

Course Title: Energy and Climate Change (Core course)

Course Code ESE- 832

Course Objectives:

- To elaborate the fundamental concepts of climate change: Science history,
- To explain the Energy causes of Climate Change (natural and anthropogenic): Greenhouse Effect, Sources of Greenhouse Gases (transport, power generation, industry).
- To discuss in detail the Effects of Climate Change: agriculture, water, food security, ecology, human health
- To enlighten the Impacts of Climate Change: floods, droughts, extreme heat, cold waves, shifting weather patterns, hurricanes. and energy.
- To discuss the Pakistan's Policy Options and Strategy: Adaptation or Mitigation strategies. Role of renewable energy resources.
- To equip students with Pakistan's Stance in Global Negotiations

Learning Outcomes.

This course aims to equip students with a comprehensive understanding of climate change through various learning objectives. Students will investigate the historical context and scientific fundamentals of climate change, grasping the earth's structural changes contributing to climate variations. They will analyze the causes and consequences of climate change, distinguishing between natural and human-induced factors and exploring the intricate relationship between greenhouse gases, biogeochemical cycles, and climatic impacts. Understanding the multifaceted effects of climate change on societies, agriculture, water resources, economics, and ecosystems will be emphasized, alongside assessing strategies for mitigation and adaptation at global, regional, and national levels, particularly focusing on renewable energy resources. Through critical thinking, application of scientific knowledge, and collaboration in discussions and case studies, students will develop the skills necessary to propose innovative solutions and communicate effectively about climate change-related challenges and potential remedies.

Detailed Contents:

Science of Climate Change

Introduction to Climate change: History, Scientific basis

Introduction to Earth Science: Structure, historical changes

Climate change Energy Causes, Effects, Scientific consequences

Impacts of Climate Change

Impacts of climate change on human, societies and on natural ecosystems (Agriculture, Water, Food security, Economics & energy).

Monitoring of global warming and changing environmental conditions

Vulnerability of Pakistan due to Climate Change

Addressing Climate Change (Mitigation and Adaptation)

Global, Regional and National Climate Change mitigation & Adaptation
Role of Renewable energy resources
Energy and transport for the future: energy efficiency; alternatives available for residential, industrial, or transportation sectors; or explorations of the decarbonization.

Climate Change Governance (Global Efforts)

International dimensions of climate change (UNFCCC, IPCC)
Role of National and International Bodies
Pakistan National Climate Change Policy
Pakistan's Stance in Global Negotiations

Invited speaker Talk/Case study

Text/Ref Books:

- Comprehensive Guide to Climate Change, John Houghton -
- Energy and Climate Change: Creating a Sustainable Future, David Coley -
- Renewable Energy and Climate change 2nd addition Volker Quaschnig
- Climate Change Profile of Pakistan Asian Development Bank
- IPCC Assessment Reports IPCC Report