

UTTARANCHAL UNIVERSITY
(Established vide Uttaranchal University Act, 2012, Uttarakhand Act No. 11 of 2013)
Premnagar-248007, Dehradun, Uttarakhand, INDIA

SYLLABUS FOR PH.D. ENTRANCE EXAM- ENERGY and ECO-SUSTAINABILITY

Renewable energy systems

Solar Photovoltaic: Solar radiation resources, measurement and Estimation; Mono crystalline and Poly crystalline solar cells, Thin film solar cells, Organic solar cells; Rooftop & Ground mount systems. SPV Modules and Arrays, Hotspots. Photovoltaic system design guidelines and methodology; Solar Photovoltaic pumping systems

Solar Thermal: Flat Plate Collectors; Concentrating Collectors; Solar Air Heating System Solar Drying, Solar Cooker; Solar Pond, Solar Distillation, Solar Detoxification. Solar Cooling System, Central Receiver Systems, Parabolic Trough Systems, Solar Furnaces

Wind Energy Technology: Types and Classification of Wind Energy Conversion Sources; Aerodynamic design principles Axial momentum, blade element and combine theory Rotor Characteristics and Maximum Power Coefficient Tip loss Correction; Wind Turbine Design Considerations; Wind Pumps and Performance Analysis Design Concepts; Wind Energy status in India

Biomass Conversion Technologies: Biomass availability, Characteristics of Biomass; Aerobic and Anaerobic Bioconversion process, Biogas production process, Process and technologies of slow and fast pyrolysis for fuel Production, Characteristics of Bio-oils and applications; Biomass Briquetting and Pelletization; Composting and Vermicomposting; Types of Gasifiers and their working; Biomass productivity Energy plantation and power programme

Alternate Energy Technologies:

- I. **Hydrogen Energy:** Hydrogen as a fuel, Properties of Hydrogen and Sources of Hydrogen. Hydrogen Production Methods, Storage Methods, Environmental Benefits, Purification of Hydrogen. Hydrogen Production Units in India. Hydrogen Management, Transportation and Limitations.
- II. **Fuel Cell:** Fuel Cell history, difference between batteries and fuel cell, Types of Fuel Cells; Components of fuel cells. Working principle of Fuel Cell, Performance Characteristics of Fuel Cell, R&D related to fuel cell development in India Fuel Cells; Tidal Energy

Energy Conservation and Audit

Energy Audit, types of energy audit; approach; Energy audit instruments; Concept of energy management, energy demand and supply; Duties and responsibilities of energy managers, Energy conservation Act. Energy Conservation in Household, Transportation, Agricultural, service and Industrial sectors, Lighting, Heating Ventilation & Air Conditioning. Energy Efficient Practices and Technologies.

Ecology, Environment & Climate Change

Earth's temperature and atmosphere, nature of Sun radiations, Biological processes, Food chains, Ecological Cycles, Bio Diversity, Environmental degradation, pollutants, Thermal and radioactive pollution, air and water pollution, Climate Change global protocols