

**CLXXX: Waste Management in SMART CITIES**  
**B. TECH 5<sup>th</sup> SEMESTER (CIVIL ENGINEERING)**  
**SMART CITIES SPECIALIZATION COURSE**

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**Credits and Hours:**

Teaching Scheme	Theory	Tutorials	Total	Credit
Hours/week	3	2	5	4
Marks	100	0	100	

**A. Outline of the course:**

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction to Solid Waste Management	04
2	Municipal Solid Waste Characteristics	10
3	Municipal Solid Waste Procedure	12
4	Current Issues in Solid Waste Management	06
5	C&D Waste and E-Waste Management	08
6	E-Waste Management Policies	05

Total Hours (Theory): 45

Total Hours (Tutorial): 30

**Total Hours: 75**

## B. Detailed Syllabus:

1	<b>Introduction to Solid Waste Management</b>	<b>04 hrs</b>	<b>9%</b>
1.1	Introduction to Solid Waste management		
2.	<b>Municipal Solid Waste Characteristics</b>	<b>10 hrs</b>	<b>22%</b>
2.1	Municipal Solid Waste Characteristics and Quantities		
2.2	MSW Rules 2016, Swachh Bharat Mission and Smart Cities Program		
3.	<b>Municipal Solid Waste Procedure</b>	<b>12 hrs</b>	<b>27%</b>
3.1	MSW Collection, Transportation, Segregation and Processing		
3.2	Disposal of Municipal Solid Waste: Landfill		
3.3	Biochemical Processes and Composting		
3.4	Energy Recovery from Municipal Solid Waste		
3.5	Current Issues in Solid Waste Management and Review of MSW Management Status in First List of 20 Smart Cities in the Country		
4.	<b>Current Issues in Solid Waste Management</b>	<b>06 hrs</b>	<b>13%</b>
4.1	Current issues in Solid Waste Management and Review of MSW Management Status in First List of 20 Smart Cities in the Country		
5.	<b>C&amp;D Waste and E-Waste Management</b>	<b>08 hrs</b>	<b>18%</b>
5.1	Construction and Demolition (C&D) Waste Management – Overview		
5.2	C&D Waste – Regulation, Beneficial Reuse of C&D Waste Material		
5.3	E-Waste Management – Issues and Status in India and Globally		
6.	<b>E-Waste Management Policies</b>	<b>05 hrs</b>	<b>11%</b>
6.1	E-Waste Management Rules 2016 and Management Challenges		

## C. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject and pedagogy will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, etc.
- Attendance is compulsory in lectures and laboratory.

- Assignments based on above course content will be given to the students at the end of week and will be evaluated at regular intervals.
- Surprise tests/Quizzes/Seminar will be conducted.
- Tutorials related to course content will be carried out in the laboratory.

#### D. Course Outcomes:

After completing this course, students will be able to:

CO1	Understand the waste generation rates and its composition
CO2	Identify methods of waste management
CO3	Understand the environmental impact of waste management and its relationship on the sustainable development and smart city development
CO4	Manage C&D Waste and E-Waste Management in smart cities as per rules.

#### Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	3	1	3	2	1	2	-	2	3	-	1	2
CO2	2	3	3	2	2	3	3	2	1	2	2	3	1	2	3
CO3	1	2	-	3	2	3	3	3	-	-	2	2	-	2	2
CO4	3	2	3	1	3	2	3	2	2	3	3	3	2	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

#### E. Recommended Study Material:

##### ❖ Text Books:

- 1) William A Worrell and P. Aarne Vesilind Solid Waste Engineering, 2nd Edition (SI Edition) Cengage Learning, 2012 (ISBN-13: 978-1-4390-6217-3)
- 2) George Tchobanoglous, Hilary Theisen and Samuel A Vigil, Integrated Solid Waste management, Tata McGraw Hill
- 3) Manual on Solid Waste Management, prepared by The Central Public Health and Environmental Engineering Organization(CPHEEO), India
- 4) MSW Management Rules 2016, Govt. of India, available online at CPCB website.

❖ **Web Materials:**

1. [https://www.researchgate.net/publication/342764074\\_Smart\\_Waste\\_Management\\_under\\_Smart\\_City\\_Mission\\_Its\\_Implementation\\_and\\_Ground\\_Realities](https://www.researchgate.net/publication/342764074_Smart_Waste_Management_under_Smart_City_Mission_Its_Implementation_and_Ground_Realities)
2. [https://www.researchgate.net/publication/343676877\\_Smart\\_City\\_Waste\\_Management\\_System\\_Using\\_Internet\\_of\\_Things\\_and\\_Cloud\\_Computing](https://www.researchgate.net/publication/343676877_Smart_City_Waste_Management_System_Using_Internet_of_Things_and_Cloud_Computing)

### **LIST OF TUTORIALS**

Tutorials on the topic of

<b>Tutorial No.</b>	<b>Name of Tutorial</b>
1	Solid Waste Management
2	Municipal Solid Waste Characteristics
3	Municipal Solid Waste Procedure
4	Current Issues in Solid Waste Management
5	C&D Waste and E-Waste Management
6	E-Waste Management Policies