SEMESTER - III PAPER - I Session 2017-18

CONDENSED MATTER PHYSICS

Unit - I

Crystal Structure :

Bravais Lattice in two and three dimension. Simple crystal structures : Hexagonal close packed structure, Diamond structure, Zinc blende structure, sodium chloride structure, cesium chloride structure.

Unit . II

Crystal diffraction by X-Ray :

Reciprocal lattice, of bcc and fcc lattice. Relation between crystal lattice axes and crystal reciprocal lattice axes. Bragg diffraction. Condition in term of reciprocal lattice vector. Brillouin zones.

Unit-III

Elastic properties of solids :

Stress and Strain components, elastic compliance and stiffness constants, elastic energy density, reduction of number of elastic constants, elastic stiffness constants for isotropic body, elastic constant for cubic isotropic bodies, elastic waves, waves in (100) direction, experimental determination of elastic constants.

Unit . IV

Lattice vibration and phonons :

Lattice dynamic of a diatomic liner lattice. Lattice vibrational spectrum. The concept of phonons momentum of phonons. Inelastic scattering of photons by phonons. Inelastic scattering of neutrons by phonons. Inelastic scattering of X-Ray.

Unit - V

Thermal properties and band theory of solids :

Anharmonicity, thermal expansion, thermal conductivity, equation of state of solids, gruneisen constant. Band theory, classification of solids, concepts of effective mass. Fermi surfaces, anomalous skin effect, De Hass van alphen effect, cyclotron resonance, magneto resistance.

Text **and** reference Books :

1. Verma and Srivastava : Crystallography for solid State physics.
2. Azaroff : Elementary to Solids.
3. Omar : Introduction Solids state physics.
4. Kittle : Solids state physics.
5. Huong : theoretical solids state physics.
6. Weertman and weertman : Elementary dislocation theory
7. Buerger : Crystal structure physics.
8. Made lung : Introduction to solids state physics.

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CLASS - M.Sc. SUBJECT - PHYSICS

SEMESTER - III PAPER - II

NUCLEAR AND PARTICLE PHYSICS

Unit-I

Nuclear Interactions and Nuclear Reactions: Nuclear forces, Exchange and tensor forces, Meson theory of Nuclear forces, Low – energy n-p scattering, and Spin dependence of n-p forces. Direct and compound nuclear reaction mechanism, reciprocity theorem.

Unit - II

Accelerators of charged particles :

Study of cyclotron, phase stability, frequency modulated cyclotron (synchorocyclotron) magnetic induction accelerator (Betatron), Electron synchrotron and liner accelerator (Linac)

Unit . III

Nuclear models :

Liquid drop model, Bohr-wheeler's theory of nuclear fission, shell model, spin orbit interaction, magic number, spin and angular momenta of nuclear ground state, nuclear quadrupole moment.

Unit - IV

Nuclear decay and elementary particles:

Decay, general features of ray spectrum, Fermi theory of decay, selection rules, parity decay in decay, multipole radiation, internal conversion, nucler isomerism.

Unit – V

Elementary particles :

Classification of elementary particles, fundamental interaction, parameters of elementary particles. Symmetry and conservation laws, symmetry schemes of elementary particles SU (3)

Text and reference Books:

1. Introduction to Nuclear physics : H.A. Enge
2. Nuclear radiation detectors : S.S. Kapoor and V.S. Ramamurthy
3. Atomic and Nuclear physics : S.N.Ghoshal
4. Nuclear and Particle physics : D.C.Tayal
5. Nuclear Physics : R.C.Sharma
6. Introduction to nuclear physics : KRANE
7. Nuclear physics Principles & Application : Lilley

16/8/2017

CLASS - M.Sc. SUBJECT - PHYSICS

SEMESTER - III PAPER – III

Digital Electronics

Unit I

Number System (Binary, Octal, Decimal, hexadecimal) and conversion between them. Boolean arithmetic, signed and unsigned binary numbers, I's complement, 2's complement.

Unit II

Godes : BCD,Gray, ASCII, EBCDIC, Demorgans theorem, Gates: OR, AND,NOT, NOR, OR, NAND, XOR, XNOR, Boolean algebra, Karnaugh map, adder and subtractor circuit design.

Unit III

Multiplexer, demultiplexer, encoder, decoder, parity checker and generator, Flip-Flops: R-S-D, J-k, J-k Master slave flip flop. Race around condition registers, shift registers (left and right shift).

Unit IV

Counters- asynchronous (ripple) counter, synchronous (parallel) counter, MOD-5 counter and MOD-10 counter, BCD counter, Up-Down counter, Shift Register counter (Ring counter).

Unit V

Digital to analog conversion (Binary weighted register method, R-2R ladder network method, complete DAC structure. Analog to digital converters(Stair case or counter method, single slope, equal slope, successive approximation ADC).

Text and reference Books:

1. "Digital principles and applications" by A.P.Malvino and Donald P. Leach, Tata Megraw-Hill company, New Delhi, 1993.
2. "Microprocessor Architecutre, Programming and Applications with 8085/8086 by Rames S.Gaonkar, Wiley-eastern Ltd. 1987 (for unit V)"
3. Digital electronics-S.N.Ali
4. Digital electronics-Morries Mano
5. Microprocessor and Microcomputers-B.Ram-Dhanpat Rai publications V edition.

Sem III 16/4/2017

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CLASS - M.Sc. SUBJECT - PHYSICS

SEMESTER - III PAPER – IV

Atomic and Molecular Physics

Unit I

Nuclear Magnetic Resonance Spectroscopy:

Concept of Nuclear Magnetic resonance spectroscopy, Interaction between nuclear spin and Magnetic field, population of energy level, relaxation processes, spin-spin interaction and spin-spin coupling between two and more nuclei (Qualitative).

Unit II

Electronic spectra of Diatomic Molecules :

Franck Condon principles, dissociation and pre-dissociation, dissociation energy. Born-Oppenheimer-approximation, vibrational coarse structure of electronic spectra (bands progression and sequence).

Unit III

Raman Spectra

Raman effect, quantum theory of Raman effect, Molecular polarisibility in Raman effect, Vibrational Raman spectra, vibration-rotation Raman Spectra of diatomic molecules, application of Raman and infrared spectroscopy in the structure determination.

Unit IV

Mossbauer Spectroscopy :

Mossbauer Effect, principles of Mossbauer spectroscopy, recoil less emission of gamma emission, line width and resonance absorption, application of Mossbauer spectroscopy

(Isomer shift, Quadra pole splitting magnetic field effect).

Unit V

Electron Spin Resonance spectroscopy :

Elementary Idea about ESR, Principle of ESR, ESR spectrometer, splinting of electron energy levels by a magnetic field, G-Values, simple experimental setup of ESR, ESR spectra of free radicals in solution, AN Isotropic System.

Text and reference Books :

1. Fundamentals of Molecular Spectroscopy _C.B. Banwell.
2. Spectra of Diatomic Molecules-Herzberg.
3. Mossbauer Spectroscopy-M.R.Bhide.
4. NMR and Chemistry-J.W.Akitt.
5. Modern Spectroscopy-J.M.Hollons.

16/8/2017

Subject : Physics

List of Experiments for M.Sc. (3rd Sem) 2017-18

Lab A : General

1. Susceptibility measurements.
2. Study of Hall Effect.
3. Study of Hysteresis curve.
4. Study of Frank and Hertz experiments.
5. e/m using Zeeman effect.

Lab : Electronics

1. To Study gates and verify truth tables.
2. To verify De-Morgan's theorem.
3. To verify truth table for RS,D,T & JK flip flop.
4. To study synchronous and Asychronous Counter.
5. Study of Multi vibrator circuits.

Note:
Other experiments depending upon availability in institution, related to theory paper in corresponding semester.

16/8/2017