SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Master of Technology
Environmental Engineering

M. Tech. II Semester III

Subject Name: Waste To Energy **Subject Code:** MTEN15201

Type of course: OE
Prerequisite: NIL

Rationale: Provide comprehensive instruction in the underlying concepts and principles of waste to energy also provide knowledge related to waste and their classification, important quality parameters of different types of wastes, Wastes suitable for the energy production. And its application to production of bio oil, biofuel and bio-char.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	100
3	0	0	3	60	25	15	0	0	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	**Introduction to Energy from Waste:** Classification of waste, Characterization of waste, as fuel, Agro based, Forest residue, Industrial waste, MSW Conversion devices, Incinerators, gasifiers, digestors.	4	12%
2.	**Pyrolysis:** Pyrolysis, Types, slow fast, Operating conditions and end product distribution, Use of pyrolysis products, Catalytic pyrolysis, Pyrolysis reactors, Utilization pyro char and gases, Manufacture of charcoal Methods, Yields and application.	8	16%
3.	**Gasification:** Gasification reaction schemes and steps, Syngas production and efficiency and Factors influencing gasification, Advantages of gasification, Typical process flow sheet and Utilization schemes for gasification products, Gasifier types , Gasifiers for biomass and wastes, Syngas conditioning and clean up, advanced gasification (Plasma gasification) process, Comparison between incineration and gasification, Design, construction and operation.	10	24%
4.	**Biogas:** Properties of biogas (Calorific value and composition) ,Biogas plant technology and status ,Bio energy system, Design and constructional	10	24%

Open Elective

	features, Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, Direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion Types of biogas Plants, Applications, Alcohol production from biomass, Bio diesel production,Urban waste to energy conversion, Biomass energy programme in India.		
5.	**Biomass Combustion:** Biomass stoves, Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation, Operation of all the above biomass combustors.	10	24%

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	**15**	**25**	**20**	**15**	**10**

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels **(Revised Bloom's Taxonomy)**

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 Text Books:

Sr no	**Title of book /article**	**Author(s)**	**Publisher and details like ISBN**	**Year of publication**	**Publication Edition**
1	Non-Conventional Energy Resources	B.H.Khan	McGraw Hill Education India Private Limited	2017	Third
2	Biomass Gasification and Pyrolysis: Practical design & Theory	Prabir Basu	Elsevier 9780080961620, 0080961622	2010	Third
3	Waste to Energy	Sethi Amrinder Singh	LAP Lambert Academic Publishing ISBN:978-3659506161	2015	-
4	Biomass for Energy in the Developing Countries, Current Roles, Potentials, Problems, Prospects	D. O. Hall, G. W. Barnard and P. A. Moss	Pergamon Press Ltd ISBN: 978-0080286891	2013	First edition

Open Elective

5	Natural Resource Conservation – Management for Sustainable Future	Daniel D. Chiras, John Reganold	Pearson Publications ISBN:978-0132251389	2009	Tenth edition

Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand and apply basic concept of waste to energy technology (R,U cognitive level)	25
CO-2	Understand the characterization of different waste. (R,U cognitive level)	15
CO-3	Know about the energy conservation system. (R,U,C cognitive level)	20
CO-4	Explain different process and application of waste to energy(R,U,A,C cognitive level)	25
CO-5	Understand concept of design of conservation system. (R,U,N,C cognitive level)	15

List of Open Source/learning website:
https://nptel.ac.in/courses/103/107/103107125/ **Unit 1 to 8(Lecture 1 to 40)**

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