

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN  
CBCS - Semester - Grading Pattern  
**B.Sc. Semester-IV**  
PHYSICS SYLLABUS

**CC: PHY-401**

**UNIT-I: Solid State Physics**

***Atomic Cohesion and Crystal Binding:***

Cohesion of Atoms(2.1), Primary Bonds (2.2), The Covalent Bond (2.2.1), The Metallic Bond (2.2.2), The Ionic Bond (2.2.3), Mixed Bond (2.2.4), Secondary Bonds(2.3), The Vander wall's Bond (2.3.1), The Hydrogen Bond (2.3.2), The Cohesive Energy(2.4), Ionic Crystal (2.4.1), Noble Gas Crystal (2.4.2), Atomic Radi. Vs Lattice constants (2.5), Elastic constants of crystals (2.6), Elastic Stress (2.6.1), Elastic strain(2.6.2), Dilation(2.6.3), Elastic Compliance and Stiffness constant (2.7), Elastic Energy density (2.7.1), Application to Cubic crystal (2.7.2), Bulk Modulus and compressibility (2.7.3).

**Basic Reference :**

Elements of Solid State Physics. (2003) by J. P. Srivastava, PHI.

**Other References**

1. Introduction to Solid State Physics by C. Kittel, Wiley Estarn. Delhi
2. Solid State Physics by Saxena, Pragati Prakasion.
3. Solid State Physics by C. M. Kachhawa

**UNIT-II :**

***Physical Interpretation and Condition on  $\Psi$ :***

Conservation of Probability (2.6), Expectation values, Ehrenfest's Theorem (2.7), Admissibility Condition on the Wave function (2.8)

***Stationary States and Energy Spectra***

Stationary states : The time Independent Schrödinger Equation (2.9), A particle in a square well potential (2.10), Bound States in a square well ( $E > 0$ ) (2.11), The square well: Non localized states ( $E > 0$ ) (2.12).

**Basic Reference:**

A Text Book of Quantum Mechanics by Mathews and K. Venkatesan Tata Mc-Graw Hill Publication

**Other References:**

1. Quantum Mechanics by John L. Powell and Bernd Crasemann
2. Quantum Mechanics by Ghatak and Loknath
3. Quantum Mechanics by Schiff

## **UNIT-III: Plasma Physics**

### ***The Basic concepts:***

Introduction (1.1), Composition and Characteristics of a Plasma (1.2), Collisions (1.3), Elastic collisions (1.3.1), Inelastic collisions (1.3.2), Surface Phenomena (1.4), Transport Phenomena (1.5), Diffusion and Mobility (1.6), Viscosity, Conductivity (1.7), Recombination (1.8), Ohm's law (1.9), Gas Discharge (1.10), Composition of various natural and Man-made Plasma (1.11), Plasma diagnostics (1.12), Plasma waves and Instabilities Confinement of Plasma (1.13), Space Plasma (1.14).

### ***Motion of charge and velocity in Magnetic and Electric field:***

Microscopic and macroscopic description (2.1), Maxwell's equation and Charge Conservation (2.2), Motion of charge particle in electric and magnetic fields (2.3), Uniform magnetic field and Oscillating electric field (2.4).

### **Basic Reference:**

Elements of Plasma Physics by S.N.Goswami New Central book Agency (P) Ltd., Calcutta.

### **Other References:**

1. Introduction to Plasma Physics and Controlled Fusion Vol.-1 by F.F.Chen.
2. Plasma Physics by S.N.Sen

## **UNIT-IV Optics**

### ***Resolving Power:***

Resolving Power of Optical Instrument (19.5), Resolving Power of a telescope (19.7), Relation between magnifying power and resolving power of a telescope (19.7.1), Resolving Power of a Plane transmission grating (19.12).

### ***Polarization:***

Introduction (20.1), Polarization by double refraction (20.5.5), Double refraction (20.8.3), Huygens' explanation of double refraction (20.9 & 20.9.1), Types of polarized light, (20.15), Retarders or Wave plates(20.17), Quarter wave plate (20.17.1), Half wave plate(20.17.2),Production of Elliptically polarized light(20.18), Detection of Elliptically polarized light(20.18.1).

### **Basic Reference :**

A text book of OPTICS by Dr. N, Subrahmanyam, Brijlal, Dr, M,N, Avadhanulu - S.Chand.

### **Other References:**

1. A Text book of Light by D.N.Vasudeva - S. Chand & Co.
2. Fundamentals of Optics by Jonkin's and White
3. Optics by AjoyGhatak
4. Principles of Optics by B.K. Mathur

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**PHYSICS SYLLABUS**

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**UNIT-I**

***Electromagnetic Induction and its practical applications***

Self Inductance and Mutual Inductance – Only Introduction (11.12, 11.16), Measurement of Self Inductance by Rayleigh's Method (11.15), Measurement of Mutual Inductance (11.23), Use of Earth Inductor – Measurement of Horizontal Component H of the Earth Magnetic Field (12.3-1), Measurement of Vertical Component V of the Earth Magnetic Field (12.3-2), Measurement of the Angle of Dip (12.3-3).

***A.C. Bridges:***

A.C. Bridges (17.5), Maxwell's Bridge (17.6.1), Owen Bridge (17.6.2), De Sauty's A.C. Bridge (17.7.1), Schering Bridge (17.7.3)

**Basic reference:**

Electricity and Magnetism By K.K.Tewari (S.Chand& Company Ltd.)

**UNIT-II : Electronics and Computer**

***Digital Electronics:***

Introduction (21.1), Number systems used in Digital Electronics (21.2), Decimal, Binary, Hexadecimal and Octal (21.2.1 to 21.2.4), Binary Codes-(A) BCD, (B) Gray, (C) Excess-3 Codes (21.4), Arithmetic Circuits – Exclusive - OR Gate (21.9), Applications of X-OR Gate:(i) Binary to Gray Code Converter (ii) A Parity Checker (iii) The Half Adder (iv) The Full Adder (v) Parallel Adder(vi)Half subtractor, (vii)Full subtractor.

**Basic Reference :**

Hand book of Electronics by Gupta & Kumar 30th Revised Edition, 2002 Pragati Prakashan, Meerut.

***Programming in – C:***

**Overview of C :** History of C (1.1), Importance of C (1.2), Sample Program: Printing a Message (1.3), Basic Structure of C Programs (1.8), Programming Style (1.9), Executing a C Program (1.10).

**Basic Reference :**

Programming in ANSI C by E.Balaguruswami (THM) (3<sup>rd</sup> Edition)

## **UNIT-III : Nuclear Physics**

### ***Radioactivity:***

(Review of Radioactive decay laws, half life, mean life time etc.) Radioactive growth and decay (2.6) Ideal equilibrium (2.7) Transient equilibrium and secular equilibrium (2.8) Radioactive series (2.9)

### ***The Q- Equation:***

Introduction (3.1), Types of Nuclear Reactions (3.2), The Balance of Mass and Energy in Nuclear Reactions (3.3), The Q-Equation (3.4), Solution of the Q-Equation (3.5).

### **Basic reference:**

Nuclear Physics by S.B.Patel (New age International (p) Ltd. Publishers)

### **Other References:**

1. Elements of Nuclear Physics by M.L.Pandya & R.P.S. Yadav Kedarnath Ramnath Meerut
2. Nuclear Physics by Kaplan

## **UNIT-IV : Modern Physics**

Orbital and Magnetic Dipole Moment (4.1), Larmor Precession (4.2), Space quantization (4.3), Electron spin (4.4), Vector model of atom (4.5), Spectroscopic terms and their notations (4.6), Stern Gerlach Experiment (4.7), Pauli's Exclusion Principle (4.8). Zeeman Effect- Normal Zeeman Effect and anomalous Zeeman Effect (12.1), Explanation of Normal Zeeman Effect (12.2), Explanation of Anomalous Zeeman Effect (12.3), Paschen back effect (12.4).

### **Basic Reference:**

Atomic & Molecular spectra by Rajkumar Kedarnath Prakashan Meerut

### **Other Reference:**

1. Spectroscopy Vol.-I by Walker & Straw
2. Atomic Physics by J.B.Rajam (5<sup>th</sup> Edition-1960) S. Chand & Co.
3. Physics of Atoms and Molecules by B.H.Bransden & C.J. Joachagh, Pearson Education.

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**LABORATORY EXPERIMENTS**

1. Resonance pendulum. Determination of 'l', 'r' & 'a'
2. Study of X-ray diffraction (Powder) Pattern.
3. Decay of Temperature when body is allowed to cool.(thermocouple)
4. To study elliptically polarized light using photocell and quarter wave plate.
5. To determine  $\lambda$  using Hartzmann formula
6. Activation energy of a semiconductor
7. Absorption co-efficient of liquid using photocell.

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**PC: PHY-402**

**LABORATORY EXPERIMENTS**

1. Study of B.G. : To determine current sensitivity, volt sensitivity, figure of merit and  $R_g$  of B.G.
2. High resistance by equal deflection method.
3. Low resistance by Carry foster bridg.
4. To determine low value of 'C' using Schering bridge.
5. Characteristics of UJT & Determination of  $R_{BB}$ ,  $V_D$  &  $\eta$
6. Characteristics of a Photodiode
7. To verify Demorgan's Theorems using IC-7400.

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