B.SC. PHYSICS-ELECTIVE - : EB-3/ Atmospheric Physics

(Credits: Theory-04, Practicals-01) Theory: 60 Lectures

COURSE OBJECTIVES:

1. To get acquainted with the general composition and the structure of Earth's Atmosphere and to know about the formation of winds and cyclones.
2. To work out with the fundamental dynamic equations due to rotation of the Earth and apply these to study various circulations and vortices of the winds.
3. To gain knowledge regarding the formation and the propagation of various waves in Atmosphere.
4. To learn about various aspects of RADAR and LIDAR and their applications.
5. To know about formation and detection of Aerosols using LIDAR.

LEARNING OUTCOMES :

1. To know about the general composition and the structure of Earth's Atmosphere and to know about the formation of winds and cyclones.
2. To work out with the fundamental dynamic equations due to rotation of the Earth and apply these to study various circulations and vortices of the winds.
3. To get acquainted with the knowledge regarding the formation and the propagation of various waves in Atmosphere.
4. To gain knowledge about various aspects of RADAR and LIDAR and their applications.
5. To comprehend about the formation and detection of Aerosols using LIDAR.

B.Sc. PHYSICS – ELECTIVE - :EB-3- ATMOSPHERIC PHYSICS / SYLLABUS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

UNIT – I

General features of Earth's atmosphere: Thermal structure of the Earth's Atmosphere, Ionosphere, Composition of atmosphere, Hydrostatic equation, Potential temperature, Atmospheric Thermodynamics, Greenhouse effect and effective temperature of Earth, Local UGC Document on LOCF Physics 190 winds, monsoons, fogs, clouds, precipitation, Atmospheric boundary layer, Sea breeze and land breeze. Instruments for meteorological observations, including RS/RW, meteorological processes and different systems, fronts, Cyclones and anticyclones, thunderstorms. (12 Lectures)

UNIT – II

Atmospheric Dynamics: Scale analysis, Fundamental forces, Basic conservation laws, The Vectorial form of the momentum equation in rotating coordinate system, scale analysis of equation of motion, Applications of the basic equations, Circulations and vorticity, Atmospheric oscillations, Quasi biennial oscillation, annual and semi-annual oscillations, Mesoscale circulations, The general circulations, Tropical dynamics. (12 Lectures)

UNIT – III

Atmospheric Waves: Surface water waves, wave dispersion, acoustic waves, buoyancy waves, propagation of atmospheric gravity waves (AGWs) in a nonhomogeneous medium, Lamb wave, Rossby waves and its propagation in three dimensions and in sheared flow, wave absorption, non-linear consideration (12 Lectures)

UNIT – IV

Atmospheric Radar and Lidar: Radar equation and return signal, Signal processing and detection, Various type of atmospheric radars, Application of radars to study atmospheric phenomena, Lidar and its applications, Application of Lidar to study atmospheric phenomenon. Data analysis tools and techniques. (12 Lectures)

UNIT – V

Atmospheric Aerosols: Spectral distribution of the solar radiation, Classification and properties of aerosols, Production and removal mechanisms, Concentrations and size distribution, Radiative and health effects, Observational techniques for aerosols, Absorption and scattering of solar radiation, Rayleigh scattering and Mie scattering, Bouguert-Lambert law, Principles of radiometry, Optical phenomena in atmosphere, Aerosol studies using Lidars. (12 Lectures)

Reference Books:

- Fundamental of Atmospheric Physics – Murry L Salby; Academic Press, Vol 61, 1996
- The Physics of Atmosphere – John T. Houghton; Cambridge University press;3rd edn. 2002.
- An Introduction to dynamic meteorology – James R Holton; Academic Press, 2004
- Radar for meteorological and atmospheric observations – S Fukao and KHamazu, Springer Japan, 2014