

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

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|------------------------------------|------------------------|
| <b>Paper Code: PT04CESC01</b>      | <b>Total Credit: 4</b> |
| <b>Title Of Paper: Meteorology</b> |                        |

| <b>Unit</b> | <b>Description in Detail</b>   | <b>Weightage (%)</b> |
|-------------|--|----------------------|
| I           | Atmospheric Electricity and Cloud Physics: Fair weather electric field in the atmosphere and potential gradients, ionization in the atmosphere. Electrical fields in thunderstorms, theories of thunderstorm electrification; Cloud classification, condensation nuclei, growth of cloud drops and ice-crystals, precipitation mechanisms: Bergeron, Findeisen process, coalescence process – Precipitation of warm and mixed clouds, artificial precipitation, hail suppression, fog and cloud-dissipation, radar observation of clouds and precipitation, radar equation, rain drop spectra, radar echoes of hail storm and tornadoes, radar observation of hurricanes, measurements of rainfall by radar.   | 25%                  |
| II          | General Circulation and Climate Modelling: Observed zonally symmetric circulations, meridional circulation models, mean meridional and eddy transport of momentum and energy, angular momentum and energy budgets; zonally asymmetric features of general circulation; standing eddies; east-west circulations in tropics: climate variability and forcings; feedback processes, low frequency variability, MJO (Madden-Julian oscillation), ENSO, QBO (quasi-biennial oscillation) and sunspot cycles. Basic principles of general circulation modelling; grid-point and spectral GCMs; role of the ocean in climate modelling; interannual variability of ocean fields (SST, winds, circulation, etc.) and its relationship with monsoon, concepts of ocean – atmosphere coupled models.   | 25%                  |
| III         | Synoptic Meteorology: Weather observations and transmission, synoptic charts, analysis of surface, upper air another derivative chart, stream-lines, isotachs and contour analysis; tilt and slope of pressure/weather systems with height. Synoptic weather forecasting, prediction of weather elements such as rain, maximum and minimum temperature and fog; hazardous weather elements like thunderstorms, duststorms, tornadoes. Tropical meteorology: Trade wind inversion, ITCZ; monsoon trough tropical cyclones, their structure and development theory; monsoon depressions; tropical easterly jet stream; low level jets, Somali jet, waves in easterlies; western disturbances; SW and NE monsoons; synoptic features associated with onset, withdrawal, break active and weak monsoons and their prediction. Air masses and fronts: sources, origin and classification of air masses; and fronts, frontogenesis and frontolysis; structure of cold and warm fronts; weather systems associated with fronts. Extra-tropical synoptic scale features: jet streams, extratropical cyclones and anticyclones. | 25%                  |
| IV          | Numerical Weather Prediction: Computational instability, filtering of sound and gravity waves, filtered forecast equations, barotropic and equivalent barotropic models, two parameter baroclinic model, relaxation method. Multi-layer primitive equation models. Short, medium and long range weather prediction. Objective analysis; Initialization of the data for use in weather prediction models; data assimilation techniques, application of satellite in NWP   | 25%                  |



**Basic Text & Reference Books:-**

- James R. Holten, An Introduction to Dynamic Meteorology, Academic Press (2004)
- Dennis L. Hartmann, Global Physical Climatology, Academic Press (1994)
- John M. Wallace and Peter V. Hobbs, Atmospheric Science-An Introductory Survey, Elsevier (2006)
- Howard B. Bluestein, Synoptic-Dynamic Meteorology in Midlatitudes: Volume I: Principles of Kinematics and Dynamics, Oxford University Press (1992)
- John A. Dutton, Dynamics of Atmospheric Motion, Dover Pubns (1995)
- Peter S. Ray, Mesoscale Meteorology and Forecasting, University of Chicago Press (1986)
- Fred V. Brock, Scott J. Richardson, Meteorological Measurement Systems, Oxford University Press (2001)
- Frederic. Lutgens, Edward J. Tarbuck, The Atmospheric- An Introduction to Meteorology, pHI (1997)

