7SA6-60.1 WASTE TO ENERGY

Credit: 3	**Max Marks: 100 (IA: 30, ETE: 70)**
3L+0T+0P	**End Term Exam: 3 Hours**

COURSE OBJECTIVES:

To provide a comprehensive understanding of waste to energy

COURSE OUTCOMES:

Upon successful completion of the course, the students will be able to:
CO-1: Students will be able to understand the different types of waste.

CO-2: Students will be able to understand the waste to energy conversion technologies.

S.No	Contents	Hours
1.	**Introduction of Bio-Waste:** Introduction to bio-resources and agricultural waste, Classification and characterization of agricultural waste including animal wastes, Principles of agricultural waste management: RRR approach, Potential of recyclable crop residues and its management, In-situ management of agricultural waste, Role of soil and plants in waste management, Impact of waste on soil and plant quality, Impact on the environment	**9**
2.	**Pre-treatment of Bio-waste:** Need of bio waste pre-treatment, Pre-treatment methods: physical, chemical and biological treatment, Biological processes of waste management, Composting and vermicomposting for bio conservation of biodegradable waste, Manure management during pre-spreading &spreading phase, Methods of preparation of different organic liquid manures from bio-resources	**8**
3.	**Bio-conversion technology**: organic manure, composting, vermicomposting, biogas generation, pyrolysis, operation and management of biogas plants, utilization of biogas and spent slurry, briquetting of biomass as fuel, landfill.	**8**
4.	**Thermo-conversion technology**: combustion, incineration, Bio-charcoal production, gasification, Production of natural source of dietary fiber; antioxidants; pectin; enzymes; organic acids such as acetic acid, ferulic acid, lactic acid and citric acid, Environmental benefit of waste management, Standards to bio- wastes and manures.	**8**
5.	**Smart Technologies of waste to energy:** Role of IoT and AI in waste-to-energy processes, Real-time monitoring of waste conversion systems and Predictive maintenance for waste-to-energy systems	**7**
	Total	**40**

TEXT / REFERENCE BOOKS

1. Rogoff Marc J. Waste to Energy. William Andrew Publishing

2. Waste to Energy, Shalini Yadav
3. Biomass, Bio fuel, Biochemicals waste biorefinery by Thallada Bhaskar, Sunita Varjani and Ashok pandey, Elsevier
4. Rai GD (2013). Non-Conventional Energy Sources, Khanna Publishers, Delhi.
5. Kothari DP, Singal KC and Ranjan R (2008) Renewable Energy Sources and Emerging Technologies, PHI Learning Pvt. Ltd., New Delhi.
6. Solanki CS (2008). Renewal Energy Technologies:A Practical Guide for Beginners" PHI Learning.
7. Seveda MS, Narale P and Kharpude SN. Bioenergy Engineering, CRC Press, Taylor & Francis

B.Tech. : Civil Engineering
4th Year - VII Semester

SN	Category	Course Code	Course Title	Hours			Marks			Credit
				L	T	P	IA	ETE	Total	
THEORY										
1	DC	7CE4-01	Numerical Methods for Engineers	3	0	0	30	70	**100**	**3**
2	DE	7CE5-11	Departmental Elective IV	2	0	0	30	70	**100**	**2**
3	UE	7CE6-60	University Elective I	3	0	0	30	70	**100**	**3**
			SUB TOTAL	**8**	**0**	**0**	**90**	**210**	**300**	**8**
PRACTICAL & SESSIONAL										
4	DC	7CE4-20	Civil Engineering Software Laboratory	0	0	2	60	40	**100**	**1**
6	UI	7CE7-30	Industrial Training	0	0	2*	60	40	**100**	**3**
7		7CE7-50	Project Stage-1	0	0	4*	60	40	**100**	**2**
8	CCA	7CE8-00	SODECA/NCC/NSS/ANANDAM/IPR	-	-	-	-	100	**100**	**1**
				0	**0**	**8**	**180**	**220**	**400**	**7**
			TOTAL OF VII SEMESTER	**8**	**0**	**8**	**270**	**430**	**700**	**15**

L = Lecture, **T** = Tutorial, **P** = Practical, **IA**=Internal Assessment, **ETE**=End Term Exam, **Cr**=Credits

***for calculation of contact hours**