jeffrey Evans,
8. Basic Hazardous Waste Management - William C. Jr. Blackman

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T.E. (Environmental Engineering) Part II, Sem - VI (Revised)

4. DESIGN OF STRUCTURES- I

Teaching Scheme

Lecture: 3 Hrs/week

Practical: 2 Hrs/week

Examination Scheme

Theory : 100 Marks

Term Work: 50 Marks

Course Learning Objectives (CLOs)

At the end of course students will

1. Understand the design philosophies of RCC.
2. Understand analysis and design of reinforced sections.
3. Study significance of shear and bond.
4. Learn design of various types of slab.

SECTION - I

Unit1: (6)

Stress –Strain behavior of concrete & steel, Behavior of RCC, Permissible stresses in concrete & steel. Design philosophies - Working stress method, Ultimate load method, Limit state method.

Unit 2: (8)

Limit state of collapse (flexure): Analysis and Design of Singly and Doubly Reinforce rectangular sections and flanged sections

Unit 3: (6)

Limit state of collapse (shear and bond): Shear failure, Types of Shear reinforcement, Design of Shear reinforcement, Bond-types, factors affecting bond Resistance, Check for development length.

SECTION - II

Unit 4: (8)

Design of two span continuous beams, three span continuous beams, Concept of moment redistribution.

Unit 5: (7)

Design of slabs: One way, Two way with different support conditions as per IS: 456, Cantilever slab.

Unit 6: (5)

Design of Circular slab by yield line theory

Term Work:

Term work shall comprise of at least eight assignments consisting of design problems on above unit

Reference books:

1. IS 456-2000
2. Limit state theory and Design –Karve and Shah, Structures publications , Pune
3. Reinforced Concrete Design – Limit state - A.K. Jain Nem Chand brothers Roorkee
4. Fundamentals of Reinforced Concrete –Sinha and Roy, S. Chand and company Ltd.
5. Ram Nagar, New Delhi
6. Limit State Design of reinforced concrete P.C.Varghese, Prentice Hall, New Delhi
7. Reinforced Concrete Design- B.C. Punmia Laxmi publications New Delhi
8. Reinforced Concrete Design-M. L. Gambhir-Mc millan India Ltd. New Delhi
9. Special publications -16-Bureau of Indian standard

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T.E. (Environmental Engineering) Part II, Sem - VI (Revised)

5. ENVIRONMENTAL MANAGEMENT

Teaching Scheme

Lectures: 3 Hrs/week

Tutorial: 1 Hrs/week

Examination Scheme

Theory: 100 Marks

Term work: 25 Marks

Oral Exam: 25 Marks

Course Learning Objectives (CLOs)

At the end of course students will

1. Understand role of Environmental Management in post graduate programme and industries.
2. Understand components & principles of Environmental Management.
3. Understand importance of Environmental organizations & information systems.
4. Identify Environment Management essential in decision making process in the field of Environmental Engineering.

SECTION I

Unit 1 (6)

Definition of Environmental Management, Principles of Environmental Management, Nature, Scope and Components of Environmental Management, Policies and Legal Aspect of Environmental Management

Unit 2 (8)

Introduction to Environmental Legislation: How the parliament functions, Bill to Act to Rules. How a Bill is issued in parliament & how it becomes an Act. How a Bill is Notified/ Gazette. Various Environmental Policies of Governmentt of India

Unit 3 (6)

Environmental Policy Analysis- Macro level and Micro level, Methods of Policy Analysis, steps involved, Environmental Management Plan (EMP), Components of EMP, Preparation of EMP, Case Study.

SECTION II

Unit 4 (8)

Environmental Economics, Estimation of Costs and Benefits, Cost-Benefit Analysis. Interest Calculations, Present and future worth of Projects, Financial Aspects of Project, DPR and other feasibility Reports, Environmental Audit, Components of Audit, Preparation of Audit Report, Case Study

Unit 5**(6)**

Organization for Environmental Management, Example, Organizational Design, Institutionalization of Environmental management in India, Ministry of Environment and Forest, Central Pollution Control Boards, State Pollution Control Boards, Local Bodies, their scopes, Organizational and Functional issues, Related Issues in Environmental Management.

Unit 6**(6)**

Environmental Information Systems, Global, National, Unit level Systems, Applications, Geographic Information System (GIS) and Remote Sensing in Environmental Management

Term work

Term work consisting of assignment on each unit.

Reference Books

1. Environmental Management By Bala Krishnamoorthy
2. Burke, Gwendolyn, Ben Ramnarine Singh and Louis Theodore. 2000. Handbook of Environmental Management and Technology. New York: John Wiley.
3. Friedman, Frank. 2000. Practical Guide to Environmental Management. Washington, D.C.: Environmental Law Institute
4. Mackenthun, Kenneth M. 1999. Basic Concepts in Environmental Management. Boca Raton, FL: Lewis
5. Paruccini, M. (Ed.). 1994. Applying Multiple Criteria Aid for Decision to Environmental Management. Boston: Kluwer Academic Publishers.
6. Rietbergen-McCracken, Jennifer and Hussein Abaza (Eds.). 2000. Economic Instruments for Environmental Management: A Worldwide Compendium of Case Studies. London: Earthscan.
7. Environmental Science For Environmental Management by Timothy O'riordan
8. Environmental Management For Sustainable Development, Second Edition By C.J. Barrow
9. Environmental Management: Principles And Practice By C.J. Barrow (Kindle Edition - Mar 14, 2007) - Kindle Book
10. Environmental Management In Practice: Vol 3 By Luc Hens, Paul Compton Edited By Bhaskar Nath (Kindle Edition - Dec 7, 2002) - Kindle Book
11. GIS For Environmental Management By Robert Scally
12. Environmental Management Readings And Case Studies By Lewis Owen
13. Applied Ecology And Environmental Management Second Edition By: Edward I Newman (University Of Bristol)
14. Corporate Environmental Management By John Darabaris
15. Environmental Management by Virginia H. Dale

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T.E. (Environmental Engineering) Part II, Sem - VI (Revised)

6. DESIGN & DRAWING OF ENVIRONMENTAL SYSTEMS

Teaching Scheme

Lectures: 2 Hrs per week

Drawing: 2 Hrs per week

Examination Scheme

Theory : ----

Term work: 50 marks

Course Learning Objectives (CLOs)

At the end of course students will

1. Understand various conditions of work at execution of water supply & sewerage scheme.
2. Learn working details including RCC for various Environmental Engineering structures
3. Study working details of water distribution system as well as sewerage system

Unit 1: (4)

General conditions of work for various water supply and sewerage schemes Guidelines regarding design of treatment facilities and approval from authorities.

Unit 2: (8)

Design of various elements in water supply schemes, Design criteria, Design of pressure pipes and gravity pipes, Design of mechanical and electrical equipments, Hydraulic flow diagram

Unit 3: (6)

Design of tanks: Underground, partially below and above ground and above ground, Design of service reservoirs: Ground and elevated.

Unit4: (6)

Design of sewer pipes: Criteria for design, Guidelines for Laying of sewer pipes, sewer appurtenances, Design of treatment units. Hydraulic flow diagram

Term work:

Term work shall consist of

1. Design and Drawing of water treatment units
2. Design and Drawing of sewage treatment units
3. Design of Ground service reservoir
4. Design of elevated service reservoir
5. Drawings of various pipe fittings and sewer appurtenances

Reference Books:

1. Manual of water Supply and treatment – Govt of India Publications
2. Manual of sewarge and sewage treatment -- Govt of India
3. Design of R.C.C. ----- Sushilkumar Ramamrutham
4. Water Supply and treatment----- Steel

SHIVAJI UNIVERSITY
Board Of Studies in Environmental Engineering

Subject Equivalence in Proposed Revised Structure implemented from 2015-16

T.E. (Environmental Engineering) Part-I	
Wastewater Engg.	Wastewater Engg. at TE- II
Urban & Rural Planning	Transportation Engg. & Town Planning at TE-I
Water Resources Engg.	Design of Structure – I at TE-II
Environmental Geotechnology	Geotechnical Engg at TE-I
Green Building	Building Planning & Design at TE- I
T.E. (Environmental Engineering) Part-II	
Air Pollution – I	Air Pollution & Noise Pollution at TE- II
Solid Waste Management	Solid and Hazardous Waste Management at TE- II
Environmental Management	Engineering Management & Economics at TE- I
Noise Pollution & Control	Environmental Management at TE – II
Quantity Surveying & Valuation	Quantity Surveying & Valuation at BE- II