



Sri Y N College (Autonomous) Narsapur  
(Affiliated to Adikavi Nannaya University)

DEPARTMENT OF PHYSICS

**I B.Sc DEGREE EXAMINATIONS MODEL QUESTION PAPER**

**For 2016-19 Batch ( w.e.f. 2015-2016)**

**SEMESTER – I**

**PHYSICS PAPER – IA MECHANICS & PROPERTIES OF MATTER**

**UNIT I Vector Analysis : 10 hrs**

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), State and proof of Gauss, Stokes theorem and **Greens theorems**.

**UNIT II Mechanics of particles : 10 hrs**

Laws of motion, motion of variable mass system, motion of a rocket. Conservation of energy and momentum. Collisions in two and three dimensions. Concept of impact parameter, scattering cross-section. Rutherford scattering-derivation.

**UNIT III Mechanics of Rigid bodies : 10 hrs**

Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum. Euler equation, precession of a top. Gyroscope, precession of the equinoxes.

**UNIT IV Mechanics of continuous media : 6 hrs**

Elastic constants of isotropic solids and their relation, Poisson's ratio and expression for Poisson's ratio in terms of  $\nu$ ,  $n$ ,  $k$ . Classification of beams, types of bending, point load, distributed load, shearing force and bending moment, sign conventions.

**UNIT V Central forces : 12 hrs**

Central forces, definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, **Gravitational potential and gravitational field**, equation of motion under a central force. Derivation of Kepler's laws. Motion of satellites.

**UNIT VI Special theory of relativity : 12 hrs**

Galilean relativity, absolute frames. Michelson-Morley experiment, negative result. Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four-vector formalism.

(Note: Problems should be solved at the end of every chapter of all units)

Reference Books:

1. BSc Physics -Telugu Akademy, Hyderabad
2. Mechanics - D.S. Mathur, Sulthan Chand & Co, New Delhi
3. Mechanics - J.C. Upadhyaya, Ramprasad & Co., Agra
4. Properties of Matter - D.S. Mathur, S.Chand & Co, New Delhi ,11th Edn., 2000
5. Physics Vol. I - Resnick-Halliday-Krane ,Wiley, 2001
6. Properties of Matter - Brijlal& Subrmanyam ,S.Chand &Co. 1982
7. Dynamics of Particles and Rigid bodies– Anil Rao, Cambridge Univ Press, 2006
8. Mechanics-EM Purcell, Mc Graw Hill
9. University Physics-FW Sears, MW Zemansky & HD Young, Narosa Publications, Delhi
10. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
11. S.G.Venkatachalapathy, Mechanics, Margham Publication, 2003.

**BLUE PRINT  
SEMESTER – 1  
PAPER I(A) – MECHANICS & PROPERTIES OF MATTER**

Chapter / Unit	SECTION A (5 marks)	(10 marks)	
UNIT – I Vector Analysis	1 (Problem)	<b>Section - B</b>	2
UNIT – II Mechanics of particles	1		2
UNIT – III Mechanics of Rigid bodies	1+1 (Problem)		1
UNIT – IV Mechanics of Continuous media	1+1 (Problem)	<b>Section - C</b>	1
UNIT –V Central forces	1		2
UNIT – VI Special theory of relativity	1 (Problem)		2



## Sri Y N College (Autonomous) Narsapur

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### DEPARTMENT OF PHYSICS

#### I B Sc - SEMESTER - II

#### PAPER – 1 (B) SYLLABUS – WAVES & OSCILLATIONS

For 2016-19 Batch (w.e.f. 2015-2016)

Total Hours : 45

#### UNIT – I:

##### **1) Simple Harmonic oscillations: (12)**

Simple harmonic oscillator, and solution of the differential equation– Physical characteristics of SHM, torsion pendulum, - measurement of rigidity modulus , compound pendulum, measurement of ‘g’, combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequency, Lissajous figures.

#### UNIT – II

##### **2) Damped Oscillations: (06)**

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with undamped harmonic oscillator, logarithmic decrement, relaxation time, quality factor.

##### **3) Forced Oscillations:- (04)**

Differential equations of forced oscillator and its solution, amplitude resonance, velocity resonance, **sharpness of resonance.**

#### UNIT – III

##### **4) Complex vibrations (08)**

Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw-tooth wave.

#### UNIT – IV

##### **5) Vibrating Strings (10)**

Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at both ends, overtones, energy transport, transverse impedance

#### UNIT – V

##### **6) Longitudinal Vibration of bars: (09)**

Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the mid point iii) bar free at both ends iv) bar fixed at one end.

##### **7) Transverse Vibrations of bars : (03)**

**Transverse vibrations in a bar –wave equation and its general solution. Boundary conditions,free-free bar, tuning fork.**

## UNIT – VI

### **8) Ultrasonics : (08)**

Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magnetostriction methods, detection of ultrasonics, determination of wavelength of ultrasonic waves. **Velocity of ultrasonic in liquids by sear's method.** Applications of ultrasonic waves.

(NOTE: Problems should be solved at the end of every chapter of all units)

#### **Textbooks:**

1. Mechanics by D.S Mathur
2. Mechanics by P. Durai Pandian (S. Chand)
3. Berkeley Physics Course. Vol.1, Mechanics by C. Kittel, W. Knight, M.A. Ruderman - Tata-McGraw Hill Company Edition 2008.
4. Fundamentals of Physics. Halliday/Resnick/Walker Wiley India Edition 2007.
5. Waves and Oscillations. S. Badami, V. Balasubramanian and K. Rama Reddy Orient Longman.
6. First Year Physics - Telugu Academy.
7. Mechanics of Particles, Waves and Oscillations. Anwar Kamal, New Age International.
8. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
9. Waves and Oscillations. N. Subramaniyam and Brijlal Vikas Publishing House Private Limited.
10. A Text Book on Oscillations, waves and Acoustics. By M.M. Ghosh

**BLUE PRINT  
SEMESTER – II  
PAPER I (B) – WAVES & OSCILLATIONS**

Chapter / Unit	SECTION A (5 marks)	(10 marks)	
UNIT – I <b>Fundamental of Vibrations</b>	1+1 (Problem)	Section - B	2
UNIT – II <b>Damped Oscillations &amp; Forced Oscillations</b>	1+1 (Problem)		2
UNIT – <b>Complex vibrations</b>	-----		1
UNIT – IV <b>Vibrating Strings</b>	1 (Problem)	Section - C	2
UNIT –V <b>Longitudinal Vibration of bars &amp; Transverse Vibrations of bars</b>	1		2
UNIT – VI <b>Ultrasonics</b>	1+1 (Problem)		1

**SRI Y. N. COLLEGE (AUTONOMOUS), NARASAPUR.**  
**DEPARTMENT OF PHYSICS**  
**II B.Sc. – SEMESTER III**  
**PAPER - II A SYLLABUS – WAVE OPTICS**  
**FOR 2015-18 BATCH**  
**(w.e.f. 2016-17)**

**Total Hours: 60**

**UNIT – I:- (8 Hours)**

**(1) Aberrations :**

Introduction to Chromatic aberration – **calculation of longitudinal chromatic aberration of a thin lens** – achromatism for two lenses (a) when in contact and (b) when separated by a distance – achromatism of a camera lens – Introduction to Spherical aberration – minimization of spherical aberration – Coma -- **Astigmatism -- Curvature of field – distortion.**

**UNIT – II:- (14 Hours)**

**(2) Interference :**

Principle of superposition – coherence– conditions for Interference of light.

Interference by division of wave front: Fresnel’s biprism – determination of wave length of light -- change of phase on reflection – **Lloyd’s mirror experiment.**

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – **Non reflecting films** -- Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) – Determination of diameter of wire. Newton’s rings in reflected light with contact between lens and glass plate – Determination of wave length of monochromatic light – Michelson Interferometer – types of fringes – Determination of wavelength of monochromatic light and **thickness of a thin transparent plate.**

**UNIT – III (14 Hours)**

**(3) Diffraction :**

Introduction – Fraunhofer diffraction:- Diffraction due to single slit– Limit of resolution – Fraunhofer diffraction due to double slit – Fraunhofer diffraction pattern with N slits (diffraction grating). Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating. Fresnel diffraction -- Fresnel’s half period zones – area of the half period zones –zone plate – Comparison of zone plate with convex lens – difference between interference and diffraction. Distinction between Fresnel and Fraunhofer diffraction.

**UNIT –IV (10 Hours)**

**(4) Polarization :-**

Polarized light : Methods of Polarization, Polarization by reflection, refraction, Double refraction, scattering of light – Brewsters law – Malus law – Nicol prism as polarizer and analyzer – Quarter wave plate, Half wave plate– Optical activity, determination of specific

rotation by Laurent's half shade polarimeter – Babinet's Compensator. Idea of elliptical and circular polarization.

**UNIT –V (14 Hours):-**

**(5) Lasers and Holography :**

Introduction – Spontaneous emission – Stimulated emission – Population inversion. Laser principle– Eienstien coefficients - Types of Lasers – He-Ne laser – Ruby laser – **Semi conductor laser -- Laser characteristics --** Applications of lasers. . Basic Principle of Holography and its applications. Gabor hologram and its limitations. Applications of holography.

**(6) Fiber Optics :**

Introduction – Optical fibers – Types of optical fibers – Rays and modes in an optical fiber - Step and graded index fibers – Fiber material – Principles of fiber communication (qualitative treatment only) -- advantages of fiber optic communication.

**Note:** Problems should be solved at the end of every chapter.

**Textbooks:**

1. Ajoy Ghatak, Optics, The McGraw-Hill companies.
2. Subramaniam and Brijlal, Optics, S. Chand & Co.
3. Halliday/Resnick/Walker, Fundamentals of Physics, C. Wiley India Edition 2007
4. Telugu Academy, Second Year Physics
5. K.Thyagarajan and A.Ghatak, Lasers: Fundamentals and Applications
6. K.Thyagarajan and A.Ghatak , An Introduction to Fibre Optics

**Books for Reference:**

1. A.S. Vasudeva, Modern Engineering Physics S.Chand & Co. Publications.
2. Jenkins A. Francis and White E. Harvey, Fundamentals of Optics, McGraw Hill Inc.35

**BLUE PRINT  
SEMESTER – III  
PAPER II(A) – WAVE OPTICS**

Unit /Chapter	SECTION A (5 marks)	(10 marks)	
UNIT I– <b>ABERRATIONS</b>	1	Section - B	1
UNIT II – <b>INTERFERENCE</b>	1+1 (Problem)		2
UNIT III – <b>DIFFRACTION</b>	1+1 (Problem)		2
UNIT IV– <b>POLARIZATION</b>	1+1 (Problem)	Section - C	2
UNIT V – <b>LASERS AND HOLOGRAPHY</b>	-----		2
UNIT V– <b>FIBER OPTICS</b>	1		1

**SRI Y. N. COLLEGE (AUTONOMOUS), NARASAPUR.**  
**DEPARTMENT OF PHYSICS**  
**II B.Sc. – SEMESTER IV**  
**PAPER - II B SYLLABUS**  
**THERMO DYNAMICS & RADIATION PHYSICS**  
**FOR 2015-18 BATCH**  
**(w.e.f. 2016-17)**

**Total Hours: 60**

**UNIT – I (10 Hours)**

**1. Kinetic theory of gases :**

Introduction – Deduction of Maxwell’s law of distribution of molecular speeds, experimental verification – mean free path - Transport Phenomena – Viscosity of gases – thermal conductivity – diffusion of gases.

**UNIT – II (12 Hours):-**

**2. Thermodynamics :**

Introduction – Isothermal and adiabatic process - Reversible and irreversible processes – Carnot’s engine and its efficiency – Carnot’s theorem – Second law of thermodynamics, Kelvin’s and Clausius statements – **Thermodynamic scale of temperature.** Entropy, physical significance – Change in entropy in reversible and irreversible processes – Entropy and disorder – Entropy of universe – Temperature- Entropy (T-S) diagram and its uses. Change of Entropy of a perfect gas – Change of entropy when ice changes into steam.

**UNIT – III (12 Hours)**

**3. Thermodynamic potentials and Maxwell’s equations :**

Thermodynamic potentials – Derivation of Maxwell’s thermodynamic relations – Clausius-Clayperon’s equation – Derivation for ratio of specific heats – Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect – expression for Joule Kelvin coefficient for perfect and Vanderwaal’s gas.

**UNIT IV (12 Hours) :-**

**4. Low temperature Physics :**

Introduction – Joule Kelvin effect – porous plug experiment. Joule expansion – Distinction between adiabatic and Joule Thomson expansion – Expression for Joule Thomson cooling – Liquefaction of helium, Kapitza’s method – Adiabatic demagnetization – Production of low temperatures – **Characterstics of Ideal refrigerant, Principle of refrigeration, vapour compression type.** Applications of substances at low temperature. Working of refrigerator and Air conditioning machines. Effects of Chloro and Fluro Carbons on Ozone layer.

**UNIT V (14 Hours) :-****5. Quantum theory of radiation :**

Black body-Ferry's black body – distribution of energy in the spectrum of Black body – Derivation of Wein's displacement law, Derivation of Rayleigh-Jean's law – Quantum theory of radiation – Derivation of Planck's law – Measurement of radiation – Earth as a Black Body. Types of pyrometers – Disappearing filament optical pyrometer – experimental determination – determination of solar constant by Angstrompyrheliometer - effective temperature of the sun.

**Note:** Problems should be solved at the end of every chapter.

**Textbooks:**

1. Subramaniyam and Brijlal, Heat and Thermodynamics, S. Chand & Co.
2. Halliday/Resnick/Walker, Fundamentals of Physics, C. Wiley India Edition 2007
3. Telugu Academy, Second Year Physics
4. R. Murugesan and Kiruthiga Siva Prasath (for statistical Mechanics) Modern Physics, S. Chand & Co.

**Books for Reference:**

1. G. Aruldas and P. Rajagopal, Modern Physics, Eastern Economy Education.
2. F. Reif, Berkeley Physics Course. Volume-5, Statistical Physics. The McGraw-Hill Companies.
3. Daniel V. Schroeder., An Introduction to Thermal Physics Pearson Education Low Price Edition.
4. R.C. Srivastava, Subit K. Saha & Abhay K. Jain , Thermodynamics, Eastern Economy Edition.

**BLUE PRINT  
SEMESTER – IV  
PAPER II(B) – THERMO DYNAMICS & RADIATION PHYSICS**

Unit /Chapter	SECTION A (5 marks)	(10 marks)	
UNIT I– KINETIC THEORY OF GASES	1	Section - B	1
UNIT II – THERMODYNAMICS	1+1 (Problem)		2
UNIT III – THERMODYNAMIC POTENTIALS AND MAXWELL'S EQUATIONS	1		2
UNIT IV– LOW TEMPERATURE PHYSICS	1+1 (Problem)	Section - C	2
UNIT V – QUANTUM THEORY OF RADIATION	1+1 (Problem)		3



**SRI Y. N. COLLEGE (AUTONOMOUS), NARASAPUR.**  
**DEPARTMENT OF PHYSICS**  
**III B.Sc. – SEMESTER V**  
**PAPER - III A SYLLABUS – Electricity, Magnetism and Electronics**  
**FOR 2016-17 BATCH**  
**(w.e.f. 2014-15)**

**Total Hours: 45**

Unit-I:

**01) Electrostatics: (08)**

**Electric Flux** - Gauss law and its applications- Uniformly charged sphere, charged cylindrical conductor. Deduction of Coulmb's law from Gauss law. Electric potential – Potential due to a charged spherical conductor, Electric field strength from the electric dipole. Lightning conductor

**2) Dielectrics: (06)**

An atomic view of dielectrics, **Polar and non-polar dielectrics in an electric field** potential energy of a dipole in an electric field. Polarization and charge density, Gauss's law for dielectric medium– Relation between D,E and P - Dielectric constant, susceptibility and relation between them. Boundary conditions at the dielectric surface.

**3) Capacitance: (08)**

Capacitance of concentric spheres and cylindrical condenser, capacitance of parallel plate condenser with and without dielectric. Electric energy stored in a charged condenser – force between plates of condenser, construction and working of attracted disc electrometer, Measurement of potential difference.

Unit-II Magnetostatics, Moving charge in electric and magnetic field:

**4) Magnetostatics: (08)**

**Magnetic Shell, Qualitative treatment, Magnetic properties of dia, para and ferro magnetic materials Langevins theory of para magnetism Weiss theory of ferro magnetism** – concepts of magnetic domains Magnetic induction (B), Intensity of Magnetization(I) and field (H) – permeability and susceptibility – Hysteresis loop - Enegy. Soft and hard magnetic materials.

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5) Moving charge in electric and magnetic field:- (05)

Hall effect, cyclotron, synchrocyclotron– force on a current carrying conductor placed in a magnetic field, force and torque on a current loop, Biot –Savart’s law and calculation of B due to long straight wire, a circular current loop and solenoid.

6) Electromagnetic induction: (10)

Faraday’s law –Lenz’s law – expression for induced emf – time varying magnetic fields  
Betatron –Ballistic galvanometer – theory – damping correction – self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid– energy stored in magnetic field – transformer – Construction, working, **energy losses and efficiency**.

**SRI Y. N. COLLEGE (AUTONOMOUS), NARASAPUR.**  
**DEPARTMENT OF PHYSICS**  
**III B.Sc. – SEMESTER VI**  
**PAPER - III (B) SYLLABUS – Electricity, Magnetism and Electronics**  
**FOR 2016-17 BATCH**  
**(w.e.f. 2014-15)**

**Total Hours: 45**

Unit-I:

1) Varying and alternating currents: (15)

Growth and decay of currents in LR, CR and LCR circuits – Critical damping. Alternating current relation between current and voltage in pure R,C and L-vector diagrams – Power in ac circuits - LCR series and parallel resonant circuit – Q-factor. **Construction of single phase ac motor, construction of single phase dc motor.**

2) Maxwell's equations and electromagnetic waves (10)

A review of basic laws of electricity and magnetism – displacement current – Maxwell's equations in differential form – Maxwell's wave equation, plane electromagnetic waves – Transverse nature of electromagnetic waves, Poynting theorem, production of electromagnetic waves (Hertz experiment)

Unit-II: Basic Electronics:

3) **Band theory of solids (qualitative) – Intrinsic and extrinsic semi conductors.** P-N junction diode, Zener diode characteristics and its application as voltage regulator. Half wave and full wave rectifiers, efficiency, ripple factor (quantitative) – p n p and n p n transistors, CB, CE and CC configurations – transistor hybrid parameters. Transistor as an amplifier.

4) Digital Principles:

Binary number system, converting Binary to Decimal and vice versa. Binary addition and subtraction (1's and 2's complement methods). Hexadecimal number system. Conversion from Binary to Hexadecimal – vice versa and Decimal to Hexadecimal vice versa. Logic gates: OR, AND, NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive – OR gate, 56

De Morgan's Laws – statement and proof, Half and Full adders.

Note: Problems should be solved from every chapter.

**Textbooks:**

1. R. Murugesan and Kiruthiga Siva Prasath , *Modern Physics* (for semi conductor & Digital Principles) S. Chand & Co.
2. Halliday/Resnick/Walker , *Fundamentals of Physics*, Wiley India Edition 2007.
3. Edward M Purcell , *Berkeley Physics Course – Vol. II , Electricity and Magnetism* The McGraw-Hill Companies.
4. D.N. Vasudeva , *Electricity and Magnetism* , S. Chand & Co.
5. Brijlal and Subramanyam , *Electricity and Magnetism*, Ratan Prakashan Mandir.
6. A.P. Malvino and D.P. Leach, *Digital Principles and Applications*, McGraw Hill Education.

**Books for Reference:**

1. D.C. Tayal , *Electricity and Electronics* , Himalaya Publishing House.
2. C.J.Smith, *Electricity and Magnetism*, Edward Arnold Ltd.
3. K K Tewari, *Electricity, Magnetism with Electronics* , S..Chand & Co.
4. Telugu Akademy , *Third year Physics*
5. V.K. Mehta, *Principles of Electronics*, S. Chand & Co

**Practicals - 3: Electricity, Magnetism and Electronics**

1. Carey Foster's Bridge – comparison of resistances.
2. Internal resistance of a cell by potentiometer.
3. Figure of merit of a moving coil galvanometer.
4. Voltage sensitivity of a moving coil galvanometer.
5. RC circuit (Frequency response)
6. LR circuit (Frequency response)
7. LCR circuit series/parallel resonance, Q-factor
8. Power factor of an A.C. circuit
9. Determination of ac-frequency-sonometer.
10. Design and construction of multimeter.
11. Construction of a model D.C. power supply.
12. Characteristics of a Junction diode
13. Characteristics of Transistor
14. Characteristics of Zener diode
15. Verification of Kirchoff's laws.

\* One has to complete a minimum of 10 experiments

**SRI Y. N. COLLEGE (AUTONOMOUS), NARASAPUR.**  
**DEPARTMENT OF PHYSICS**  
**III B.Sc. – SEMESTER V**  
**PAPER - IV A SYLLABUS – Modern Physics**  
**FOR 2016-17 BATCH (w.e.f 2014-15)**

**Total Hours: 45**

Unit-I:

1) Atomic Spectra: (10)

**Bohr's atomic theory, Spectra of Hydrogen**, Introduction – Drawbacks of Bohr's atomic model - Sommerfeld's elliptical orbits – relativistic correction (no derivation). Vector atom model and quantum numbers associated with it. Stern & Gerlach experiment. L-S and j-j coupling schemes. Spectral terms, selection rules, intensity rules. Zeeman Effect, Paschen-Back Effect and Stark Effect (basic idea).

2) Molecular Spectroscopy: (10)

Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule, determination of internuclear distance. Vibrational energies and spectrum of diatomic molecule. Raman effect, Classical theory of Raman effect. Properties of Raman effect. Experimental arrangement for Raman effect and its applications.

Unit-II: Quantum Mechanics: (05)

1) Photoelectric effect-Einstein photoelectric equation. Compton's effect (quantitative) experimental verification. Stability of atom. Limitations of old quantum theory.

**2) Matter Waves: (06)**

de Broglie's hypothesis – wavelength of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Double slit experiment. Standing de Broglie waves of electron in Bohr orbits.

**3) Uncertainty Principle: (05)**

Heisenberg's uncertainty principle for position and momentum ( $x$  and  $p_x$ ), Energy and time ( $E$  and  $t$ ). Gamma ray microscope. Position of electron in a Bohr orbit. **Particle in a box** Complementary principle of Bohr.

**4) Schrodinger Wave Equation: (09)**

Schrodinger time independent and time dependent wave equations. Wave function properties – Significance. Basic postulates of quantum mechanics. Operators, eigen functions and eigen values, expectation values. Application of Schrodinger wave equation to particle in one and **three** dimensional boxes.

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**DEPARTMENT OF PHYSICS**  
**III B.Sc. – SEMESTER VI**  
**PAPER - IV B SYLLABUS – Nuclear Physics**  
**FOR 2016-17 BATCH (w.e.f 2014-15)**

**Total Hours: 45**

Unit-I: Nuclear Physics: (20)

1) Nuclear Structure:- (04)

Basic properties of nucleus – size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, **p-p and n-p scattering (concepts)**, nuclear forces.

2) Alpha and beta decays (06)

Nuclear models – Liquid drop model, shell model. Alpha and Beta Decays: Range of alpha particles, Geiger – Nuttall law. Gamow's theory of alpha decay. Geiger – Nuttall law from Gamow's theory. Beta spectrum – neutrino hypothesis, Fermi's theory of beta decay. (qualitative)

3) Nuclear Reactions: (04)

Types of nuclear reactions, channels, **Nuclear reaction, kinematics**, Compound nucleus, direct reactions (concepts).

4) Nuclear Detectors – (06)

GM counter, proportional counter, scintillation counter, Wilson cloud chamber and solid state detector

Unit-II: Solid State Physics: (25)

1) Crystal Structure: (05)

Crystalline nature of matter. Crystal lattice, Unit Cell, Elements of symmetry. Crystal systems, Bravais lattices. Miller indices. Simple crystal structures (**SC, BCC AND FCC, Cscl, NaCl and diamond structure**)

2) X-Ray diffraction (04)

X-ray Diffraction: Diffraction of X –rays by crystals, Bragg's law, Experimental techniques - Laue's method and powder method.

### 3) Bonding in crystals (06)

Types of bonding in crystals – characteristics of crystals with different bondings Lattice energy of ionic crystals – determination of Madelung constant for NaCl crystal. **Calculation of Born coefficient and repulsive exponent. Born – Haber cycle.**

### 4) Super Conductivity:- (05)

Basic experimental facts – zero resistance, effect of magnetic field, Meissner effect. **Persistent current, isotopic effect.** Type I and Type II superconductors. Elements of BCS theory-Cooper pairs. Applications. High temperature superconductors (general information)

### 5) Nanomaterials: (05)

Introduction, nanoparticles, metal nanoclusters, **Semi conductor nano particles**, carbon nanotubes, **carbon nano clusters**, quantum nanostructures – nanodot, nanowire and quantum well. Applications of Nano Particles.

Note: Problems should be solved from every chapter.

#### **Text Books:**

1. G. Aruldas & P. Rajagopal , *Modern Physics*, Eastern Economy Edition.
2. Arthur Beiser, *Concepts of Modern Physics*. Tata McGraw-Hill Edition.
3. R. Murugesan and Kiruthiga Siva Prasath, *Modern Physics*, S. Chand & Co.
4. D.C. Tayal , *Nuclear Physics*, Himalaya Publishing House.
5. G. Aruldas, *Molecular Structure and Spectroscopy*, Prentice Hall of India, New Delhi.
6. Gurdeep R Chatwal and Shyam Anand, *Spectroscopy Atomic and Molecular*, 58 Himalaya Publishing House.
7. *Telugu Academy* , Third Year Physics
8. J.P. Srivastava.(for chapter on nanomaterials) *Elements of Solid State Physics* , Prentice-hall of India Pvt. Ltd.

#### **Books for Reference:**

1. Young & Freedman , A. Lewis Ford, *University Physics with Modern Physics*, Low Price Edition (Eleventh Edition).
2. Eyvind H. Wichman, *Quantum Physics*, Volume.4. The McGraw-Hill Companies.
3. Mahesh C. Jani, *Quantum Mechanics*, Eastern Economy Edition.
4. Irving Kaplan , *Nuclear Physics*, Narosa Publishing House.
5. Charles Kittel, *Introduction to Solid State Physics*, John Wiley and Sons.
6. A.J. Dekker., *Solid State Physics* , Mac Millan India