SYLLABUS FOR APPLIED PHYSICS

SEMESTER – 4

APPLIED PHYSICS COURSE CODE : US04CAPH01 (3 Credit Course)

COURSE TITLE : Spectroscopy

(Effective from June 2018)

Unit 1 : **Atomic Spectra**

Investigation of Spectra, Production of Spectra, Types of Spectra, Wave Number, The Spinning Electron, Space Quantization, Quantum Numbers and their Physical Interpretation, L-S Coupling, J-J Coupling, Experimental study of Zeeman Effect, Classical Interpretation of Normal Zeeman Effect, Anomalous Zeeman Effect, Stark Effect

Unit 2 : **Molecular Spectra**

Origin of molecular spectra, nature of molecular spectra, different modes of molecular excitation, factors affecting line width of molecular spectra, factors affecting intensity of molecular spectra, Born-Oppenheimer approximation, rotation of linear system, rotational spectra of rigid linear molecules, non-rigid rotator, the energy of a diatomic molecule, vibrating diatomic molecule as a harmonic oscillator, theory of the origin of vibration-rotation spectrum of a molecule, the Anharmonic oscillator

Unit 3 : **Mass Spectrometer**

Basic mass spectrometer, types of mass spectrometers: magnetic deflection mass spectrometer, time of flight mass spectrometer, Components of a mass sepectrometer: the inlet sample system, ion sources, Electrostatic accelerating system, ion collecting system and recording of mass spectrograph, Vacuum system, applications of mass spectrometry: Gas chromatograph-Mass spectrometer, Liquid chromatograph-Mass spectrometer, NMR Spectroscopy: Principle: Nuclear spin nuclear energy levels resonance conditions, NMR absorption spectra, The chemical shift, construction details of NMR spectrometer: magnetic field, The radio-frequency transmitter, the signal amplifier and detector, The display system, Recording unit, sample holder.

Unit 4 : **UV/Visible spectroscopy**

Introduction, Electromagnetic radiation, Interaction of radiation with matter, Beer Lambert's Law, deviation from the law, Absorption instruments: radiation sources, optical filters: absorption filters, interference filters, monochromators: prism, diffraction gratings, mounting of gratings, types of gratings, Holographic gratings, Detectors: photovoltaic cells, photo emissive cells, high vacuum photo emissive cells, gas filled photoemissive cells, photomultiplier tubes, silicon diode detector, diode arrays.

Text Books :

1. Elements of Spectroscopy by S L Gupta, V Kumar, R C Sharma,Pragati Prakashan
2. Handbook of analytical instrumentation by R.S. Khandpur

Reference Books :

1. Modern Physics by R. Murugeshan and Kiruthiga Sivaprasath, S. Chand & Company Ltd. New Delhi.
2. Molecular structure and Spectroscopy by G Aruldhas, Prentice-Hall of India Private Limited

SYLLABUS FOR APPLIED PHYSICS

SEMESTER – 4

APPLIED PHYSICS COURSE CODE : US04CAPH02 (3 Credit Course)

COURSE TITLE : Electricity, Magnetism and Solid State Electronics

(Effective from June 2018)

**Unit 1 : Electrostatics**

Electric field: Brief introduction to Gradient, Divergence, Curl and Coordinate Systems, Coulomb's Law, The Electric field, Continuous charge distribution, Divergence and curl of Electrostatic fields: Field lines, Flux and Gauss's law, The Divergence of E, Applications of Gauss's law, The Curl of E, Electric Potential: Introduction to potential, Comments on potential, Poisson's equation and Laplace's equation, The potential of a localized charge distribution, Work and Energy in Electrostatics: The work done to move a charge, The energy of a point charge distribution, The energy of a continuous charge distribution

**Unit 2 : Magnetostatics**

The Lorentz Force Law: Magnetic fields, Magnetic forces, Currents, The Biot-Savart law: Steady currents, The Magnetic field of a steady current, The Divergence and Curl of B: Straight-Line currents, The Divergence and Curl of B, Applications of Ampere's law, Comparison of Magnetostatics and Electrostatics, Magnetic Vector Potential: The Vector potential, Summary; Magnetostatic boundary conditions, Multipole expansion of the vector potential

Unit 3 : **Transistor Biasing Circuits**

Introduction, Need to bias a transistor, Selection of operating point, Need for bias stabilization, Requirement of a biasing circuits, Different biasing circuits, Fixed-bias circuit, Collector to base bias circuit, Voltage divider biasing circuit, Approximate analysis, Accurate analysis, Emitter bias circuit, PNP transistor biasing circuit

Unit 4 : **Small Signal Amplifiers and h-parameters**

Introduction, Single stage transistor amplifier, Amplifier performance analysis methods, Graphical method, AC and DC load lines, Calculation of gain, Input and output phase relationship, Equivalent circuit method, Development of transistor AC equivalent circuit, h parameter equivalent circuit, Amplifier analysis, Need of multistage amplifier, Gain of multistage amplifier

Text Books :

1. Introduction to Electrodynamics by David J Griffiths, Prentice-Hall of India Private Ltd.
2. Electricity and Magnetism by A S Mahajan and A A Rangwala Tata McGraw Hill Publishing Company Ltd
3. Basic Electronics and Linear Circuits by N N Bhargava, D C Kulshreshtha and S C Gupta Tata McGraw Hill Publishing Co. Ltd., New Delhi

Reference Books :

1. Basic Electronics – Solid State by B. L. Theraja, S. Chand Publications

SYLLABUS FOR APPLIED PHYSICS
SEMESTER – 4
APPLIED PHYSICS COURSE CODE : US04CAPH03 (3 Credit Course)
COURSE TITLE : Practicals
(Effective from June 2018)

1. To determine the refractive index of prism using the Brewster's law
2. Determination of Rydberg's constant with the help of diffraction grating and Hydrogen discharge tube.
3. Dissociation energy determination of $I_2$.
4. Determination of Laser parameters – Wavelength, and Angle of divergence
5. Experimental determination of Hall voltage.
6. Electrical conductivity by Four probe method.
7. JFET characteristics
8. Fixed voltage biasing using FET / BJT / MOSFET
9. Self-biasing using FET/ BJT / MOSFET
10. Potential divider biasing using FET/ BJT / MOSFET
11. Voltage stabilizer trainer
12. Study of Solar Cell using solar education kit
13. Ultrasonic receiver and transmitter
14. RYB signal generator
15. Determination of Planck's constant by photocell method.
16. FET voltage amplifier

**Reference Books :**


1. A Laboratory Manual of Physics for Undergraduates by D P Khandelwal
2. University Practical physics by D C Tayal-Himalayan publishing house.
3. Advanced Practical Physics by Worsnop & Flint.
4. Instructions manual-Kit developed for doing experiments in Physic(At BSc. and M.Sc. Physics levels) by R Srinivasan and K R S Priolkar-Indian Academy of Science, Banglore.
5. B.Sc. Practical Physics by C. L. Arora, S. Chand & Company Ltd. New Delhi.