

AGT-854	Energy Resources and Management	3(3-0)
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Outcomes

- The concepts of renewable energy resources and its management.
- The problems related to use of renewable energy source.
- The environmental impacts of conventional fossil fuels.
- The performance of different renewable energy sources and technologies.

Contents

1. Overview of energy sources:

- a. Non-renewable and renewable energy sources
- b. Worldwide scenario of renewable and non-renewable energy resources

2. Potential of various types of energy sources

- a. Potential of non-renewable and renewable energy sources in Pakistan

3. Energy generation from agricultural crops/wastes:

- a. Biogas production and its uses,
- b. Types of biogas plants
- c. Design, installation, operation and management of biogas plants.
- d. Gasification technology
- e. Types of gasifiers,
- f. Working principle and uses of biomass gasifiers

4. Solar Energy:

- a. Solar radiation, solar terminologies, basic earth-sun angles, time derived solar angles,
- b. Estimation of solar radiation, radiation measurements,
- c. Solar thermal collectors, flat plate collector, evacuated collector, solar concentrators, parabolic trough, Scheffler reflector,
- d. Solar PV system, off-grid and on-grid PV system, hybrid inverters,
- e. Load calculation and design of off-grid PV system,
- f. Applications of solar energy in agriculture viz. drying, roasting, pasteurization, cooking, baking, distillation etc.,
- g. Solar driven tubewell and drip irrigation system,

h. Solar green houses.

5. Wind Energy:

- a. Wind energy potential in the country,
- b. Type of wind turbines,
- c. Application of wind energy (domestic/commercial/agriculture sector).
- d. Design of vertical and horizontal axis wind turbine/mills,
- e. Wind operated pumps for water lifting.

6. Energy from crops

- a. First, second and third generation biofuels (biodiesel, bioethanol),
- b. Transesterification process,
- c. Application of biofuels.

7. Energy conservation and management:

- a. Energy management/audit with reference to: fertilizer (organic/inorganic), chemical controls, post-harvest system and food consumption.
- b. Energy conservation in tillage, harvesting, threshing, and irrigation operations,
- c. Technological alternative for efficient energy utilization and management in agriculture sector
- d. Energy saving technologies, use of LEDs, inverter AC, energy efficient devices etc.

Suggested Readings:

- 1. Enteria, N., A. Akbarzadeh. 2013. Solar Energy Sciences and Engineering Applications. CSC Press, London, UK.
- 2. Korres, N., P. O'Kiely, J.A.H. Benzie, J.S. West. 2013. Bioenergy Production by Anaerobic Digestion: Using Agricultural Biomass and Organic Waste. Taylor and Francis Group, UK.
- 3. Nelson, V. 2014. Wind Energy: Renewable Energy and the Environment. CSC Press, Taylor and Francis Group, UK.
- 4. Sorensen, B. 2004. Renewable Energy. Elsevier Academic Press, UK.