

Faculty of Climate Variability and Aquatic Ecosystem

Subject Code: D1814

Name of the Subject: Climate Science

<p align="center">Module. 1</p>	<p>Weather and Climate-Climatic data and normals-World weather watch and Global observation system- -El Nino - Southern Oscillation-Indian Ocean Dipole- Stratosphere and Climate-Ozone depletion- Air pollution problems- Global warming and Climate Change. Composition and Vertical structure- troposphere and stratosphere- - surface pressure and winds – Moisture in the Atmosphere- Clouds and their classification - Inter Tropical Convergence Zone – Subtropical anticyclones – Trade Winds – Upper level winds and jet streams- Atmospheric thermodynamics- General circulation of the Atmosphere - Heat balance of the Atmosphere and Ocean system.</p>
<p align="center">Module. 2</p>	<p>Weather systems: Thunderstorm, dust storm, hail and tornado – Tropical Cyclones – Cyclone structure, Genesis, growth and decay- Cyclones in North Indian Ocean basin- associated strong winds- heavy rain and storm surges - their life cycle. Southwest Monsoon – intra-seasonal and interannual variability of rainfall – monsoon onset - droughts and floods in monsoon – heavy rainfall – monsoon depressions and midtropospheric cyclones - short, medium and long range forecasting of monsoon – Global factors affecting monsoon - northeast monsoon, Other weather systems- Western disturbance and associated weather – Fog – Heat and Cold waves– Fronts and Depressions of middle latitudes and associated weather – Waves in westerlies – western disturbances affecting India.</p>
<p align="center">Module .3</p>	<p>Weather and Climate-Climatic data and normals-World weather watch and Global observation system - El Nino - Southern Oscillation-Indian Ocean Dipole- Stratosphere and Climate-Ozone depletion- Air pollution problems- Global warming and Climate Change- IMD-WMO-IPCC- WCRP- National Action Plan for Climate Change-State Action Plan on Climate Change. Introduction to Hydrosphere- Hydrological cycle- Properties of sea water and their distribution, mixed layer, thermocline, heat budget –introduction to the Energy Budget of the Atmosphere and Oceans- Coastal Processes: Effects of climate change on coastal processes, coastal erosion- Hydrology of Lakes, Rivers and wetlands- river runoff-floods and flood plains- ground water-mangroves-dams and reservoirs- wetland functions and values.The Radiative Balance, carbon cycle of the ocean- Ocean acidification and marine calcifiers - climate sensitivity to oceans – indicators of past climates in ocean- lake sediment cores, ice cores, corals, and other geologic records. Global Ocean Circulation - Indian ocean Circulation- Equatorial processes - thermohaline circulation- salt transport in the ocean- global conveyor belt-Ekman layer- El Niño and the Southern Oscillation -El Niño and its Effects – coastal and open ocean <u>Upwelling</u>.</p>
<p align="center">Module. 4</p>	<p>The biosphere - land and the oceans- Marine and coastal environment – biological zonation, inter-tidal ecosystem - sea as a biological environment – comparison among marine and terrestrial environment. Albedo of the Earth's surface- biosphere influences on fluxes of greenhouse gases - Plankton in the surface oceans and photosynthesis - influences of biosphere in the amount of aerosols in the atmosphere- mechanisms and processes which couple the biosphere with the rest of the climate system .Integrated approach in addressing biodiversity and climate change challenges - The Man and the Biosphere (MAB) Programme</p>

Module. 5	Effects of global warming - Danger for Earth's biome by Global warming spells - The dramatic effects at high latitudes - multiple processes contribution to decreased surface reflectivity- assessment of ecosystem feedbacks to the climate system - carbon sequestration - projected climatic and ecological changes as informed basis for community and regional planning.
Module .6	Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non-Spatial– Projection – Types of Projection – Data Input Raster and Vector data structures – Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters – History of development. Essential Goal of Marine GIS, GIS technique and technology, Relating information from different sources, GIS uncertainties, Data representation, Data capture, Raster-to-vector translation, Projections, coordinate systems, and registration, Spatial analysis with GIS
Module. 7	Introduction to digital computer-functional units of a computer – storage – primary storage – secondary storage. Generation of computers, Introduction to programming languages –types of programming languages – high level languages – assembly language – machine language. Climate Models and Climate Data from ICT perspective; OpenClimateGIS – GIS for climate data; Climate Translator; NetCDF — the most commonly used format for climate simulation data; CIM (Common Information Model) — the most commonly used metadata standard for climate models and simulation data, Climate Data sources and analysis tools.