SCHEME OF COURSE WORK

Course Title	: Waste as a Source of Energy		
Course Code	19CH21P1	L T P C	: 2 0 0 2
Program:	: M.Tech.		
Specialization:	Open elective		
Semester	: II		

Course Outcomes (COs):

At the end of the course, the student will be able to

1	Differentiate and characterize different waste
2	Recognize the various waste to energy conversion processes.
3	Explain the various biochemical conversion processes
4	Explain the various thermochemical conversion processes.
5	Explain the various biomass process to energy conversion.

Program Outcomes (POs)

At the end of the program, the students will be able to

1. acquire fundamentals in the areas of waste to energy conversion
2. Identify and classify wastes that are suitable for production of energy
3. apply innovative skills and analyze waste to energy production systems problems critically
4. identify suitable systems to produce energy from various sources
5. Understand various innovative technologies for production of energy from wastes
6. collaborate with educational institutions, industry and R&D organizations in multidisciplinary teams
7. prepare technical reports and communicate effectively
8. engage in independent and life-long learning and pursue professional practice specialized areas of energy production from wastes
9. exhibit accountability to society while adhering to ethical practices
10. act independently and take corrective measures where necessary

Course Outcome versus Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO-1		S		S						
CO-2	S		S		S	M	M		M	
CO-3	S		S		S	M	M	S		
CO-4	S		S		S	M	M	S		
CO-5	M	S	M	M	S	M	S	S	S	S

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

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Teaching-Learning and Evaluation

WEEK	TOPIC / CONTENTS	COURSE OUTCOMES	SAMPLE QUESTIONS	TEACHING-LEARNING STRATEGY	ASSESSMENT METHOD & SCHEDULE
1	Introduction to Waste to energy production	CO1	1. How are agro based wastes characterized? 2. Explain in detail the characteristics of forest based wastes 3. What are the predominant characteristics of domestic wastes that are suitable for energy production	Lectures PPT, Seminar	Seminar, Assignments (week 3-8)
1	Characterization of waste as fuel	CO1			
2	Classification waste from different sources	CO1			
3.	Classification waste from different sources	CO1			
4	characteristics of industrial waste	CO1			
5	converting waste to energy using combustion	CO2	1. Explain in detail the process of gasification 2. Explain the process of anaerobic digestion	Lectures PPT, Seminar	
6	Fundamentals of Gasification	CO2			
7	Fundamentals of Gasification	CO2			
8	Mid-Test 1	CO-1, CO-2			

10	Conversion of waste to energy using combustion	CO3	.1. Describe the process of production of energy from Municipal solid wastes 2. Describe the working of a recirculating fluidized bed gasifier	Lectures PPT, Seminar	
11	bio-gas production from waste	CO3			
12.	combustion of Municipal Solid Waste	CO3			
12	different types of thermo-chemical conversion of waste to energy	CO4	.1. What are the advantages of briquetting? How are briquettes manufactured? 2. Explain the various strategies for reducing the environmental impacts of incineration	Lectures PPT, Seminar	Seminar, Assignments (week 11-16)
13	environmental and health impacts of incineration	CO4			
14	strategies for reducing environmental impacts thermos-chemical conversion	CO4			
15	different biomass technologies	CO5	1. Explain the working of a biodiesel extraction plant with a neat sketch 2. How is oil extracted from algae? Describe this process with a neat sketch	Lectures PPT, Seminar	
16	Biomass characterization	CO5			
17	working of Biomass based thermal power plants	CO5			
18	Mid-Test 2	CO-3, CO-4, CO-5			
19/20	END EXAM	All Cos			