

M. Sc. II Year		MPH-E306			Semester-III
ELECTIVE PAPER- II		ADVANCED ATMOSPHERIC PHYSICS			
Total Lectures	Time Allotted for End Semester Examination	Marks Allotted for Continuous Assessment	Marks Allotted for End Semester Examination (ESE)	Maximum Marks (MM)	Total Credits
60	3 Hrs	30	70	100	04

NOTE: The question paper shall consist of two sections (Sec.-A and Sec.-B). Sec.-A shall contain 10 short answer type questions of six marks each and student shall be required to attempt any five questions. Sec.-B shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT-I

ATMOSPHERIC THERMODYNAMICS I

Gas laws: Virtual temperature, Hydrostatic equation: Geopotential, Scale height, Constant pressure surfaces, Reduction of pressure to sea level, First law of thermodynamics: Joule's law, Specific heats & enthalpy, Adiabatic processes: Air parcel & dry adiabatic lapse rate, Potential temperature, Thermodynamic diagrams, (12 Lectures)

UNIT-II

ATMOSPHERIC THERMODYNAMICS II

Water vapour in air: Moisture parameters, Pseudoadiabatic processes & saturated adiabatic lapse rate, Equivalent and wet bulb potential temperatures, Normand's rule, Ascent decent effect, Static stability : Unsaturated & saturated air, Conditional & convective stability, Second law of thermodynamics: Carnot cycle, entropy, Clausius - Clapeyron equation. (12 Lectures)

UNIT-III

CLOUD MICROPHYSICS I- WARM CLOUD

Theory of nucleation of water vapour & cloud condensation nuclei, Microstructure of warm clouds, Cloud liquid water content & entrainment, Growth of cloud droplets in warm clouds: by condensation, by collection, collision-coalescence, (12 Lectures)

UNIT-IV

CLOUD MICROPHYSICS II- COLD CLOUD

Microphysics of cold clouds: Nucleation, Growth & concentration of ice particles, Formation of precipitation in cold clouds, Artificial modification of clouds & precipitation: Modification of warm & cold clouds, Inadvertent modification. (12 Lectures)

UNIT-V

ATMOSPHERIC DYNAMICS

Kinematics of large scale horizontal flow: Elementary properties, Vorticity & divergence, Deformations, streamlines & trajectories, Dynamics of horizontal flow: Apparent & real forces, Equation of motion, Geostrophic & thermal wind, Vertical motion & planetary rotation, Vorticity conservation, Potential vorticity, Primitive equations: Vertical coordinate, Hydrostatic balance, Energy equation, Vertical motion field, Solution & application of primitive equations. (12 Lectures)

Text Books / Reference Books

1. Atmospheric Science - John M. Wallace & Peter V. Hobbs, Academic Press (2006)
2. Dynamic Meteorology - Holton, J.R., 3rd edition, Academic Press N.Yf. (1992).
3. Numerical Weather Prediction - G.J. Haltiner and R.T. Villians, John Wiley and Sons, 1980