



FACULTY OF ENGINEERING & TECHNOLOGY

Second Year Master of Engineering

Semester III

Course Code: 102330313

Course Title: WASTE TO ENERGY

Type of Course: Open Elective Course

Course Objectives: To enable students to understand of the concept and best available technologies for Waste to Energy.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Internal		External		Total
				Theory	J/V/P*	Theory	J/V/P*	
3	0	0	3	40/16	-	60/24	-	100/40

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	INTRODUCTION: The Principles of Waste Management and Waste Utilization. Waste Management Hierarchy and 3R Principle of Reduce, Reuse and Recycle. Waste as a Resource and Alternate Energy source	06
2	WASTE SOURCES: Waste production in different sectors such as domestic, industrial, agriculture, postconsumer, waste etc. Classification of waste – agro based, forest residues, domestic waste, industrial waste (hazardous and non-hazardous). Characterization of waste for energy utilization.	08
3	TECHNOLOGIES FOR WASTE TO ENERGY: Biochemical Conversion: Energy production from organic waste through anaerobic digestion and fermentation. Thermo-chemical Conversion: Combustion, Incineration and heat recovery, Pyrolysis, Gasification; Plasma Arc Technology and other newer technologies.	12
4	WASTE TO ENERGY OPTIONS: Landfill gas, collection and recovery. Refuse Derived Fuel (RDF) – fluff, briquettes, pellets. Alternate Fuel Resource (AFR) – production and use in Cement plants, Thermal power plants and Industrial boilers. Conversion of wastes to fuel resources for other useful energy applications. Energy from Plastic Wastes – Non-recyclable plastic wastes for energy recovery. Energy Recovery from wastes and optimization of its use, benchmarking and standardization.	07



5	E-WASTE: E-waste: E-waste in the global context, Growth of Electrical and Electronics Industry in India, Environmental concerns and health hazards, Recycling e-waste: a thriving economy of the unorganized sector, Global trade in hazardous waste, impact of hazardous e-waste in India. Management of e-waste: e-waste legislation, Government regulations on e-waste management, International experience, need for stringent health safeguards and environmental protection laws of India.	06
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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						R: Remembering; U: Understanding; A: Application, N: Analyze; E: Evaluate; C: Create
R	U	A	N	E	C	
10%	20%	30%	15%	10%	15%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1	Nicholas P. Cheremisinoff. Handbook of Solid Waste Management and Waste Minimization Technologies. An Imprint of Elsevier, New Delhi (2003).
2	M. Dutta , B. P. Parida, B. K. Guha and T. R. Surkrishnan. Industrial Solid Waste Management and Landfilling practice. Narosa Publishing House, New Delhi (1999).
3	Waste-to-Energy in Austria – White Book – Figures, Data Facts, 2nd edition , May 2010
4	Hagerty, D. Joseph; Pavoni, Joseph L; Heer, John E., “Solid Waste Management”, New York, Van Nostrand

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Analyse the various aspects of Waste to Energy Systems.	40
CO-2	Understanding about the operations of Waste to Energy plants.	40
CO-3	Analyze methods for management of e-waste. .	20

Supplementary learning Material:

1	CPCB Guidelines for Co-processing in Cement/Power/Steel Industry
2	Report of the task Force on Waste to Energy, Niti Ayog (Formerly Planning Commission) 2014
3	Gazette Notification on Waste Management Rules 2016
4	http://greene.gov.in/wp-content/uploads/2018/01/e-waste_in_india-Document.pdf
5	www.mnre.gov.in
6	http://www.cpcb.nic.in



CVM
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