



**Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore**  
**Shri Vaishnav Institute of Technology and Science**  
**Choice Based Credit System (CBCS) Scheme in light of NEP-2020**  
**Generic Elective for UG**

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
GUME204	GE	Waste to Energy Conversion using Mechanical Techniques	60	20	20	0	0	4	0	0	4

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;  
**\*Teacher Assessment** shall be based following components: Quiz/Assignment/Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs)**

Sustainability aims to conserve energy and natural resources, and to ensure that they have minimal impact on the environment and society. It targets fulfilling the needs of the present without compromising the ability of future generations to meet their own needs.

1. Introduce students to the principles of waste management and energy recovery.
2. Familiarize students with mechanical techniques for converting waste into energy.
3. Enable students to understand the environmental and economic benefits of waste-to-energy (WTE) technologies.
4. Develop practical skills through hands-on experience with mechanical systems and WTE processes.

**Course Outcomes (COs)**

Course outcomes are:

1. Understand the fundamentals of waste-to-energy conversion and its significance.
2. Identify mechanical techniques used in WTE processes.
3. Analyze the feasibility and efficiency of WTE systems.
4. Evaluate the environmental impacts and economic viability of WTE technologies.

**Syllabus:**

**Unit-I**

**Introduction to Waste and Energy**

Types and sources of waste, characterization of wastes; Waste management hierarchy-Reduce, Reuse, Recycle, Recover, Dispose; Energy potential of different types of waste.

**Unit-II**

**Fundamentals of Mechanical Techniques in WTE**

Mechanical separation and pre-processing of waste- Sorting, shredding, compacting, and baling; Energy production from waste

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**Unit-III**

**Mechanical Conversion Processes**

Incineration with Energy Recovery- Mechanical feeding systems for incinerators, Ash handling and recovery systems; Mechanical Pyrolysis Processes, Integration of gasifiers with energy recovery systems

**Unit-IV**

**Emerging Mechanical Techniques**

Waste-to-biogas, production using mechanical systems, Integration of mechanical and thermal methods for energy recovery, Mechanical-Biological Treatment (MBT)

**Unit-V**

**Sustainability and Environmental Impact**

Environmental impact of WTE conversion- Air pollution, emissions, and control measures; Life Cycle Assessment (LCA) of WTE systems, Economic analysis of WTE projects

**References Books:**

1. NB Klinghoffer and M J Castaldi. “Waste to Energy Conversion Technology (Woodhead Publishing Series in Energy)”. Woodhead Publishing Ltd; 1<sup>st</sup> edition, 2013.
2. WA Worrell and PA Vesilind. “Solid Waste Engineering”. CL Engineering; 2nd edition, 2011.
3. A Karagiannidis. “Waste to Energy-Opportunities and Challenges for Developing and Transition Economies”, Springer London; 1<sup>st</sup> edition, 2012.
4. Kharmawphlang, I. M., Paul, J., Doloi, S., and Hussain, N. Waste to Energy Technologies: “A Sustainable Key Approach Towards Circular Economy and Energy Recycling. In Trash or Treasure: Entrepreneurial Opportunities in Waste Management” (pp. 143-181). Cham: Springer Nature Switzerland, 2024.

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