

B.Sc. Third Year Physics Syllabus

(Annual pattern)

(Revised Syllabus Effective from June 2010)

Title	Paper	Periods	Marks
Quantum Mechanics, Atomic & Molecular Physics (Compulsory paper)	VIII	80	100
Solid state Physics, Solid state Devices & Electronics(Elective Paper)	IX-A	80	100
Astrophysics & Energy Studies (Elective Paper)	IX-B	80	100
Physics Practical(Compulsory paper)	X	80	100
Physics Practical (Elective Paper)	XI-A	80	100
Physics Practical (Elective Paper)	XI-B	80	100

(Quantum Mechanics, Atomic and Molecular physics)**Marks: 100****Periods: 80****Unit I: Matter Waves: (Book 1, 2)****(16 Periods) (20 Marks)**

Introduction, Compton Effect, de Broglie wave length, Wave function, Relation between Wave and Group velocity, Davisson and Germer experiment, G.P.Thomson's Experiment, Heisenberg's uncertainty principle and its applications.

Unit II: Wave Mechanics: (Book 1, 2)**(16 Periods) (20 Marks)**

The Wave function and its physical significance, The wave Equation, Schrödinger's Time dependent form equation, Probability current, Operators, Schrödinger's time independent (Steady-state form) equation, Eigen values and Eigen functions.

Unit III: Applications of Quantum Mechanics: (Book 1, 2)**(16 Periods) (20 Marks)**

The particle in a box – energy quantization, wave functions, Momentum Quantization, The particle in a three dimensional box. Schrodinger equation for the hydrogen atom, separation of variables, Quantum numbers –Total quantum number, Orbital quantum number, Magnetic quantum number.

Unit IV: Atomic Physics: (Book 2, 3)**(16 Periods) (20 Marks)**

The vector atom model, Quantum numbers associated with the vector atom model, L-S and J-J coupling, The Pauli's exclusion Principle, Selection rules, Intensity rules, Interval rule, Normal Zeeman effect, Anomalous Zeeman effect, Stark effect.

Unit V: Molecular Spectra: (Book 2, 3)**(16 Periods) (20 Marks)**

Theory of pure rotational spectra, Theory of rotation-vibration spectra, Raman Effect, Experimental study, Raman Effect in solids, liquids and gases.

Books Recommended:

1. Perspectives of Modern Physics-Arthur Beiser(McGraw-Hill Int.Edition)
2. Modern physics – R. Murugesan.(S.Chand & Co.XIth Revised edition)
3. Atomic Physics - J. B. Rajam (S.Chand & Co.)
4. Text Book of Quantum mechanics – Kakani & Chandaliya ((S.Chand & sons)
5. Introduction to Atomic Spectra – H. E. White.(McGraw-Hill)
6. Molecular Structure & Spectroscopy – G. Aruldhas (PHI Ltd.)
7. Fundamental of molecular spectroscopy: C N Banwell, (Tata McGraw hill, 3rd edition).

*(Solid State Physics & Electronics)***Marks: 100****(Elective Paper)****Periods: 80****Unit I: Crystal structure:****(Book 1, 6)****(16 Periods) (20 Marks)**

Introduction, Periodicity in lattices, Lattices and bases, Translation vectors, Unit cell, symmetry operations, Point groups, space group, Bravais lattice, Simple crystal structure((SC, BCC, FCC, CsCl, NaCl), Miller indices, Packing fractions for Simple cubic(SC), BCC and FCC, Structure of diamond.

Bonding in Solids :

Introduction, Ionic bonds, covalent bond, metallic bonds, Vander wall's force and hydrogen bond.

Unit II: Thermal properties of Solids: (Book 1, 6)**(16 Periods) (20 Marks)**

Thermal vibrations (frequencies, amplitude), Specific heat of solids, Einstein's theory of specific heat, Debye's theory of specific heat of solids, Dulong-Petit's law.

Lattice Vibrations and Thermal Properties:

Lattice heat capacity, Classical theory of specific heat, Einstein's theory of specific heat, Vibrational modes of a 1-D monoatomic lattice, Debye's theory of specific heat of solids, Limitations of Debye model.

Unit III: Free electron theory of metals and Band theory of solids: (Book 1)**(16 Periods) (20 Marks)**

Drude-Lorentz theory, Sommerfeld's Model, Thermal conductivity, Electrical conductivity, Widemann-Franz relation, Thermionic Emission, Escape of electrons from metals, Hall Effect, Hall coefficient, Mobility and Hall angle. Density of states, Distinction between metals, semiconductors and insulators.

Unit IV: Solid state devices:**(Book 5, 6)****(16 Periods) (20 Marks)**

Semiconductor materials, Energy bands in solids, Intrinsic and Extrinsic Semiconductor, P-N junction theory, P-N junction with no external voltage, Forward bias, Reverse bias, V-I characteristics, Zener diode, Varactor diode, Light emitting diode, Tunnel diode.(V-I characteristics), Half wave rectifier, Full wave rectifier(expression for efficiency).

Unit V: Analysis of Bipolar Junction Transistors (BJT): (Book 5, 7, 8, 9)**(16 Periods) (20 Marks)**

Introduction, Transistor biasing, voltage divider bias, Determination of h-parameters, Analysis of common emitter amplifier and common – collector amplifier using h-

parameters (current gain, voltage gain, power gain, input resistance and output resistance)

Field Effect Transistors: (Book 9)

JFET: Principle of working, static characteristics, JFET parameters, Transfer characteristics, JFET as an amplifier.

MOSFET: Construction and working in Depletion and Enhancement mode, Types of MOSFET, Characteristics of MOSFET.

Books Recommended:

1. Solid State Physics – Saxena, Gupta, Saxena (Pragati Prakashan Meerut)
2. Solid State Physics – Puri & Babar (S.chand & Co.)
3. Solid State Physics & Electronics – R.K.Puri & V.K.Babar (S. chand & Co)
4. Solid state Physics – R.L.Singhal (Kedar Nath Ram Nath Co., Meerut)
5. Electronics Principles – A.P.Malvino (TMH)
6. Modern physics – R. Murugesan.(S.Chand & Co.XIth Revised edition)
7. Principles of Electronics – V. K. Mehta(S.Chand & Co.)
8. Basic Electronics (Solid State) – B.L.Thereja(S.Chand & Co.)
9. Basic Electronics & Linear Circuits—N.N.Bhargava,D.C.Kulshreshtha(TMh)

B.Sc. III Year

PHYSICS PAPER – (IX-B)

Elective Paper

(Astrophysics & *Energy Studies*)

Marks: 100

Periods: 80

Unit I: Stellar physics:

(16 Periods) (20 Marks)

Electromagnetic spectrum, Transmission of radiations through atmosphere, Black body radiation and Wien's law, Physical properties of astronomical objects, Spectral classification of stars, H-R diagram, luminosity classification of stars, distance measurement by Parallax method.

The Sun: Photosphere, chromospheres and corona.

Unit II: The Solar System:

(16 Periods) (20 Marks)

Kepler's Laws of Planetary Motion, Structure, composition and atmosphere of our solar system (all nine planets), Comets, Asteroids, Meteors, Meteoroids.

Solar Energy:

Solar constant, solar radiation at the Earth's surface, solar energy collectors: physical principle of the conversion of solar radiation in to heat.

Types of collectors: Parabolic collectors, Mirror strip reflector, Fresnel lens collector, Compound parabolic concentrators (CPC).

Unit III: Application of Solar Energy: (Book 7) (16 Periods) (20 Marks)

Solar Water Heating, Heating and Cooling of Buildings, Thermo electric conversion, Power generation, PV cells, Solar distillation, Pumping, Cooking, Hydrogen production

UNIT IV: Energy from Biomass: (Book 7) (16 Periods) (20 Marks)

Conversion technology, Factors affecting gas generation, classification of biogas plants, Advantages and disadvantages of different types of plants, Problems

Unit V: Fuel Cells: (Book 7) (16 Periods) (20 Marks)

Design and Principle of operation, Classification, Types, Advantages and disadvantages, Conversion efficiency, Types of electrodes, Work output and EMF of Fuel Cells, Applications of Fuel Cells.

Books Recommended:

1. Astrophysics(Stars and Galaxies) – K.D. Abhyankar (University Press Hyderabad)
2. Observational Astrophysics – Robert C. Smith (Cambridge University Press)
3. Astrophysics- A Modern Perspective- K.S. Krishna Swamy (New Age International)
4. Stars- Life, Death and Beyond – A.K.kimbhavi, J.V.Narlikar (IUCAA-Pune)
5. An Introduction to astrophysics- Baidynath Basu (PHI)
6. Solar energy utilization - G.D.Rai ,(Ed,V.1995)
7. Non-Conventional Energy Sources – G.D. Rai (Khanna Publishers, Delhi)
8. Solar Energy – S.P.Sukhatme (II nd edition Tata McGraw-Hill).
9. Fundamentals of Renewable Energy Systems - D. Mukherjee and S. Chakrabarti, (New Age International Publishers.)
10. Non Conventional Energy Resources - D.S. Chauhan and S.K.Srivastava, (New Age International Publishers)

B.Sc. III Year

PHYSICS PAPER – X

Physics Practical (*Compulsory paper*)

Marks: 100

Periods: 80

1. 'Y' by Koenig's Method
2. Coefficient of viscosity by oscillating disc method
3. Determination of Stefan's constant
4. Determination of Rydberg's constant
5. Hartmann's dispersion formula
6. Temperature of flame
7. Diffraction at straight edge. Determination of wavelength
8. Diffraction at cylindrical obstacle. Determination of wavelength
9. Diffraction Grating. Determination of wavelength (Minimum deviation method)
10. Resolving Power of Prism
11. Conductivity by Forbe's method
12. Determination of dispersive power of prism
13. Planck's constant (h) by LED
14. e / m by Thomson's method
15. Thermal conductivity of rubber tube

B.Sc. III Year

PHYSICS PAPER – XI-A

Physics Practical (*Elective Paper*)

Marks: 100

Periods: 80

(Based on Solid State Physics & Electronics)

1. Calibration of bridge wire using Carrey – Foster's bridge
2. Efficiency of a transformer
3. C-E amplifier: frequency response
4. FET characteristics (drain curves, trans conductance curves)
5. FET common source amplifier
6. Study of CRO: Measurement of frequency and voltage sensitivity
7. Transistorized regulated power supply using Zener diode
8. Power supply using π type filter (Half wave rectifier)
9. Power supply using π type filter (Full wave rectifier)
10. Study of FET as milli voltmeter
11. Low pas and High pass filter using resistance and capacitance
12. Clipper and Clamper circuits
13. Study of Hartley oscillator
14. Study of Colpitt's oscillator
15. Study of Phase shift oscillator

B.Sc. III Year

PHYSICS PAPER – XI-B

Physics Practical (*Elective Paper*)

Marks: 100

Periods: 80

(Based on Astrophysics & Electronics)

1. Estimation of mass of the Jupiter
2. Astronomical photometry
3. Distance of star cluster by main sequence fit
4. Solar spectrum
5. Observing the Sun: Sun spots
6. Sun spectrum: Fraunhofer lines
7. Locating objects in the sky
8. Studying features of the moon surface
9. Observing Jovian planet: Jupiter and its satellites
10. Characteristics of solar cell
11. Characteristics of solar cooker
12. Study of Power versus load characteristics of Solar Photovoltaic panel.
13. Study of Series combination of Solar Photovoltaic panels
14. Study of Parallel combination of Solar Photovoltaic panels
15. Determination of Calorific value of Coal/Cow dung
16. Study of Solar Hot water system.