

XE-H: Atmospheric & Ocean Science

Section A: Atmospheric Science

Fundamental of Meteorology, Thermal structure of the atmosphere and its composition, Radiation Balance and Laws, Wind Belts, Monsoon, Climate. Atmospheric Thermodynamics. Hydrostatic equilibrium and: Hydrostatic equation, variation of pressure with height, geopotential, Tropical convection. Atmospheric Electricity. Cloud Physics. Observation Techniques of the Atmospheric Properties.

Fundamental equations. Pressure, gravity, centripetal and Coriolis forces, continuity equation in Cartesian and isobaric coordinates, Scale analysis, inertial flow, geostrophic and gradient winds, thermal wind, vorticity. Atmospheric turbulence, baroclinic instability. Atmospheric Waves.

Tropical meteorology: Trade wind inversion, ITCZ; monsoon trough tropical cyclones, their structure and development theory; monsoon depressions; Climate variability and forcings; Madden-Julian oscillation (MJO), ENSO, QBO (quasi-biennial oscillation) and sunspot cycles. Primitive equations of Numerical Weather Prediction. General Circulation and Climate Modelling.

Synoptic weather forecasting, prediction of weather elements such as rain, maximum and minimum temperature and fog. Data Assimilation.

Section B: Ocean Sciences

Seawater Properties, T-S diagrams, Ocean Observations, Ocean Tide and Waves and their properties. Coastal processes and Estuary Dynamics. coastal zone management. Wind Driven Circulation: Ekman, Sverdrup, Stommel and Munk theories, Inertial currents; geostrophic motion; barotropic and baroclinic conditions; Oceanic eddies. Global conveyor belt circulation. Subtropical gyres; Western boundary currents; equatorial current systems; Current System in the Indian Ocean.

Momentum equation, mass conservation, vorticity. Ocean and Wave Modeling, Ocean State Forecasting. Data Assimilation. Ocean Turbulence.

Chemical Property of seawater, major and minor elements, their behavior and chemical exchanges across interfaces and residence times in seawater, Element chemistry in atypical conditions-estuaries, Biochemical cycling of nutrients, trace metals and organic matter. Air-sea exchange of important biogenic dissolved gases; carbon dioxide-carbonate system; alkalinity and control of pH; biological pump. Marine Pollution. Primary and secondary production; factors controlling phytoplankton and zooplankton abundance and diversity; nekton and fisheries oceanography.