

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NGLC511	Atmosphere, Ocean and Climate Dynamics	3	0	0	3

Course Objective

The primary objective of the course is to provide knowledge about fundamental aspects of atmosphere, ocean, land and major issues related to variability and changes observed in the climate.

Learning Outcomes

Upon completion of the course, students will be able to:

- Earth's atmosphere, ocean and land as a system of systems.
- General circulation and stability of atmosphere.
- Atmosphere-ocean coupling, feedback effects and climate change.
- Monsoon system in India and teleconnection.
- About climate change indicators.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Structure and chemical composition of the Earth's atmosphere, lapse rate and stability, convection, radiativeconvective equilibrium, pressure and geopotential height, air masses, wind belts and greenhouse gases. Atmospheric turbulence and boundary layer. Atmospheric circulation. Cloud formation, precipitation processes and water balance. Atmospheric pollution.	9	Understand about earth's atmosphere: chemical composition, structure, circulation patterns and major processes.
2.	Hypsography of the continents and ocean floor. Physical and chemical properties of seawater and their spatial variations. Residence times. Ocean currents, waves and tides, ocean eddy, stratification, Ekman pumping, important current systems. Major water masses of the world's oceans. Marine Pollution. Harmful Algal Blooms.	8	Learn about oceans: seawater characteristics and processes.
3.	Air-sea fluxes, interactions and climate feedback. Insolation and heat budget, radiation balance, Walker cell, general circulation of the atmosphere and ocean. Motion of fluids, waves in atmospheric and oceanic systems. Hurricanes and Tornadoes, categories, scales and indexes.	8	Know waves in atmosphere and ocean systems, air-sea interactions, and climate feedbacks.
4.	Weather and Climate. Classification of climates. Climate Indicators and Indices. Climate variability. General weather systems of India, - Monsoon system, tropical cyclone and jet stream, Western disturbances and severe local convective systems, distribution of precipitation over India.	8	Understand weather and climate, climate variability and indices, monsoon system in India and teleconnection.
5.	Climatic and sea level changes on different time scales. Sea surface temperature. Global and regional oscillation pattern and climate. Coupled ocean-atmosphere system, El Nino Southern Oscillation (ENSO), El Niño and La-Nina and effect on monsoon systems, drought, and flood events. Climate models, changes in cryosphere, global warming, and climate change.	9	Major global and regional oscillation patterns and their effects on the rainfall and climate.
	Total	42	

Reference Books:

1. Atmosphere, Ocean, and Climate Dynamics: An Introduction to Text by J. Marshall and R. A. Plumb
2. The Atmosphere and Ocean: A Physical Introduction by N.C. Wells Other
References:
1. Atmospheric Science by J.M. Wallace and P.V. Hobbs
2. Atmosphere, Weather and Climate by R. G. Barry and R. J. Chorley
3. The Atmosphere: An Introduction to Meteorology by F.K. Lutgens, E.J. Tarbuck, D.G. Tasa
4. Essentials of Meteorology: An Invitation to the Atmosphere by C.D. Ahrens
5. Meteorology : Understanding the Atmosphere by Steven Ackerman, John Knox
6. Essential of Oceanography by Trujillo/ Thurman
7. Essentials of Oceanography, by Tom Garrison
8. Fundamentals of Weather and Climate by McIlveen
9. Understanding Weather and Climate by Edward Aguado, James E. Burt