# Waste to Energy

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| **Semester II****Subject code – 6OE5204EE** | **L 3** | **T****-** | **P 0** | **Credits****3** |
| **Course Objectives**: | **Course Outcomes**: |
| 1. To enable students to aware about the generation of energy from the waste. | **After completion of the course, the student will be able to**1. Learn the Classification of waste as a fuel.
2. Learn the Manufacture of charcoal.
3. Carry out the designing of gasifiers and biomass stoves.
4. To learn the Biogas plant technology
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**UNIT-I**

**Introduction to Energy from Waste:**

Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors. Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

**UNIT-II**

**Biomass Gasification:**

Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

**UNIT-III**

**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.

**UNIT-IV**

**Biogas:**

Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass

gasification - pyrolysis and liquefaction

**UNIT-V**

**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.

**References:**

1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book, Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, TataMcGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.