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

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Subject</th>
<th>Teaching Scheme (Hours)</th>
<th>Paper Marks</th>
<th>Examination Scheme</th>
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### S.E. (Environmental Engineering) Part II (Semester IV) Revised

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**Grand Total of Part I & II** 1600
### T.E. (Environmental Engineering) Part I (Semester V) Revised

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<th>Sr. No.</th>
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* Theory paper of 4 hours duration

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

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<th>Sr. No.</th>
<th>Subject</th>
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**Grand Total of Part I & II** 1600

Vocational/Industrial Training of 3 to 4 weeks during summer vacation is to be completed.
### SHIVAJI UNIVERSITY, KOLHAPUR

**B.E. (Environmental Engineering) Part I (Semester VII) Revised**

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### B.E. (Environmental Engineering) Part II (Semester VIII) Revised

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**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:  Examination Scheme
Lecture: 3 Hrs/ week Theory: 100 marks
Practical: 2 Hrs/ week 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          e. DO
   c. Hardness – Lime Dosage determination  g. Fe & Mn
   d. Fluoride                      h. MPN

2. Design of various treatment units based on above theory.
3. A visit to water treatment plant & report.

Reference Books:

SHIVAJI UNIVERSITY

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

2. ENGINEERING MANAGEMENT AND ECONOMICS

Teaching Scheme          Examination Scheme
Lectures: 3 Hrs/week         Theory: 100 Marks
Tutorial: 1 Hr/week                              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,
Decision Making- process; Liner Programming – Graphical Method, Transportation Problem.

Unit 2                  (07)


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)

Unit 5 (06)

Unit 6 (07)

TERMWORK:
At least one assignment based on each unit.

RECOMMENDED BOOKS:
1. Engineering Management – Stoner
2. Principles of Management – Davar
4. Essentials of Management – Koontz, Dounell and Weigrick
6. Operation Research – S.H.Deshpande
7. Operation Research – Wagner Wikey Easter Ltd., new Delhi
9. Material Management – Gopal Krishnan, Sdueshan
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.


Unit: 2 Pavement Design (10)


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.


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

Unit: 3 Railway Engineering

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

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

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

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:

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

UNIT 5: (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.

UNIT 6: (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 – Rebmann's construction and modification.

UNIT 7: (04)

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

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)
7. Geotechnical Engineering by Venkatramiah
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)


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

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:

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:

12. “Mechanics of Material” - Beer and Johnston, M.
Teaching scheme:                  Examination Scheme
Lecture: 3 Hrs/ week             Theory: 100 marks
Practical: 2 Hrs/ week           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 wastewater.
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)


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
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
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:

4. Manual on sewerage and sewage Treatment systems – CPHEEO, Government of India in collaboration with JICA.
SHIVAJI UNIVERSITY
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
Definition, Atmosphere- Structure and Composition

Unit 2: Air quality
Definition of Air Pollution, History of air pollution, Sources and types of air pollutants, units of measurement

Unit 3: Effects of Air Pollution
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 )
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

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

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

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

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 repot.
   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
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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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.
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)
Unit 5 (9)

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,
SHIVAJI UNIVERSITY
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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

Unit 1:  

Unit 2:  
Limit state of collapse (flexure): Analysis and Design of Singly and Doubly Reinforce rectangular sections and flanged sections

Unit 3:  
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:  
Design of two span continuous beams, three span continuous beams, Concept of moment redistribution.

Unit 5:  
Design of slabs: One way, Two way with different support conditions as per IS: 456, Cantilever slab.

Unit 6:  
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
4. Fundamentals of Reinforced Concrete –Sinha and Roy, S. Chand and company Ltd.
5. Ram Nagar, 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
SHIVAJI UNIVERSITY
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)

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)
Unit 5
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
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
   Washington, D.C.: Environmental Law Institute
   Boca Raton, Fl: Lewis
   Instruments for Environmental Management: A Worldwide Compendium of Case
7. Environmental Science For Environmental Management by Timothy O'riordan
   C.J. Barrow
9. Environmental Management: Principles And Practice By C.J.Barrow (Kindle
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
    Newman (University Of Bristol)
14. Corporate Environmental Management By John Darabaris
15. Environmental Management by Virginia H. Dale
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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.

Unit 4: (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:

2. Manual of sewarge and sewage treatment -- Govt of India
3. Design of R.C.C. -------- Sushilkumar Ramamrutham
4. Water Supply and treatment------------- Steel
Subject Equivalence in Proposed Revised Structure implemented from 2015-16

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