

SPS-424

ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
M.Sc. SPACE PHYSICS
IV SEMESTER

(w.e.f. 2009-2010 admitted batch)

2009-2010

SP 401 IONOSPHERIC RADIO WAVE PROPAGATION AND SOUNDING TECHNIQUES

UNIT -- I : IONOSPHERIC RADIO WAVE PROPAGATION

Theory of wave propagation (Chs. 2.5 – 2.10 in Davies)

Properties of plane waves in isotropic and anisotropic media. Group propagation. Ray and group velocities. Phase and group paths. 2 Hrs.

Radio waves in ionized media (Ch.4 in Davies)

Propagation in isotropic plasma and refractive index. Concepts of critical frequency and virtual height. Magnetoionic theory – constitutive relations of magnetoplasma and the Appleton-Hartree (A-H) formula for refractive index. Ordinary and extraordinary waves. Reflection conditions. Quasi Longitudinal (QL) and Quasi Transverse (QT) approximations to AH formula, Dispersion curves 8 Hrs.

UNIT-II

Absorption (Chs.5 and 6 in Davies)

Deviative and non-deviative absorption. 6 Hrs.

Oblique incidence propagation (Chs.12.1, 12.2 and 12.3 in Davies)

Equivalence theorems – Secant law, Breit and Tuve's theorem and Martin's equivalence theorem. Transmission curves for flat ionosphere. 4 Hrs.

Ray paths in ionosphere (Chs.7.1 and 7.2 in Davies)

Need for ray tracing. Methods of ray tracing – Bremner's rules for ray tracing and Booker's Quartic. 4 Hrs.

UNIT-III : IONOSPHERIC SOUNDING TECHNIQUES

Ground based techniques (Ch.2 in Rishbeth & Garriott and Appendix A in Kelly & Heelis)

Pulse sounding and ionosonde. Reduction of ionograms to N-f profiles. Ionospheric absorption measurement by A1 and A2 techniques. Faraday rotation and Total Electron Content (TEC). Scattering of radio waves in the ionosphere – incoherent scatter radar and coherent scatter (MST) radar. 14 Hrs.

UNIT-IV

Rocket & Satellite techniques (Chs.1 & 2 in Rishbeth & Garriott & Appendix A in Kelly & Heelis)

Satellite drag experiment for atmospheric density. Langmuir Probe (LP) and Retardation Potential Analyzer (RPA). Ion mass spectrometers. Fluxgate magnetometer. Double probe electric field detectors. Barium ion cloud measurements. 12 Hrs.

BOOKS: 1. "Ionospheric radio propagation" by K.Davies

2. "Introduction to ionospheric physics" by H.Rishbeth & O.K.Garriott.

3. "The earth's ionosphere (Plasma physics & dynamics) by M.C.Kelly & R.A.Heelis.

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