

CORE COURSE XIV - CLIMATE CHANGE

Unit 1

Atmosphere, Hydrosphere, Lithosphere, Biosphere and their linkage. Earth's geological history and development and evolution of the atmosphere; Gaia Hypothesis. Elements of climate, climatic controls. Earth and sun relations; Rotation and Revolution. Spatial and temporal patterns of climate parameters.

Unit 2

Meteorology fundamentals – Pressure, temperature, wind, humidity, radiation, atmospheric stability adiabatic diagrams, turbulence and diffusion. Scales of meteorology. Applications of micrometeorology to vegetated surfaces, urban areas, human beings, animals. Application of Meteorological principles to transport and diffusion of pollutants. Scavenging processes. Effects of meteorological parameters on pollutants and vice versa. Wind roses. Topographic effects. Pollution climatology.

Unit 3

Atmosphere and climate. Basic atmospheric properties, climatic controls. Climatic classifications and variability. Movement in the atmosphere: global scale, regional scale, local scale. Oceans: General circulation patterns. Air – Sea interaction.

Unit 4

Global Energy balance: Source, transfer, distribution. Energy balance of the atmosphere. Wind, stability and turbulence; Monsoons; El Niño, Southern Oscillations, cyclones. Natural climate changes: Records of climate change (glacial cycles, ocean sediments, corals, tree rings)

Unit 5

Human Impacts on climate – Causes and consequences of Global warming – Greenhouse effect; Global and regional trends in greenhouse gas emissions – Sea level rise; role of oceans and forests as carbon sinks, Ozone depletion – stratospheric ozone shield; Ozone hole. Impacts of Climate change: Effects on organisms including humans; effects on ecosystems and productivity; species distribution changes; spread of diseases; Extinction risk for temperature – sensitive species; UV effects Climate change and Policy: Montreal Protocol; Kyoto Protocol; Carbon trading; clean development mechanisms.

Reference

1. Barry, R.G., 2003. Atmosphere, weather and climate. Routledge Press, UK
2. Critchfield, Howard J., 1998, General climatology, Prentice Hall India Pvt. Ltd., New Delhi.
3. Firor, J., and J.E.Jacobsen, 2002. The crowded greenhouse: population, climate change and creating a sustainable world. Yale University Press.
4. Harvey D., 2000, Climate and Global Climate Change, Prentice Hall.