

SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Earth Science)
Semester: III
Syllabus with Effect from: June - 2014

Paper Code: PT03CESC03	Total Credit: 4
Title Of Paper: Climate Dynamic & Earth System Interactions	

Unit	Description in Detail	Weightage (%)
I	Atmosphere: Geometry and Chemical composition, Physical properties of air, Global energy balance - Planetary emission temperature, Atmospheric absorption spectrum, Green house effect, Vertical structure of the atmosphere, Temperature and greenhouse gases. The relationship between pressure and density, hydrostatic balance, Vertical structure of pressure and density, The nature of convection, Convection in water, Dry convection in a compressible atmosphere, The atmosphere under stable conditions, Moist convection, Convection in the atmosphere, Radiative-convective equilibrium.	25%
II	The meridional structure of the atmosphere- Radiative forcing and temperature, Pressure and geopotential height, Moisture and winds. The equations of fluid motion-Differentiation following the motion, Equation of motion for a nonrotating fluid, Conservation of mass, Integration, boundary conditions, and restrictions in application, Equations of motion for a rotating fluid. Balanced flow-Geostrophic motion, The Taylor-Proudman theorem, The thermal wind equation, Subgeostrophic flow: the Ekman layer.	25%
III	The general circulation of the atmosphere: Circulation, A mechanistic view of the circulation, Energetics of the thermal wind equation, Large-scale atmospheric energy and momentum budget, Latitudinal variations of climate. Ocean and its circulation-Physical characteristics of the ocean, Inferences from geotropic and hydrostatic balance, Ocean eddies. The wind-driven circulation-The wind stress and Ekman layers, Response of the interior ocean to Ekman pumping, Interior balances, Depth-integrated circulation: Sverdrup theory, Effects of stratification and topography, Baroclinic instability in the ocean.	25%
IV	The thermohaline circulation of the ocean: Air-sea fluxes and surface property distributions, Observed and Dynamical models thermohaline circulation, Observations of abyssal ocean circulation, The ocean heat budget and transport, Freshwater transport by the ocean. Climate and climate variability-The ocean as a buffer of temperature change, Southern Oscillation, Paleoclimate. Mathematical and physical structure of Climate models-Hierarchy of Climate models, general circulation models.	25%

Basic Text & Reference Books:-

- Atmosphere, Ocean and Climate Dynamics: An Introductory, John Marshall and R. Alan Plumb, Elsevier Academic Press.
- An Introduction to Dynamic Meteorology, James R Holton, Academic Press.
- Physics of Climate, Jose P. Peixoto, Abraham H. Oort, American Institute of Physics
- Global Physical Climatology, Dennis L. Hartmann , Academic press.
- Atmosphere-Ocean dynamics, A E Gill, Academic press.
- Dynamical Paleoclimatology: Generalized Theory of Global Climate Change B. Saltzman, Academic press.
- James R Holton, 'An Introduction to Dynamic meteorology' 2004, 4th Ed. Academic Press.

