

SPPU B.E./B.Tech CIVIL Sem 7 syllabus

Environmental Engineering - II

401 001 Environmental Engineering - II

Unit I

Sewage quantity: Collection and conveyance of sewage, sources of sewage, variations in sewage flow, Flow quantity estimation (sewage and storm water quantification), design of storm water system, Design of circular sanitary sewers. Pumping of sewage, necessity, location. Effect of change of life style on sewage quality.

Characteristics of sewage: Methods of sampling, Physical, chemical and biological characteristics, Quality requirements for disposal and recycle/reuse of sewage as per CPCB norms.

Stream sanitation: Self-purification of natural streams, river classification as per MoEF & CC, Govt. of India; Oxygen Sag Curve, Streeter - Phelps equation and terminology (without derivation and numerical). National river cleaning plan.

Unit II

Sewage treatment: Pollution due to improper disposal of sewage, Introduction to sewage treatment, preliminary, primary, secondary and tertiary treatment, Unit operation and Process flow diagram for sewage treatment, Theory and design of screen chamber, Grit Chamber and Primary sedimentation tank as per the Manual of CPHEEO.

Unit III

Theory & design of secondary treatment units: Introduction to unit operations and processes for secondary treatment. Principles of biological treatments, role of microorganism in wastewater treatment.

Activated sludge process: Theory and design of ASP, sludge volume index, sludge bulking & control, modifications in ASP. Operational

problems and maintenance in ASP.

Concept of Sequential batch reactor (SBR) .

Trickling filter: Biological principle, different T.F media & their characteristics, design of standard rate and high rate filters using NRC formula, single stage & two stage filters, recirculation, ventilation, operational problems, control measures, theory of rotating biological contactors.

Unit IV

Low cost treatment methods for rural areas

Oxidation pond: Bacteria - algae symbiosis, design of oxidation pond as per the manual of CPHEEO, advantages & disadvantages of oxidation ponds.

Aerated lagoons: Principle, aeration method, advantages & disadvantages of aerated Lagoons, design of aerated lagoon. Introduction and theory of Phytoremediation technology for wastewater treatment. Introduction and theory of root zone cleaning system.

Unit V

Onsite Sanitation Treatment systems: Septic tank, up-flow anaerobic filter. and Package Sewage Treatment Plant- Working principle, advantages and disadvantages. Introduction to MBR, MBBR and FMBR.

Anaerobic digester: Principle of anaerobic digestion, stages of digestion, bio - gas production its characteristics & application, factors governing anaerobic digestion,. Dewatering of sludge by gravity thickener, sludge drying bed, decanters. Methods of sludge treatment and disposal, advantages & disadvantages. Up-flow Anaerobic Sludge Blanket (UASB) Reactor- Principle, advantages & disadvantages.

Unit VI

Industrial waste water treatment: Equalization and neutralization. Application of preliminary, primary and secondary treatment for industrial wastewater as per the CPCB norms.

Sources of waste water generation from manufacturing process, characteristics of effluent, different methods of treatment & disposal of effluent for the following industries: Sugar, dairy and distillery. Discharge standards as per CPCB norms.

Recycle & reuse of treated wastewater: Gardening, sewage farming, W.C. Flushing, reuse in industry.

Text Books:

1. Environmental studies by Rajgopalan- Oxford University Press.
2. Waste Water Treatment & Disposal – Metcalf & Eddy - TMH publication.
3. Environmental Engg. - Peavy, Rowe - McGraw Hill Publication.
4. Waste Water Treatment – Rao & Dutta.

Reference Books:

5. Waste Water Engg. – B.C. Punmia & Ashok Jain - Arihant Publications.
6. Water Supply & Waste Water Engg.- B.S.N. Raju – TMH publication.
7. Sewage Disposal & Air Pollution Engg. – S. K. Garg – Khanna Publication.
8. Environmental Engg. – Davis - McGraw Hill Publication.
9. Manual on sewerage and sewage treatment – Public Health Dept., Govt. of India.
10. Standard Methods by APHA.

Transportation Engineering

401 002 Transportation Engineering

Unit I

Highway Development & Planning:

History, Development Plans, Classification of roads, Road Patterns, road development in India - Vision 2021 & Rural Road Development Vision 2025, Current road projects in India; highway alignment and highway project report preparation (Planning surveys & Master Plans based on saturation system).

Unit II:

Geometric design of highways:

Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, problems, Highway drainage, Importance of highway drainage, subsurface and surface drainage systems.

Unit III

Traffic engineering & control:

Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control devices (signs, signals, islands, road markings); Accident studies, types of road intersections; parking

studies; highway lighting.

Unit IV

Pavement materials:

Materials used in Highway Construction and related tests - Soil subgrade and CBR Test, Stone aggregates, bituminous binders, bituminous paving mixes, viscosity based gradation of bitumen, Modified Bitumen (Cutbacks, Emulsions, Crumbed Rubber Modified Bitumen - CRMB, Polymer Modified Bitumen-PMB, Foamed Bitumen), Marshall Stability Mix Design and Test (All 5 test parameters).

Unit V

Pavement Design:

Introduction; flexible pavements - Computation of design traffic (Vehicle Damage Factor VDF, Lane distribution factor LDF, Traffic growth rate); stresses in flexible pavements; design guidelines for flexible pavements as per IRC 37-2012 (steps only); rigid pavements-components and functions; factors affecting design; stresses in rigid pavements (ESWL); design guidelines for concrete pavements as per IRC 58-2015 (steps only); joints in CC pavements, problems.

Unit VI

A. Pavement Construction:

Construction process of GSB, WBM, WMM; Cemented base, Introduction to bituminous works such as prime coat, tack coat, seal coat, Built-up Spray Grout (BSG), Asphaltic Concrete (AC) or Bituminous Concrete (BC), Bituminous Macadam (BM), Dense Bituminous Macadam (DBM) and premix carpet, Dry lean Concrete (DLC), Pavement Quality Concrete (PQC).

B. Modern Trends in Highway Materials, Construction & Maintenance:

Mastic Asphalt, Cold Mix Asphalt Technology, Warm Mix Asphalt Technology, Recycled/Reclaimed Asphalt Pavement (RAP) (Manual Series - 2), Concept of Super pave Mix Design (Super pave Series 2), Non-Destructive Evaluation of Pavements (Falling Weight Deflectometer FWD).

Text Books:

1. Highway engineering - S.K. Khanna, C.E.G. Justo & A. Veeraragavan, Nem Chand and Brothers, Roorkee
2. Principles of Highway Engineering and Traffic Analysis (4th edition) F. L. Mannering, Scott S. Washburn, Wiley India
3. Principles and practices of Highway engineering -Dr. L.R. Kadiyali, Khanna Publishers Delhi.

Reference Books:

1. A Course in Highway Engineering - S.P. Bindra, Dhanpat Rai and Sons, Delhi.
2. Principles of Transportation Engineering - G.V. Rao Tata MacGraw Hill Publication
3. Highway Engineering - Rangawala, Charotar publishing House, Anand 388001 (Gujrat)
4. Principles of Transportation Engineering - Partha Chakraborty, Animesh Das, Prentice Hall of India Pvt. Ltd., New Delhi.
5. Highway and Bridge Engineering - B.L. Gupta, Amit Gupta Standard publishers Distributors, Delhi.

Structural Design and Drawing III

401 003 Structural Design and Drawing III

Unit 1

Prestressed concrete - Analysis:

Introduction, Basic concepts, materials, various Pre-tensioning and Post-tensioning systems, concept of losses, Stress calculations, and concept of cable profile.

Unit 2

Prestressed concrete - Design:

Design of post tensioned prestressed concrete simply supported rectangular and flanged sections for flexure and shear including end block.

Design of one way and two way post tensioned slabs (Single panel only).

Unit 3

Design of Flat slab:

Introduction to flat slab, Design of prestressed two way flat slab by direct design method.

Unit 4

Earth retaining structures:

Introduction, Functions and types of retaining walls, Analysis and design of RCC cantilever type of retaining wall for various types of backfill conditions.

Unit 5

Liquid retaining structures:

Introduction, types, function, codal provisions, methods of analysis, Design of circular, square, and rectangular water tanks resting on ground by working stress method, Introduction to limit state design of water tanks.

Unit 6

Introduction to vibration and earthquake analysis:

Introduction to single and multi-degree of freedom systems: free, forced, un-damped and damped vibration, Estimation of earthquake forces by seismic coefficient method, Estimation of combined effect of lateral forces and vertical loading on G+2 storied frames.

Text Books:

1. Limit state theory and design of reinforced - Dr. V. L. Shah and Dr S. R. Karve - Structures Publications, Pune.
2. Fundamentals of Reinforced Concrete- N.C. Sinha, S.K. Roy - S. Chand & Co. Ltd
3. Advanced design of structures- Krishnaraju - Mc Graw Hill.
4. Design of Prestressed concrete structures- T. Y. Lin.
5. Prestressed Concrete- N. Krishna Raju - Tata Mc Graw Hill Publication Co.
6. Earthquake resistant design of structures- Agarwal, Shrikhande, PHI learning.

Reference Books:

7. Comprehensive RCC Design - Punmia, Jain & Jain - Laxmi Publications.
8. Design of design of reinforced Concrete structures- M. L. Gambhir -PHI.
9. Reinforced Concrete, Vol I- Dr.H J. Shah Charotar Publishing House
10. Prestressed Concrete - A Fundamental Approach- Edward Nawy - PHI..
11. Reinforced concrete design- Pillai and Menon TMH.
12. Elementary Structural Dynamics-Selvam, Dhanpatrai Publications.

