

**B.Sc. II<sup>nd</sup> year Physics (Semester-III)**  
**(Mathematical, Statistical Physics and Relativity)**  
**Course code PHY-201**  
**Paper-VII**

Period-45

Marks-50

**1. Differentiation and ordinary differential equation:**

Limit of function, partial differentiation, successive differentiation, total differentiation, exact differentiation, chain rule.

Ordinary differential equation, order and degree of differential equation, solution of first order differential equation, and solution of second order linear differential equation with constant coefficient

a) Homogeneous equations, b) Inhomogeneous equation, Special case of exponential right hand to find P.I.

**2. Statistical basis and classical statistics:**

Introduction, probability, principle of equal a priori probability, probability and frequency, some basis rules of probability theory, permutation and combination, macrostates and microstates, phase space, thermodynamic probability, division of compartments into cells, Maxwell-Boltzmann energy distribution law, evaluation of  $g_i$ ,  $u$  and  $\beta$ , M.B. distribution function for ideal gas, M.B. Speed distribution law.

**3. Quantum statistics:**

Need of quantum statistics, Bose-Einstein distribution law, Planck's radiation law, Fermi-Dirac distribution law, electron gas, Fermi level and Fermi energy,  $E_{FO}$  for electrons in a metal, comparison of three static, difference between classical and quantum statistics.

**4. Theory of relativity:**

Introduction, frame of reference, Galilean transformation equations, Michelson Morley experiment, special theory of relativity, Lorentz transformation equation, length contraction, time dilation, addition of velocities, variation of mass-energy equivalence.

**Reference Books:**

1. Mathematical Physics- Gupta, Kumar
2. Mathematical Physics- B.S. Rajput (PragatiPrakashan)
3. Heat, thermodynamics & statistical Physics- Brijlal, N. Subrahmanyam, P.S. Hemne. S. Chand Publication
4. Text book of heat and thermodynamics- J.B. Rajam & C. L. Arora.

~~5. Mathematical Physics- D. M. Gupta, K. S. Chandra, S. Chand Publication~~

**B.Sc. II<sup>nd</sup> year Physics (Semester-III)**

**(Modern and Nuclear Physics)**

**Course code PHY-202**

**Paper-VIII**

**Period-45**

**Marks-50**

**1. Photoelectric Effect :**

Introduction, Lenard's method to determine  $e/m$  for photoelectrons, Richardson and Compton experiment, Relation between photoelectric current and retarding potential, Relation between velocity of photoelectrons and frequency of light, photoelectric cells- (1) Photo- emissive cell (2) Photo- voltaic cell (3) Photoconductive cell, Applications of photoelectric cells.

**2. X-rays :**

Introduction, The absorption of X-ray's, Laue's experiment, Bragg's Law, The Bragg's X-ray spectrometer, powder crystal method, The Laue method, X-ray spectra, Main features of continuous X-ray spectrum, Characteristics x-ray spectrum.

**3. Nuclear forces and models :**

Introduction, Binding energy, Nuclear stability, Nuclear forces, Meson theory of nuclear forces, liquid drop model, shell model, Energy released in Fission, Chain reaction, Atom bomb, Nuclear Reactors, Nuclear fusion, Source of stellar energy.

**4. Particle Accelerators and Detectors :**

Linear accelerator, Cyclotron, Synchrocyclotron, Betatron, Ionisation chamber, proportional counter, Geiger – Muller counter.

**Reference Books:**

1. Modern Physics- J. B. Rajan
2. Modern Physics- R. Murugesan, Er.Kirutyhiga, Sivaprasath. S. Chand Publication
3. Nuclear Physics- Kaplan
4. Nuclear Physics- B.N. Srivastava
5. Atomic and nuclear physics-N. Subramanyan and Brijlal.

B.Sc. II<sup>nd</sup> year (Semester-III)

Physics Practical

Course code PHY-203

Paper-IX

Marks-50

1. 'h' by Photo cell ✓
2. e/m by Thomson's tube method. ✓
3. Determination of absolute value of  $B_H$  and  $B_V$  using Earth Inductor ✓
4. Stefan's constant by using thermo couple ✓
5. Measurement of low resistance using potentiometer.
6. Frequency of A.C. mains using sonometer. ✓
7. Specific rotation by Laurent's half shade polarimeter. ✓
8. Cauchy's constant by spectrometer ✓

Note: At least six experiments should be performed.

Paper - IX + ~~XIII~~

6 + 6 = 12 (1 Record book)

**B.Sc. II<sup>nd</sup> year (Semester-III)**

**Physics Practical**

**Course code PHY-204**

**Paper-X**

4-10-13-14

**Marks-50**

- 1 Thermal conductivity of rubber tube. ✓
2. Study of temperature dependence of total radiation. ✓
3. To draw the histogram of theoretical Gaussian curve.
4. Comparison of capacities by Desauty's method. ✓
- 5 Velocity of sound using Helmholtz resonator.
- 6 Surface tension by Ferguson's method. ✓
- 7 R. P. of Telescope/microscope. ✓
8. Determination of Wavelength of light by Newton's ring. ✓

**Note:** At least six experiments should be performed.

Paper - X + XIV

6 + 6 = 12 practical 1 Record book

**B.Sc. II<sup>nd</sup> year Physics (Semester-IV)**

**(General Electronics )**

**Course code PHY-205**

**Paper-XI**

**Period-45**

**Marks-50**

**1. Semiconductor :**

Introduction, Construction, Working and Characteristics of semiconductor diode, Zener diode, Zener diode characteristics, Transistor (PNP and NPN), Transistors characteristics (CE, CB and CC), Construction, Working and Characteristics of FET & MOSFET.

**2. Transistor Biasing and Amplifiers :**

Transistor biasing, Selection of operating point, bias stability, transistor biasing circuits - fixed bias or base bias, collector feedback bias, emitter feedback bias or self-bias.

Single stage transistor amplifier, frequency response of RC coupled amplifier, Noise in amplifiers, feedback in amplifiers, Op-Amp characteristics, inverting & non-inverting amplifier, Op-Amp as an adder and subtractor.

**3. Oscillators and Multivibrators:**

Two port network representation of a transistor, Hybrid parameters or h - parameters, Positive feedback, Basic principle of Oscillators, requirements of feedback, RC Oscillator (Phase shift Oscillator), LC Oscillator (Hartley Oscillator) Transistorised. Astable multivibrator, monostable multivibrator, bistable Multivibrator,

**4. Modulation and demodulation :**

Modulation, Amplitude modulation, Modulation index, frequency modulation, phase modulation, demodulation, advantages of frequency modulation over amplitude modulation.

**Reference Books:**

1. Basic principle of electronics- V. K. Mehta.
2. Basic Electronics & Linear circuits- N.N. Bhargawa.
3. An introduction to Electronics edition-II or III – A.P. Malvino.
4. Radio engineering- M.L. Gupta.
5. An introduction of Electronics – K. J. M. Rao.

**B.Sc. II<sup>nd</sup> year Physics (Semester-IV)**

**(Solid State Physics)**

**Course code PHY-206**

**Paper-XII**

**Period-45**

**Marks-50**

**1. Crystal Structure :**

Introduction, Crystal lattice- plane lattice, space lattice, translation vectors, Unit cell, (primitive, non primitive Wigner-Sietz primitive cell) Basis, symmetry operations, point groups and space groups, type of lattices (two dimensional and three dimensional lattices), lattice directions and planes, Miller indices, Inter planer spacing, simple crystal structure.

**2. Bonding and Band theory of solids :**

Introduction, concept of inters-atomic forces, cohesive energy and types of bonding. primary bonds- (ionic bonds, covalent bond and metallic bond), secondary bonds- (Vander Walls bonds and hydrogen bonds).

The Kroning-Penney model, Energy versus Wave vector relationship, different representations (Brillouin zone)

**3. Thermal properties of solids :**

Classical theory of lattice heat capacity (Concept and comparison with experimental values), Einstein's theory of lattice heat capacity, Debye's model of lattice heat capacity, density of modes, limitations of Debye's model.

**4. Free electron theory of metals and Transport properties:**

Drude-Lorentz's classical theory, electrical conductivity, thermal conductivity Wiedemann Franz law, significance of Fermi energy level, Hall effect, Hall voltage and Hall coefficient, experimental determination of Hall coefficient, Importance of Hall effect.

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**Reference Books:**

1. Physics for degree student – C. L. Arora & Dr. P. S. Hemne – S. Chand publication
2. Solid State Physics and Electronics – R. K. Puri & V.K. Babbar- S. Chand publication
3. Fundamentals of Solid State Physics- Saxena, Gupta, Saxena – Pragati prakashan, Meerat
4. Solid State Physics, Revised VI<sup>th</sup> Editions, S.O. Pallai.
5. Introduction to Solid State Physics, VII<sup>th</sup> Edition, C. Kittel.

**B.Sc. II<sup>nd</sup> year (Semester-IV)**

**Physics Practical**

**Course code PHY-207**

**Paper-XIII**

**Marks-50**

1. Energy band gap of semiconductor using thermister. ✓
2. I.V. Characteristics of solar cell. ✓
3. Calibration of bridge wire using Carry-Foster's bridge. ✓
4. Determination of absolute capacity of condenser using B.G.
5. Full wave rectifier with  $\Pi$  filter. ✓
6. Viscosity of liquid using Searle's viscometer.
7. High resistance by leakage through condenser. ✓
8. Viscosity of liquid by oscillating disc method ✓

**Note:** At least six experiments should be performed.

**B.Sc. II<sup>nd</sup> year (Semester-IV)**

**Physics Practical**

**Course code PHY-208**

**Paper-XIV**

**Marks-50**

B.Sc. III (XXIV)

- 1 Transistor characteristics in CE configuration.
2. Transistor characteristics in CB configuration
3. Study of CE amplifier
4. Hartly Oscillator using transistor.
- 5 Wien Bridge Oscillator using transistor/ Op-Amp
- 6 Op-Amp as adder/subtractor
- 7 JFET characteristics. ( $r_p$ ,  $g_m$  and  $\mu$ )
8. Self-inductance by Owen's Bridge

Note: At least six experiments should be performed.

**Additional activity**

1. Organize study tour industrial/research institute
2. Conduct Seminars

Reference Books

1. Physics for degree student - C. L. Kora & Dr. P. S. Hemra - S. Chand publication
2. Solid State Physics and Electronics - R. P. Puri & V. K. Kapoor - S. Chand publication
3. Fundamentals of Solid State Physics - S. M. Gupta, Saxena - Pragati Publication
4. Solid State Physics, Revised VI<sup>th</sup> Edition - S. O. Puri
5. Introduction to Solid State Physics VII<sup>th</sup> Edition - C. Kittel