Course Type	Course Code	Name of Course	L	T	P	Credit
DC	ESC 311	Solid Waste Management	3	0	0	9

Course Objective

To provide a comprehensive insights of the types, sources, generation, storage, collection, transport, processing and disposal of municipal solid waste. The student is expected to know about the regulatory framework for the municipal solid waste management.

Learning Outcomes

Upon successful completion of this course, students will:

- Understand the fundamental principles of existing and emerging technologies for the treatment of waste and recovery of materials and energy from waste.
- Have an overview of the Indian and international waste management regulations and guidelines for the design, construction, operation and management of waste treatment facilities.
- To have an overview of management of waste from industrial and agricultural sector.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Introduction to Solid Waste:** Sources, types, composition, physical, chemical and biological characteristics of municipal solid waste, properties and classification of hazardous solid waste, problems related to solid waste management, Agricultural, Domestic (urban) wastes, Biomedical waste, E-waste, Plastic Waste and Construction Waste, Management of lead acid battery.	6	The unit will provide an overview of different types of solid wastes and their characteristics.
2	**Engineering principles:** Generation and collection rates, separation, storage and processing at source, collection of solid waste, transfer and transport, hauled container system and stationary container system, analysis of collection systems, optimization of routes, transfer stations, need and types of transfer station, location of transfer station.	10	This unit will help student in understanding the engineering principles of different solid waste management systems.
3	**Solid waste disposal:** Landfill classification, types and methods, siting considerations, stages of landfill. Composition, characteristics, generation, movement and control of landfill gas. Composition, formation, movement and control of leachate in landfills. Layout and preliminary design of landfills, landfill operation and closure, final cover.	11	This unit will help the students in understanding the design and operation of solid waste landfill.
4	**Material separation and processing technologies:** Thermal conversion technologies, combustion, pyrolysis and gasification, combustion calculations, Environmental control, biological and chemical conversion technologies, Aerobic and Anaerobic Composting, energy recovery, recycling, waste minimization and utilization.	9	This unit provides a detailed overview of thermal treatment technologies along with the recycling and anaerobic digestion options.
5	**Source specific solid waste management:** Agriculture, Process industry, Mineral and Metallurgicalindustry, Disposal of industrial and mill tailings etc. Regulatory aspects of solid waste management.	6	To understand the management strategy of some specific types of wastes. The unit will also give an insight of regulatory framework.

Text Books:

1. Tchobanoglous, G., Theisen, H., and Vigil, S. A. (2014). Integrated Solid Waste Management: Engineering Principles and Management Issues. New Delhi: McGraw-Hill Education (India) Private Limited.
2. Peavy, H. S., Rowe, D. R., & Tchobanoglous, G. (2010). Environmental Engineering. New York: McGraw-Hill.
3. Khan, I. H., and Ahsan, N. (2012). Textbook of solid waste management. New Delhi: Satish Kumar Jain for CBS Publisher and Distributors.

Reference Books:

1. Tchobanoglous, G., and Kreith, F. (2002). Handbook of Solid Waste Management-Second Edition. New York: McGraw-Hill.
2. CPHEEO (2000). Manual on Municipal Solid Waste Management, Central Public Health and Environmental Engineering Organisation, Ministry of Urban Development, Govt. of India, New Delhi.
3. Williams, P. T. (2005). Waste treatment and disposal-Second Edition. London: John Wiley and Sons.