

BHARATHIAR UNIVERSITY, COIMBATORE-641 046

M. Sc. PHYSICS DEGREE COURSE

(AFFILIATED COLLEGES – CBCS PATTERN)

(For Candidates Admitted During the Academic Year 2011-2012 Batch & Onwards)

Note :

The revised syllabus for the papers Spectroscopy and Plasma Physics of M.Sc. Physics (Colleges) degree programme for the candidates admitted from the academic year 2011-12 are furnished below. There is no change in remaining papers.

THIRD SEMESTER

PAPER X-SPECTROSCOPY

Unit I: Atomic & Microwave Spectroscopy

Spectra of Alkali Metal Vapours-Normal Zeeman Effect-Anomalous Zeeman Effect-Magnetic Moment of Atom and the G Factor-Lande's 'g' Formula-Paschen Back Effect-Hyperfine Structure of Spectral Lines. Microwave Spectroscopy-Experimental Method-Theory of Microwave Spectra of Linear, Symmetric Top Molecules.

Unit II: Infrared & Raman Spectroscopy

IR Spectroscopy: Practical Aspects-Theory of IR Rotation Vibration Spectra of Gaseous Diatomic Molecules-Applications-Basic Principles of FTIR Spectroscopy.

Raman Spectroscopy: Classical and Quantum Theory of Raman Effect-Rotation Vibration Raman Spectra of Diatomic and Polyatomic Molecules-Applications-Laser Raman Spectroscopy.

Unit III: Electronic Spectra: Fluorescence & Phosphorescence Spectroscopy

Electronic Excitation of Diatomic Species-Vibrational Analysis of Band Systems of Diatomic Molecules-Deslandre's Table-Intensity Distribution-Franck Condon Principle-Rotational Structure of Electronic Bands-Resonance and Normal Fluorescence-Intensities of Transitions-Phosphorescence Population of Triplet State and Intensity-Experimental Methods.

Unit IV: NMR & NQR Spectroscopy

NMR Spectroscopy: Quantum Mechanical and Classical Description-Bloch Equation-Relaxation Processes-Experimental Technique-Principle and Working of High Resolution NMR Spectrometer- Chemical Shift

NQR Spectroscopy: Fundamental Requirements-General Principle-Experimental Detection of NQR Frequencies-Interpretation and Chemical Explanation of NQR Spectroscopy

Unit V: ESR & Mossabauer Spectroscopy

ESR Spectroscopy: Basic Principles-Experiments-ESR Spectrometer-Reflection Cavity and Microwave Bridge-ESR Spectrum-Hyperfine Structure

Mossabauer Spectroscopy: Mossabauer Effect-Recoilless Emission and Absorption-Mossabauer Spectrum-Experimental Methods-Hyperfine Interaction-Chemical Isomer Shift

Books for Study & Reference:

1. Molecular Structure and Spectroscopy – G. Aruldas
2. Spectroscopy: Volumes I, II and III-B.P. Straugham & S. Walker
3. Fundamental of molecular spectroscopy – C.B.Banwell
4. Introduction to molecular spectroscopy - G.M.Barrow.
5. Atomic Physics - J.B.Rajam, S.Chand Publications.

FOURTH SEMESTER

PAPER XIV - PLASMA PHYSICS

Unit – I Fundamental concepts about Plasma

Kinetic pressure in a partially ionized – mean free path and collision cross section- mobility of charged particles – Effect of magnetic field on the mobility of ions and electrons-Thermal conductivity- Effect of magnetic field; - Quasi-neutrality of plasma Debye shielding distance – Optical properties of plasma.

Unit – II Motion of charged particles in Electric and Magnetic field:

Particle description of plasma- Motion of charged particle in electrostatic field- Motion of charged particle in uniform magnetic field - Motion of charged particle in electric and magnetic fields- Motion of charged particle in inhomogeneous magnetic field - Magneto-hydrodynamics - Magneto-hydrodynamic equations – Condition for magnetohydrodynamic behavior.

Unit – III Plasma oscillations and waves

Introduction, theory of simple oscillations - electron oscillation in a plasma – Derivations of plasma oscillations by using Maxwell's equation – Ion oscillation and waves in a magnetic field – thermal effects on plasma oscillations – Landau damping – Hydromagnetic waves – Oscillations in an electron beam.

Unit – IV Plasma Diagnostics techniques

Single probe method - Double probe method – Use of probe technique for measurement of plasma parameters in magnetic field – microwave method – spectroscopic method ; Effect of magnetic field on the intensity of spectral lines - laser as a tool for plasma diagnostics-X-ray diagnostics of plasma – acoustic method – conclusion.

Unit-V plasma confinement and Possible applications

Magneto hydrodynamic generator – Basic theory – Principle of working – Plasma diode – confinement and possible application of plasma, stellarator – magnetic mirror confinement.

Books for study and reference:

1. Plasma physics- plasma state of matter – S.N.Sen, Pragati Prakashan, meerut
2. Introduction to plasma physics – F.F.Chen, Plenum press, London
3. Principles of plasma physics – Krall & Trivelpiece
4. Introduction to Plasma Theory-D.R. Nicholson
5. The Plasma State-J.L. Shohet
6. Introduction to Plasma Physics-M. Uman
7. Principles of Plasma Diagnostics-I.H. Hutchinson
8. Plasma Diagnostic Techniques-R.H. Huddleston & S.L. Leonard