Course title : Energy and Environmental Implications
Course credits : 2
Number of modules : 2
Module 1: Coal, Oil and Natural Gas
Module 2: Nuclear, Hydro, and Energy & Climate Change Linkages

Detailed syllabus:

Module 1: Coal, Oil and Natural Gas

I. Overview of Energy Sector – Global & Indian Context

II. Coal

- **Coal Basics:**
  Formation of coal
  World and domestic reserves of coal Production & imports of coal
  Coal types, coal characteristics and properties Quality of Indian coals
- **Coal Utilization Technologies:**
  Uses of coal
  Coal washing, pyrolysis, combustion gasification, liquefaction, Coal bed methane, ash utilisation
- **Environmental Aspects and Clean Use of Coal**
  Environmental impacts of coal mining and combustion and pollution control measures
  Clean coal technologies
  Carbon dioxide capture, storage and utilization

III. Oil and Natural Gas

- **Basics**
  Formation of oil and natural gas Reserves of oil and natural gas
  Production, imports of oil & gas
- **Uses &Environmental Aspects**
  Use of petroleum products as fuels and feedstock Uses of natural gas, LNG, CNG, LPG
  Oil Refining
  Environmental aspects of oil and natural gas

Module 2: Nuclear, Hydro, and Energy & Climate Change Linkages

I. Nuclear

- **Basics**
  Overview on Radioactivity -half- life, nuclear decay, nuclear reactions Uranium and thorium reserves
  Nuclear Reactors and technologies
- **Fuel Processing and Safety**
  Nuclear fuel cycle
  Nuclear fuel reprocessing, safety & nuclear waste management

II. Hydro

- **Basic & Technology**
  Basic concepts, hydro potential and exploitation in India Major hydroelectric power plants in India
  Components of hydroelectric power plant: weir/intake, channel, desilting, forebay, spillway, penstock, turbine – Impulse and Reaction, generator, governor
- **Environmental Issues**
  Environmental issues Constraints and problems Future Prospects

III. Energy & Climate Change Linkages

Energy and carbon emissions

International Response to Climate Change – UNFCCC
SDGs and Energy - Accessibility, affordability reliability and sustainability

Evaluation/Assessment scheme:

1. Quizzes – 40% (one at the end of each module)
2. End semester exam – 60% (at the end of course)

Learning outcomes:

At the end of the course the student will be able to:

- Understand the energy systems and its environmental implications
- Quantify the scale of pollution from a conventional Energy source
- Identify strength and weak-linkages in the energy systems