

## PRINCIPLES OF SOLID WASTE MANAGEMENT

**Paper Code: ETEN-304**

**Paper: Principles of Solid Waste Management**

|          |            |          |
|----------|------------|----------|
| <b>L</b> | <b>T/P</b> | <b>C</b> |
| <b>3</b> | <b>0</b>   | <b>3</b> |

### **INSTRUCTIONS TO PAPER SETTERS:**

**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

**Objective:** On completion of the course, students will:

1. Understand the implications of the production, resource management and environmental impact of solid waste management;
2. Understand components of solid waste management infrastructure systems to minimize the above effects.
3. Be aware of the significance of recycling, reuse and reclamation of solid wastes, sludges and landfills sites.

### **UNIT – I**

Sources, Composition and Properties of Municipal solid waste.

Life cycle analysis of waste. Need for solid waste management, integrated solid waste management (SWM) System, Hierarchical approach for SWM. Segregation, reuse and recycling of solid waste, storage.

[T1, T2][No. of Hours: 11]

### **UNIT – II**

Methods of treatment of solid waste - Incineration, Pyrolysis and Gasification Systems. Types and design of Incinerators, Composting: Theory of composting, Manual and mechanized composting, Design of composting plan.

Solid Waste Collection and Transportation: Types of collection systems (Hauled- container system and Stationary container system), Collection routes and their Layout, Solid waste transfer stations.

[T1, T2][No. of Hours: 12]

### **UNIT – III**

Characteristics and quantities of sludges from various unit operations, Sludge treatment flow diagrams, Stabilization, Anaerobic sludge digestion, Aerobic sludge digestion, Composting, Conditioning, Dewatering, Thermal reduction, Land application of sludge.

Landfills: Classification, Types and methods, Site selection, Site preparation, Composition, Characteristics, Generation, and Control of Landfill gases; Composition, Formation, Movement and control of leachate in landfills; landfill design. Revegetation of closed landfill sites, Long term post closure plan, Groundwater monitoring during and after closure.

[T1, T2][No. of Hours: 11]

### **UNIT – IV**

Remedial actions for abundant waste disposal sites, Waste to energy- Heat value of refused, combustion and energy recovery, energy production from waste, material and thermal balances, other technologies. Case Studies, Health and safety issues, Monitoring Requirements in respect of Dioxins, furans, NO<sub>x</sub>, Environmental Issues, Solid waste and livelihood.

[T1, T2][No. of Hours: 10]

### **Text Books:**

- [T1] CPHEEO, "Manual on Municipal Solid Waste Management", Ministry of Urban Development, ND  
[T2] Tchobanoglous G., Theisen H., Viquel S.A., "Integrated Solid Waste Management: Engineering, Principles and Management issues", Tata McGraw Hill Publishing Company Ltd., New Delhi.

### **Reference Books:**

- [R1] Peavy H.S., Rowe D.R., Tchobanoglous G., "Environmental Engineering", Tata McGraw Hill  
[R2] Cunningham W.P., Cunningham M.A., "Principles of Environmental Science", Tata McGraw Hill  
[R3] Krishnamoorthy B., "Environmental Management, Text Book and Cases", PHI Learning (P) Ltd.,  
[R4] Chandrappa R., Das D.B., "Solid Waste Management: Principles and Practice",  
[R5] Davis M.L., Cornwell D.A., "Introduction to Environmental Engineering", Tata McGraw Hill