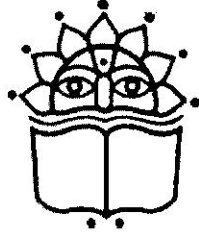


**Vidya Prathishthan's  
Kamalnayan Bajaj Institute of Engineering and  
Technology, Baramati.**



**Faculty of Science and Technology**

**Board of Studies  
Civil Engineering**

**Syllabus**

**Multidisciplinary Minor (MDM) Courses**

S.Y. B. Tech.

Civil Engineering

**(w.e.f. AY: 2024 - 2025)**



Multidisciplinary Minor (MDM) Subjects			
AI23051	AI & Machine Learning	ET23053	Internet of Things
AI23052	Data Science	CE23051	Waste Management
AI23053	Generative AI	CE23052	Green Building & Smart Cities
C023051	Cloud Computing	ME23051	Introduction to 3D Printing Technologies
C023052	High Performance Computing	ME23052	Introduction to Robotics & Automation
C023053	Comp Graphics & Gaming	EL23051	Solar Tech
IT23051	Cyber Security	EL23052	Industrial Automation
IT23052	Full Stack Development	GS23051	Nano Technology
ET23051	Embedded Systems	GS23052	Linear Algebra and Statistics
ET23052	Drone Technology		

*Vaay*

BOS

Civil Engineering  
Head

Department of Civil Engineering  
VPKBIET, Baramati-413133

*B. Wale*

DEAN

Academics

*Anilay*

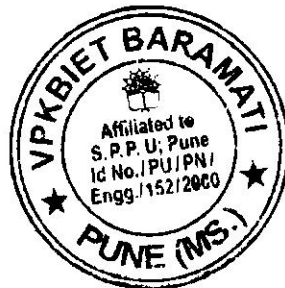
DEAN

Autonomy

*Pravin*

PRINCIPAL

VPKBIET, Baramati.  
Kamalnayan Bajaj Institute of  
Engineering & Technology, Baramati  
Vidyanagari, Baramati-413133



**Course Name with Code: Waste Management (CE23051 )**

**Teaching Scheme:**

**3 Credits**

**Examination Scheme:**

**TH: 2 Hrs./week**

**Activity: 20 Marks**

**PR: 2 Hrs./week**

**In semester: 20 Marks**

**End Semester: 50 Marks**

**TW: 20 Marks**

**Prerequisite:**

1. Fundamentals of Environmental Studies, Engineering Chemistry

**Companion Course, if any: Laboratory Practical**

**Course Objectives:**

1. To understand problems of waste, estimate and characterize waste.
2. To apply the knowledge of mathematics, science, and engineering for effective waste collection systems and for waste collection route optimization.
3. To understand the working of waste to energy system.
4. To understand management and legal requirements of special waste, reuse, recycle and material recovery.

**Course Outcomes:** After Completion of course students will be able to

CO1: understand waste management systems with respect to characteristics, sampling and generation rate.

CO2: explain methods of storage, collection and transportation of waste.

CO3: describe waste to energy systems from solid waste.

CO4: understand legal requirements of special waste.

**Course Contents**

**Unit 1: Evolution, Sources and Types of Waste (6 Hours)**

Introduction of waste, Functional elements, Types and sources of waste, Sampling and characteristics, Estimation of waste quantity, Factors affecting waste generation rate.

**Unit 2: Collection and Transportation of Waste (6 Hours)**

Integrated waste management, different methods of waste collection, transfer and transportation of waste, use of radio frequency identification (RFI)/global positioning system (GPS) for tracking vehicle location and optimization of route, methods of measuring waste.

**Unit 3: Waste to energy (6 Hours)**

Basic principles of processing and treatment of municipal solid waste, Materials recovery and recycling, composting, anaerobic digestion or bio methanation, incineration and sanitary landfilling.

**Unit 4: Special Waste Management and Regulations (6 Hours)**

Objectives and key points of hazardous and other waste management rules- 2016, domestic hazardous waste, e-waste, biomedical waste, plastic waste, slaughterhouse waste, construction & demolition waste, and lead battery waste.

**Books & Other Resources:****Textbooks**

01 Integrated Solid Waste Management: Engineering Principles and Management Issues, George Tchobanoglous, Hilary Theisen, Samuel Vigil, Tchobanoglous George, Vigil Samuel, McGraw-Hill Companies, Incorporated.

02 Solid waste management, Dr. A.D. Bhide

03 Solid waste Management, Sasikumar K and Sanoop Gopi Krishna, PHI.

**Reference Books**

01 Solid waste Engineering, Vesilind P. A., Worrell W and Reinhart, Thomson Learning Inc., Singapore.

02 CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000.

03 Hazardous waste Management, Charles A. Wentz, Second Edition, McGraw Hill International Edition, New York.

04 C for Environmental Scientists and Engineers, Y. Anjaneyulu and Valli Manickam, Wiley Publications. 05 Standard Handbook of Hazardous Waste Treatment and Disposal, Harry Freeman, McGraw-Hill Education, 1998

**Term work**

1. Report of site visit to municipal solid waste management (Society/village/town/city).
2. Practical/theoretical identification of impacts of improper management of municipal solid waste.
3. Practical/theoretical sampling methods and characterization study of municipal solid waste.
4. Practical/theoretical estimation of solid waste generation and estimation of quantity
5. Prepare a report for management of any of the special wastes.
6. Prepare a report on use of smart technologies in solid waste management.
7. Determine calorific value of municipal solid waste using bomb calorimeter.
8. Determine moisture content and volatile solids for organic fraction of municipal solid waste.

**Activity:**

Poster presentation

**Course Name with Code: Green Building and Smart Cities. (CE23052)**

**Teaching Scheme:**

**Credits**

**Examination Scheme:**

**TH: 2 Hrs./Week**

**3**

**Activity:20 Marks**

**PR: 2 Hrs./Week**

**In-semester:20 Marks**

**End-semester: 50 Marks**

**Term Work: 20 Marks**

**Prerequisites:**

1. Global Warming, Building Materials.

**Course Objectives:**

1. To understand the definition, concept & objectives of the green building and to imbibe basics of green design.
2. To understand planning specifications of green building.
3. To understand the definition, concept & objectives of the smart city.
4. To understand the policies of smart city.

**Course Outcomes (COs):** The students will be able to learn:

1. Demonstrate green concept skills and apply tools of green building assessment.
2. Select appropriate green building material and technique.
3. Acquaint knowledge on smart cities planning and development.
4. Develop work break down structure, scheduling and project management of smart cities.

**Course Contents**

**Unit 1: Concept of Green Buildings**

**(6 Hours)**

- a) Definition of Green Buildings, typical features of green buildings, Necessity, Initiatives, Green buildings in India, Green building Assessment- Green Building Rating Systems (BREEAM, USGBC, LEED, IGBC, TERI-GRIHA, GREEN STAR), Criteria for rating, Energy efficient criteria, environmental benefits economic benefits, health and social benefits, Major energy efficiency areas for building, Life cycle cost of buildings, Codes and Certification Program
- b) **Green Design:** Definition, Principles of sustainable development in Building Design, Characteristics of Sustainable Buildings, sustainably managed Materials, Integrated Lifecycle design of Materials and Structures (Concepts only)

**UNIT 2: Green Building Materials, Planning and Specifications**

**(6 Hours)**

- a) **Green Building Materials:** Sustainably managed Materials, depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; Embodied Energy of Materials, Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds (VOC's), Natural Non-Petroleum Based Materials, Recycled materials, Renewable and Indigenous Building Materials, Engineering evaluation of these materials.
- b) **Green Building Planning and Specifications:** Environment friendly and cost-effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green Strategies for Building Systems, Alternative Construction Methods, Energy Conservation Measures in Buildings, Waste & Water management and Recycling in Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar & Daylight, Plumbing

and its Effect on Energy Consumption.

**UNIT 3: Introduction to Smart cities**

**(6 Hours)**

- a) Introduction of Smart City, Concept of smart city, Objective for smart cities, History of Smart city world and India. Need to develop smart city. Introduction to city planning, Concept, principle stakeholders, key trends in smart cities developments.
- b) **Intelligent transport systems:** Smart vehicles and fuels, GIS, GPS, Navigation system, traffic safety management, mobility services, E-ticketing

**UNIT 4: Project management and Policies in Smart Cities**

**(6 Hours)**

- a) **Project management:** Phases, Stages of project and work break down Structure, Project organization structure, Planning, Scheduling and CPM, Project cost analysis, resource allocation & leveling, Line of balancing technique, Project monitoring and control, Project risk management. Storage and conveyance system of water, sustainable water and sanitation, sewerage system, flood management, conservation system.
- b) **Policy for Smart City:** Integrated infrastructure management systems for smart city, Infrastructure management system applications for existing smart city. Worldwide policies for smart city Government of India - policy for smart city, Mission statement & guidelines, Smart cities in India, Case studies of smart city.

**Books & Other Resources:**

**Text Books:**

1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao – New Age International Publishers
2. Integrated Life Cycle Design of Structures – By AskoSarja – SPON Press
3. Green Buildings (McGraw hill publication): by Gevorkian
4. Smart City on Future Life - Scientific Planning and Construction by Xianyi Li
5. The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities) by Nicos Komninos
6. 7. Mission statement & guidelines on Smart City Scheme". Government of India - Ministry of Urban Development

**List of free reference guides/resources available on the net:**

1. [http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines](http://smartcities.gov.in/upload/uploadfiles/files/Smart%20City%20Guidelines)
2. IGBC reference guide
3. Free abridged versions of LEED reference guides.

**List of Practical's:**

1. Assignment on- Identify sources of pollution in your area.
2. Assignment on- Technology involved in different construction of green building.
3. Assignment on- Technology involved in different construction of smart building
4. Model making of green building/ smart cities (Maximum 4 students in one group)

**Activity:**

Report on Case Study of Green Building/ Smart City. (Maximum 4 students in group)