

B. Tech Civil Engineering

Course code: Course Title	Course Structure			Pre-Requisite
CE340: Solid Waste Management and Air Pollution	L	T	P	NIL
	3	0	2	

Course Objective: This course focuses on the classification and characterisation of solid waste, including waste estimation, collection, transportation, processing, and disposal methods such as engineered landfilling and deep-well injection. It also explores strategies for waste reduction, material reuse, and energy recovery. The course also covers air quality characteristics, national standards, pollutant classification, and the impacts of key pollutants on health, plants, and buildings. It introduces meteorological principles, dispersion mechanisms, and enables the computation of ambient air quality. It also explores the engineered system for air pollution control, including control devices for particulate and gaseous pollutants.

S. No.	Course Outcomes (CO)
CO1	To provide an overview of the sources, classification, and characteristics of solid waste and air pollutants.
CO2	To develop solid waste collection and transportation plans based on waste generation patterns and urban planning principles.
CO3	To decide appropriate processing technologies, such as composting, incineration, and landfilling, for a typical solid waste management facility.
CO4	To assess pollution spread in the ambient air based on the pollution inventory and the dispersion model.
CO5	To plan integrated solutions for environmental sustainability based on pollution control technologies and regulatory frameworks for both air pollution and solid waste management.
CO6	To develop a material and energy recovery plan for promoting sustainable reuse and circular economy principles.

S. No	Contents	Contact Hours
UNIT 1	Definition, Characteristics, and Perspectives: Types of solid wastes; municipal, Industrial, and Hazardous waste. Sources of municipal waste, physical and chemical composition. Reduction in raw materials usage, reduction in solid waste quantities, reuse of solid waste materials, material recovery, and energy recovery.	6
	Engineered System for Solid Waste Management: functional elements, typical generation rates of solid waste, estimation of solid waste quantity, factors affecting generation rates, On-Site handling, storage, and processing of solid waste.	

UNIT 2	Types of collection systems, determination of vehicles and labor requirements, collection routes, transfer stations and their siting factors, mechanical volume reduction, and thermal volume reduction techniques. Landfilling: design and operation of landfills. Deep-well injection technique of waste disposal	8
UNIT 3	Engineered Systems for Resource and Energy Recovery: Processing techniques; mechanical size reduction, component separation, magnetic and electromechanical separation, and drying and dewatering. Materials and energy recovery; composting, anaerobic digestion, combustion, incineration, gasification, and pyrolysis.	7
UNIT 4	Air Quality: Definition, characteristics and perspectives of air quality. Historical air pollution episodes, units of measurement, sources and classification of pollutants, primary and secondary pollutants, particulates, PM ₁₀ , PM _{2.5} and their significance, health effects of particulates accompanied with other pollutants. Detection, analysis and effects of air pollutants (Hydrocarbons, CO, oxides of Sulphur and nitrogen) on human health, plant and building materials. National ambient air quality standards. Indoor air pollution.	6
UNIT 5	Meteorology and Natural Purification Processes: atmospheric properties, scales of motion, influence of meteorological phenomenon on air quality, Lapse rates and dispersion, pressure systems and dispersion, wind and dispersion, moisture and dispersion, Gaussian dispersion modeling, determination of stack height.	7
UNIT 6	Engineered Systems for Air Pollution Control: Atmospheric cleansing processes, and control at source approach. Control devices for particulate contaminants; gravitational settling chambers, centrifugal collectors, wet collectors, fabric filters (baghouse filters), and electrostatic precipitators (ESP). Control devices for gaseous contaminants, and automotive emission control.	8
Total		42

REFERENCES		
S. No	Name of Books/ Authors/ Publishers	Year of Publication
1.	Peavy, Howard S., Rowe, Donald R., and Tchobanoglous, George, "Environmental Engineering," McGraw-Hill Education (India) Pvt. Ltd., New Delhi.	1985
2.	CPHEEO manual on Municipal Solid Waste Management, Ministry of Urban Development, New Delhi.	2016
3.	Rao, C.S., "Environmental Pollution and Control Engineering", New Age International publishers.	2006