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## **OBT551 INTRODUCTION TO BIOENERGY AND BIOFUELS**

### DETAILED SYLLABUS

#### **OBJECTIVES**

- This course will be focused on achievement, acquisition of knowledge and enhancement of comprehension of information regarding bioenergy and biofuel technologies and their sustainable applications.

#### **UNIT I CONCEPTS**

Biopower, Bioheat, Biofuels, advanced liquid fuels, drop-in fuels, biobased products

#### **UNIT II FEEDSTOCKS**

Harvested Feedstocks: First generation biofuels, Second generation biofuels, third generation biofuels. Residue Feedstocks: Agricultural wastes, forestry wastes, farm waste, organic components of residential, commercial, institutional and industrial waste.

#### **UNIT III CONVERSION TECHNOLOGIES**

Biorefinery concept – biorefineries and end products, Biochemical conversion – hydrolysis, enzyme and acid hydrolysis, fermentation, anaerobic digestion and trans-esterification, Thermochemical conversion – Combustion, Gasification, Pyrolysis, other thermochemical conversion technologies. Scaling up of emerging technologies.

#### **UNIT IV BIOFUELS**

Pros and cons of Biofuels, Algal biofuels, Cyanobacteria and producers of biofuels, Jatropha as biodiesel producer, Bioethanol, Biomethane, biohydrogen, biobutanol, metabolic engineering of fuel molecules, Engineering aspects of biofuels, Economics of biofuels

#### **UNIT V SUSTAINABILITY & RESILIENCE**

Environmental Sustainability, bioenergy sustainability, emissions of biomass to power generation applications, emissions from biofuels. ILUC issues, Carbon footprint, Advanced low carbon fuels

#### **TEXTBOOKS:**

1. Biorenewable Resources – Engineering new products. Robert C Brown. Blackwell Publishing Professional, 2003.

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2. Biofuels. Wim Soetaert and Erik Vandamme (Editors) Wiley. 2009.
3. Biomass for Renewable Energy, Fuels and Chemicals. Donald Klass. Academic press. 1998

**REFERENCES:**

1. Introduction to Bioenergy. Vaughn C. Nelson and Kenneth L. Starcher.
2. Bioenergy: Biomass to Biofuels by by Anju Dahiya
3. Bioenergy: Principles and Applications by Yebo Li and Samir Kumar Khanal
4. Bioenergy by Judy D. Wall and Caroline S. Harwood
5. Bioenergy: Sustainable Perspectives by Ted Weyland