



DEPARTMENT OF PHYSICS
SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR
(Affiliated to Adikavi Nannaya University, Rajamahendravaram)
Accredited by NAAC at 'A+' Grade (4th Cycle)



For 2026-2030 Batch [w.e.f. 2025-2026]
I B.Sc. SEMESTER – I MAJOR

COURSE 1: INTRODUCTION TO MATHEMATICAL PHYSICS

SYLLABUS

Hours: 45

Credits: 3

3 hrs/week

UNIT-I: VECTOR ANALYSIS

(9. 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), Statement and proof of Gauss and Stokes theorems.

UNIT-II: LINEAR ALGEBRA

(9. Hrs.)

Vector and Scalar quantities in Physics, Matrices and Operations: Types, Addition and Multiplication, Identity and Inverse, Determinant (2x2 and 3x3), Trace, Transpose. System of Linear Equations: Solving 2-variable system using matrices, **Simple examples from physics** (Current, forces)

UNIT – III: COMPLEX NUMBERS

(9. Hrs.)

Basic Complex numbers: Real and imaginary parts, Conjugate of complex numbers, Addition subtraction and Multiplication of complex numbers. Phasor representation: representation of voltage and current as phasors, **Derivation of Impedance of a series LCR circuit**

UNIT – IV: PROBABILITY

(9. Hrs.)

Probability Theory Basics, Sample space, events, conditional probability, and Bayes' theorem. Independence and mutual exclusivity. Random Variables and Probability Distributions, Concept of random variables (discrete and continuous). Common distributions and their applications: Binomial, Poisson, and **Gaussian**

UNIT V: FOURIER ANALYSIS

(9. Hrs.)

Graphical understanding of Sine and Cosine functions, Need for Fourier analysis, Fourier theorem and evaluation of Fourier coefficients, Analysis of periodic wave functions – Square wave and saw tooth wave.

REFERENCE BOOKS

1. Mathematical methods for physics sciences (3rd edition) - Mary. L. Boas
2. First Chapter (Vector analysis) in Introduction to Electrodynamics (3rd edition) – David. J. Griffiths
3. Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier.

BLUE PRINT

I B.Sc. PHYSICS SEMESTER – I-MAJOR COURSE 1: INTRODUCTION TO MATHEMATICAL PHYSICS

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I - VECTOR ANALYSIS	2	1	1
UNIT-II – LINEAR ALGEBRA	2	1	1
UNIT – III COMPLEX NUMBERS	1	1	1
UNIT – IV PROBABILITY	1	1	1
UNIT V FOURIER ANALYSIS	2	1	1



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For 2026-2030 Batch [w.e.f. 2025-2026]
I B.Sc. SEMESTER – I MAJOR

COURSE 2: MECHANICS AND PROPERTIES OF MATTER
SYLLABUS

Hours: 45

Credits: 3

3 hrs/week

UNIT-I: MECHANICS OF PARTICLES

(9 hrs.)

Newton's Laws of motion, motion of variable mass system, Equation of 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-II: CENTRAL FORCES

(9 hrs.)

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, conservative force as a negative gradient of potential energy, equations of motion under a central force, derivation of Kepler's laws, motion of satellites.

UNIT III: ELASTICITY AND BENDING OF BEAMS

(9 hrs)

Stress and strain, Hooke's Law, Elastic moduli – Young's, bulk, and shear modulus, Poisson's ratio – Physical meaning, Bending of beams – Types, point and distributed load, Cantilever and uniform bending (Qualitative treatment), Torsional pendulum – working principle and uses.

UNIT IV: FLUID MECHANICS

(9 hrs)

Fluids – Characteristics and classification, Streamline Vs turbulent flow, Bernoulli's theorem – Statement, simple derivation and applications (Venturimeter), Equation of continuity – Concept, Viscosity – Poiseuille's law (statement and qualitative explanation), Surface tension – Examples and qualitative ideas (Additional Information).

UNIT V: SPECIAL THEORY OF RELATIVITY

(9 hrs.)

Galilean relativity, Michelson-Morley experiment, negative result, postulates of special theory of relativity, Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation.

REFERENCE BOOKS:

1. B.Sc Physics -Telugu Academy, 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. Mechanics-EM Purcell, Mc Graw Hill
8. University Physics-FW Sears, MW Zemansky & HD Young, Narosa Publications, Delhi
9. College Physics-I. T. Bhima sankaram and G. Prasad. Himalaya Publishing House.
10. Mechanics, S. G. Venkata chalapathy, Margham Publication, 2003.
11. Fluid Mechanics – Frank M. White, McGraw Hill.
12. Textbook of Fluid Dynamics – M. D. Raisinghania, S. Chand & Co.

BLUE PRINT**I B.Sc. SEMESTER –I MAJOR
COURSE 2: MECHANICS AND PROPERTIES OF MATTER**

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: MECHANICS OF PARTICLES	2	1	1
UNIT-II: CENTRAL FORCES	2	1	1
UNIT III: ELASTICITY AND BENDING OF BEAMS	1	1	1
UNIT IV: FLUID MECHANICS	1	1	1
UNIT V: SPECIAL THEORY OF RELATIVITY	2	1	1



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**For 2026-2030 Batch [w.e.f. 2025-2026]****I B.Sc. SEMESTER – II** ***MAJOR***

COURSE 3: WAVES AND OPTICS

SYLLABUS

Hours: 45**Credits: 3****3hrs/week****UNIT-I: SIMPLE HARMONIC, DAMPED & FORCED OSCILLATIONS (9 Hrs.)**

Simple Harmonic Oscillator: Solution of differential equation, and physical characteristics.
Combination of two mutually perpendicular SHMs (1:1 and 1:2 frequencies), Lissajous figures.
Damped Harmonic Oscillator: Solution of differential equation, Logarithmic decrement, relaxation time, quality factor, Forced Oscillations: Solution of differential equation.

UNIT-II: VIBRATING STRINGS AND BARS (9 Hrs.)

Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones and harmonics. Energy transport and transverse impedance. Longitudinal vibrations in bars-wave equation and its general solution. Special cases (i) bar fixed at both ends (ii) bar fixed at the midpoint. Tuning fork.

UNIT-III: INTERFERENCE (9 hrs)

Principle of superposition – coherence Conditions for interference of light. Fresnel's biprism determination of wavelength of light, change of phase on reflection, Oblique incidence of a plane wave on a thin film due to reflected light (cosine law) –colors of thin 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. Determination of wavelength of monochromatic light using Newton's rings.

UNIT-IV: DIFFRACTION (9 hrs.)

Introduction, distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction – Diffraction due to single slit, Fraunhofer diffraction pattern with N slits (diffraction grating), Resolving power of grating, Determination of wavelength of light in normal incidence using

diffraction grating. Fresnel's half period zones-area of the half period zones-zone plate,

Difference between interference and diffraction

UNIT-V: POLARIZATION

(9 hrs.)

Polarized light: methods of polarization by reflection, refraction, double refraction, etc., Brewster's law, Maule's 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.

REFERENCE BOOKS:

1. BSc Physics Vol.1, Telugu Academy, Hyderabad.
2. BSc Physics Vol.2, Telugu Academy, Hyderabad
3. Fundamentals of Physics. Halliday/Resnick/Walker, Wiley India Edition 2007.
4. Waves & Oscillations. S. Badami, V. Balasubramanian and K.R. Reddy, Orient Longman.
5. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
6. Optics – Ajoy Ghatak, Tata McGraw Hill
7. Fundamentals of Optics – Jenkins and White, McGraw Hill
8. Wave Optics and Vibrations – N. Subrahmanyam & Brijlal, S. Chand & Co.
9. Vibrations and Waves – H. J. Pain, Wiley.

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SEMESTER – II
COURSE 3: WAVES AND OPTICS**

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: SIMPLE HARMONIC, DAMPED & FORCED OSCILLATIONS	2	1	1
UNIT-II: VIBRATING STRINGS AND BARS	1	1	1
UNIT-III: INTERFERENCE	1	1	1
UNIT-IV: DIFFRACTION	2	1	1
UNIT-V: POLARIZATION	2	1	1



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For 2026-2030 Batch [w.e.f. 2025-2026]
I B.Sc. SEMESTER – II MAJOR

Major Course 4: HEAT AND THERMODYNAMICS

SYLLABUS

Hours: 45

Credits: 3

3hrs/week

UNIT-I: KINETIC THEORY OF GASES

(9 hrs)

Kinetic Theory of gases- Introduction, Maxwell's law of distribution of molecular speeds, Lammert's toothed wheel method; Mean free path. Principle of equipartition of energy, Transport phenomenon in ideal gases: viscosity and Thermal conductivity.

UNIT-II: THERMODYNAMICS

(9 hrs)

Introduction- Reversible and irreversible processes, Carnot's engine and its efficiency, Carnot's theorem, Thermodynamic scale of temperature, Second law of thermodynamics Entropy: Physical significance, Change in entropy in reversible and irreversible processes; Change of entropy when ice changes into steam. Temperature- Entropy (T-S) diagram and its uses; Expression for Efficiency of Carnot's Engine by using T-S diagram.

UNIT-III: THERMODYNAMIC POTENTIALS AND MAXWELL'S EQUATIONS (9 hrs)

Thermodynamic Potentials-Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy and their significance, Derivation of Maxwell's thermodynamic relations from thermodynamic potentials, Clausius-Clayperon's equation, Joule-Kelvin coefficient for ideal and Van der Waals' gases.

UNIT-IV: LOW TEMPERATURE PHYSICS

(9 hrs)

Methods for producing very low temperatures, Critical temperature, Inversion temperature, Joule Kelvin effect - derivation, Porous plug experiment, Distinction between adiabatic and Joule Thomson expansion, Expression for Joule Thomson cooling, Production of very low temperatures by adiabatic demagnetization (Quantitative), Refrigeration – Vapour compression machine.

UNIT-V: QUANTUM THEORY OF RADIATION**(9 hrs)**

Black body, Ferry's black body, Spectral energy distribution of black body radiation, Wein's displacement law and Rayleigh- Jean's law (No derivations), Planck's law of black body radiation-Derivation, Deduction of Wein's law and Rayleigh- Jean's law from Planck's law, Solar constant and its determination using Angstrom Pyroheliometer, Estimation of surface temperature of Sun.

REFERENCE BOOKS

1. B.Sc Physics, Vol.2, Telugu Akademy, Hyderabad
2. Thermodynamics, R.C. Srivastava, S.K. Saha & Abhay K. Jain, Eastern Economy Edition.
3. Unified Physics Vol.2, Optics & Thermodynamics, Jai Prakash Nath & Co. Ltd., Meerut
4. Fundamentals of Physics. Halliday/Resnick/Walker. C. Wiley India Edition, 2007
5. Heat and Thermodynamics - N BrijLal, P. Subrahmanyam, S. Chand & Co., 2012
6. Heat and Thermodynamics - MS Yadav, Anmol Publications Pvt. Ltd, 2000
7. University Physics, HD Young, MW Zemansky, FW Sears, Narosa Publishers, New Delhi

BLUE PRINT**SEMESTER – II****COURSE 4: HEAT AND THERMODYNAMICS**

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: KINETIC THEORY OF GASES	1	1	1
UNIT-II: THERMODYNAMICS	1+1 (Problem)	1	1
UNIT-III: THERMODYNAMIC POTENTIALS AND MAXWELL'S EQUATIONS	1	1	1
UNIT-IV: LOW TEMPERATURE PHYSICS	1+1 (Problem)	1	1
UNIT-V: QUANTUM THEORY OF RADIATION	1+1 (Problem)	1	1



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For 2025-2029 Batch [w.e.f. 2026-2027]
II B.Sc. SEMESTER – III MAJOR

COURSE 5: ATOMIC, MOLECULAR AND NUCLEAR PHYSICS

SYLLABUS

Hours: 45

Credits: 3

3 hrs/week

UNIT-I: INTRODUCTION TO ATOMIC STRUCTURE AND SPECTROSCOPY (9 hrs.)

Introduction to Bohr's model of the hydrogen atom, Vector atom model and Quantum numbers associated with it, Stern and Gerlach experiment, Coupling Schemes (LS & JJ), Zeeman effect, Experimental arrangement to study Zeeman effect and **expression for Zeeman shift**

UNIT-II: MOLECULAR SPECTROSCOPY (9 hrs.)

Molecular rotational and vibrational spectra, electronic energy levels and electronic transitions, Raman Effect, Characteristics of Raman effect, Experimental arrangement to study Raman Effect, Quantum theory of Raman Effect, **Applications of Raman effect.**

UNIT-III: MATTER WAVES & UNCERTAINTY PRINCIPLE (9 hrs.)

Matter waves, de Broglie's hypothesis, Properties of matter waves, Davisson and Germer's experiment, Heisenberg's uncertainty principle for position and momentum & energy and time, Illustration of uncertainty principle using diffraction of beam of electrons (Diffraction by a single slit) and photons **(Gamma ray microscope).**

UNIT-IV: INTRODUCTION TO NUCLEAR PHYSICS (9 hrs)

Nucleus: Properties of nucleus, Mass defect, Binding energy; Nuclear forces: Characteristics of nuclear forces, Nuclear Models- Liquid drop model, Shell model, magic numbers.

UNIT-V: NUCLEAR DETECTORS AND NUCLEAR ACCELERATOR (9 hrs)

Nuclear detectors: Geiger- Muller counter, Cloud chamber (expansion type), Scintillation counter. Nuclear Accelerators: Cyclotron-construction, working and applications; Synchrocyclotron-construction, working and applications, **Classification of elementary particles.**

REFERENCE BOOKS:

1. B.Sc Physics, Vol.4, Telugu Academy, Hyderabad
2. Atomic Physics by J.B. Rajam; S. Chand & Co.,
3. Modern Physics by R. Murugesan and Kiruthiga Siva Prasath. S. Chand & Co.
4. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
5. Nuclear Physics, Irving Kaplan, Narosa Pub. (1998).
6. Nuclear Physics, Theory and experiment – P.R. Roy and B.P. Nigam, New Age Int.1997.
7. Atomic and Nuclear Physics (Vol.2), S.N. Ghoshal, S. Chand & Co. (1994).
8. Nuclear Physics, D.C. Tayal, Himalaya Pub. (1997).

BLUE PRINT**II B.Sc. PHYSICS SEMESTER – III MAJOR
COURSE 5: ATOMIC, MOLECULAR AND NUCLEAR PHYSICS**

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: INTRODUCTION TO ATOMIC STRUCTURE AND SPECTROSCOPY	2	1	1
UNIT-II: MOLECULAR SPECTROSCOPY	1	1	1
UNIT-III: MATTER WAVES & UNCERTAINTY PRINCIPLE	2	1	1
UNIT-IV: INTRODUCTION TO NUCLEAR PHYSICS	1	1	1
UNIT-V: NUCLEAR DETECTORS AND NUCLEAR ACCELERATOR	2	1	1



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For 2025-2029 Batch [w.e.f. 2026-2027]
II B.Sc. SEMESTER – III MAJOR
COURSE 6: BASIC ELECTRONICS

SYLLABUS

Hours: 45

Credits: 3

3 hrs/week

UNIT I: PASSIVE COMPONENTS AND CIRCUIT FUNDAMENTALS (9 hrs)

Resistors: Types (carbon, wire-wound, metal film), color coding, tolerance, Capacitors: Types (ceramic, electrolytic, film), applications, Inductors: Basic structure and applications - Series and parallel combinations: Equivalent resistance/capacitance/inductance - Basic laws: Ohm's Law, Kirchhoff's Voltage and Current Laws (KVL, KCL) with simple applications

UNIT II: SEMICONDUCTOR PHYSICS AND DIODES (9 hrs)

Intrinsic Vs extrinsic semiconductors - Doping, energy band diagrams, charge carriers - PN junction diode: Construction, working, forward/reverse biasing, I-V characteristics - Special diodes: Zener diode, LED, solar cell – construction, characteristics and uses.

UNIT III: TRANSISTORS AND THEIR OPERATION (9 hrs)

BJT: Structure, current components, working of NPN/PNP - Configurations: CB, CE, CC – input/output characteristics - Applications: Transistor as a amplifier (qualitative understanding).

UNIT IV: POWER SUPPLIES AND REGULATION (9 hrs)

Need for DC power supply: Block diagram - Rectifiers: Half-wave, full-wave, bridge with waveforms - Filter circuits: LC, and π filters – working principle - Voltage regulation: Zener diode regulation.

UNIT V: INTRODUCTION TO DIGITAL ELECTRONICS (9 hrs)

Analog Vs Digital signals - Number systems: Binary, decimal, hexadecimal – conversions, binary arithmetic - Logic gates: AND, OR, NOT – symbols, truth tables, simple logic circuits, Demorgan's theorems, Universal gates (NAND, NOR) – brief introduction.

TEXTBOOKS / REFERENCES:

1. V.K. Mehta & Rohit Mehta – *Principles of Electronics*, S. Chand
2. R.S. Sedha – *A Textbook of Applied Electronics*, S. Chand
3. D. Chattopadhyay & P.C. Rakshit – *Electronics: Fundamental Concepts*, New Central
4. Malvino & Leach – *Digital Principles and Applications*, McGraw-Hill
5. A.K. Maini – *Digital Electronics*, Wiley India

BLUE PRINT**II B.Sc. PHYSICS SEMESTER – III MAJOR
COURSE 6: BASIC ELECTRONICS**

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT I: PASSIVE COMPONENTS AND CIRCUIT FUNDAMENTALS	2	1	1
UNIT II: SEMICONDUCTOR PHYSICS AND DIODES	2	1	1
UNIT III: TRANSISTORS AND THEIR OPERATION	1	1	1
UNIT IV: POWER SUPPLIES AND REGULATION	1	1	1
UNIT V: INTRODUCTION TO DIGITAL ELECTRONICS	2	1	1



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For 2025-2029 Batch [w.e.f. 2026-2027]
II B.Sc. SEMESTER – III MAJOR

COURSE 7: APPLIED OPTICS

SYLLABUS

Hours: 45

Credits: 3

3 hrs/week

UNIT-I: GEOMETRICAL OPTICS (9 hrs.)

Ray optics assumptions, Fermat principle, Translation matrix, Reflection matrix, Refraction matrix, ABCD matrices system matrix, Thick lens formula, Thin lens formula, Ramsden eyepiece, Huygens eyepiece, two lens formula - (i) separated by a distance and (ii) in contact.

UNIT-II: ABERRATIONS (9 hrs.)

Fresnel theory of Reflection and Refraction. Monochromatic aberrations, Spherical aberration, Methods of minimizing spherical aberration, Coma, Astigmatism and Curvature of field, Distortion; Chromatic aberration-the achromatic doublet; Achromatism for two lenses (i) in contact and (ii) separated by a distance.

UNIT-III: LASERS (9 hrs.)

Lasers: Introduction, Spontaneous emission, Stimulated emission, Population Inversion, Laser principle, Einstein coefficients, Types of lasers: He-Ne laser, Ruby laser, Semiconductor laser, Applications of laser.

UNIT-IV: OPTICAL FIBERS AND HOLOGRAPHY (9 hrs.)

Principle of Optical fibers, Acceptance angle, Acceptance cone, Numerical aperture, Types of optical fibers - Graded and Stepped index, Types Signal attenuation mechanisms in optical fibers, Applications of Optical fibers - Sensors, Imaging, **Communication.**

Holography: Basic principle of holography-Gabor hologram and its limitations, Applications of holography.

UNIT-V: APPLICATIONS OF OPTICAL INSTRUMENTS (9 hrs.)

Introductory ideas and applications of various microscopes viz., (i) Optical microscopes (Compound microscope, Confocal microscope) (ii) Electron microscopes – SEM, Introductory ideas and applications of various telescopes viz., (i) Optical telescopes (ii) Radio telescopes (iii) Solar telescopes (iv) Infrared telescope (v) **Ultraviolet telescope.**

REFERENCE BOOKS:

1. B.Sc Physics, Vol.2, Telugu Academy, Hyderabad.
2. Optics - principles and applications Kailash K. Sharma
3. An introduction to Lasers M N Avadhanulu
4. Lasers Tyagarajan Ghatak 2nd Ed.
5. Introduction to Fiber Optics Tyagarajan Ghatak
6. Principles of Laser material processing Elijah Kannatey Asibu
7. Quantum optics: An introduction Mark Fox

BLUE PRINT**II B.Sc. PHYSICS SEMESTER – III MAJOR
COURSE 7: APPLIED OPTICS**

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: GEOMETRICAL OPTICS	2	1	1
UNIT-II: ABERRATIONS	2	1	1
UNIT-III: LASERS	2	1	1
UNIT-IV: OPTICAL FIBERS AND HOLOGRAPHY	1	1	1
UNIT-V: APPLICATIONS OF OPTICAL INSTRUMENTS	1	1	1



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For 2025-2029 Batch [w.e.f. 2026-2027]

II B.Sc. SEMESTER – IV MAJOR

COURSE 8: ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC THEORY

SYLLABUS

Hours: 45

Credits: 3

3 hrs/week

UNIT-I: ELECTROSTATICS AND DIELECTRICS (9 hrs)

Gauss's law - Statement and its proof, Electric field intensity due to uniformly charged solid sphere, Electrical potential–Equipotential surfaces, Potential due to a uniformly charged sphere. Dielectrics-Polar and Non-polar dielectrics - Effect of electric field on dielectrics, Dielectric strength, Electric displacement D, electric polarization Relation between D, E and P, Dielectric constant and electric susceptibility.

UNIT-II: CURRENT ELECTRICITY (9 hrs)

Electrical conduction - drift velocity-current density, equation of continuity, ohms law and limitations, Kirchhoff's Law's, conditions of balance of Wheatstone's bridge. Superposition Theorem, Norton's Theorem.

UNIT-III: MAGNETOSTATICS AND ELECTROMAGNETIC INDUCTION (9 hrs)

Magneto statics: Ampere's law & Biot-Savart's law and its applications: (i) long straight wire and (ii) circular loop, Hall Effect, determination of Hall coefficient and applications, magnetic charge, concept of vector potential.

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, Self-induction and Mutual induction, Self- inductance of a long solenoid, mutual inductance of a pair of coils, coefficient of Coupling.

UNIT-IV ELECTROMAGNETIC WAVES-MAXWELL'S EQUATIONS (9 hrs)

Maxwell's equations: integral and differential forms (No derivation), Continuity equation, Concept of displacement current. Plane electromagnetic wave equation, Hertz experiment - Transverse nature of electromagnetic waves, Electromagnetic wave equation in conducting media, **Skin depth**, Poynting theorem-Pointing vector, **Wave equations for E & B, Maxwell's equations in matter.**

UNIT-V VARYING AND ALTERNATING CURRENTS (9 hrs)

Growth and decay of currents in LR, CR, LCR circuits-Critical damping, alternating current - A.C. fundamentals, and A.C through pure R, L and C, Relation between current and voltage in LR and CR circuits, Phasor and Vector diagrams, LCR series and parallel resonant circuit, Q - factor, Power in ac circuits, Power factor.

REFERENCE BOOKS:

1. B.Sc Physics, Vol.3, Telugu Akademy, Hyderabad.
2. Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.
3. Electricity, Magnetism with Electronics, K.K. Tewari, R. Chand & Co.,
4. "Electricity and Magnetism" by Brijlal and Subramanyam Ratan Prakashan Mandir, 1966
5. "Electricity and Magnetism: Fundamentals, Theory, and Applications" by Murugesan, Kiruthiga Siva Prasath, and M. Saravanapandian
6. "Electricity and Magnetism: Theory and Applications" by Ajoy Ghatak and Lokanathan
7. Electricity and Magnetism: Problems and Solutions" by Ashok Kumar and Rajesh Kumar
8. Electricity and Magnetism, R. Murugesan, S. Chand & Co.

BLUE PRINT**II B.Sc. PHYSICS SEMESTER – IV MAJOR****COURSE 8: ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC THEORY**

Chapter / Unit	Section - A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: ELECTROSTATICS AND DIELECTRICS	2	1	1
UNIT-II: CURRENT ELECTRICITY	1	1	1
UNIT-III: MAGNETOSTATICS AND ELECTROMAGNETIC INDUCTION	2	1	1
UNIT-IV ELECTROMAGNETIC WAVES-MAXWELL'S EQUATIONS	1	1	1
UNIT-V VARYING AND ALTERNATING CURRENTS	2	1	1



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II B.Sc. SEMESTER – IV MAJOR

COURSE 9: ANALOG ELECTRONICS

SYLLABUS

Hours: 45

Credits: 3

3 hrs/week

UNIT I: BJT AMPLIFIERS (9 hrs)

Review of transistor operation in CE configuration - Load line analysis, biasing concepts (fixed bias, voltage divider bias) - CE amplifier: Circuit, gain, input/output impedance - Frequency response, bandwidth - Multistage amplifiers and emitter follower (voltage follower)

UNIT II: POWER AND FEEDBACK AMPLIFIERS (9 hrs)

Classification of amplifiers: Class A, B, AB, C - Class A and Class B power amplifiers – working and efficiency - Push-pull amplifier – circuit and waveforms - Negative feedback: Types (voltage/current series/shunt), effect on gain, bandwidth, stability

UNIT III: OPERATIONAL AMPLIFIERS – BASICS (9 hrs)

Characteristics of ideal and practical op-amp - Parameters: CMRR, slew rate, input offset voltage, bias current - Pin configuration and block diagram of IC 741 - Open loop and closed loop configuration.

UNIT IV: APPLICATIONS OF OP-AMPS (9 hrs)

Inverting and non-inverting amplifiers – gain derivation and characteristics - Adder, subtractor circuits - Integrator and differentiator – design and applications - Comparators and zero-crossing detectors.

UNIT V: OSCILLATOR CIRCUITS (9 hrs)

Conditions for oscillations: Barkhausen criterion - RC oscillators: Phase shift oscillator, Wein's bridge oscillator – circuit, working - LC oscillators: Hartley – basic theory and circuits - Crystal oscillator: Construction and applications.

TEXTBOOKS / REFERENCES:

1. Robert L. Boylestad – *Electronic Devices and Circuit Theory*, Pearson
2. Ramakant A. Gayakwad – *Op-Amps and Linear Integrated Circuits*, PHI
3. D. Roy Choudhury – *Linear Integrated Circuits*, New Age International
4. A.P. Malvino – *Electronic Principles*, Tata McGraw-Hill
5. Millman & Halkias – *Integrated Electronics*, McGraw-Hill

BLUE PRINT**II B.Sc. PHYSICS SEMESTER – IV MAJOR****COURSE 9: ANALOG ELECTRONICS**

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT I: BJT AMPLIFIERS	2	1	1
UNIT II: POWER AND FEEDBACK AMPLIFIERS	2	1	1
UNIT III: OPERATIONAL AMPLIFIERS – BASICS	2	1	1
UNIT IV: APPLICATIONS OF OP-AMPS	1	1	1
UNIT V: OSCILLATOR CIRCUITS	1	1	1



DEPARTMENT OF PHYSICS
SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR
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For 2025-2029 Batch [w.e.f. 2026-2027]

II B.Sc. SEMESTER – IV MAJOR

COURSE 10: ADVANCES IN PHYSICS

MODEL QUESTION PAPER

Hours: 45

Credits: 3

3 hrs/week

UNIT-I: CONCEPTS OF QUANTUM MECHANICS (9 hrs.)

Photoelectric effect, Compton Effect, Schrodinger's wave Equation time dependent, Time independent, postulates of Quantum mechanics, Properties of wave function, Eigen functions and Eigen values. One-dimensional particle in a box.

UNIT-II: LAGRANGIAN MECHANICS (9 hrs.)

Conservation laws, Constraints, Generalized coordinates and velocities, Virtual displacement, virtual work, D'Alembert Principle, Lagrange's equation of motion, Application-Simple pendulum, Atwood machine. Principle of least action, Hamiltonian equation of motion, Legendre transformation.

UNIT III: EVOLUTION OF COMPUTERS (9 hrs.)

Computers: Mechanical to electronic evolution, Generations of computers: Vacuum tubes, transistors, ICs, microprocessors, Moore's Law and classical computing limitations, Need for a new paradigm: Introduction to quantum concepts, Key contributions from Feynman, Deutsch, and others, Overview of Shor's and Grover's algorithms, Concept and implications of quantum supremacy.

UNIT IV: FUNDAMENTALS OF NANOTECHNOLOGY (9 hrs.)

Introduction to Nanoscience and Nanotechnology, Definition, historical development, and importance. Volume to Surface ratio, quantum effects, Types of Nanomaterials: Nanoparticles, nanowires, nanotubes, quantum dots. Applications of Nanotechnology: In electronics, medicine, energy, and environment.

UNIT V: RENEWABLE ENERGY (9 hrs.)

Conventional and Non-conventional energy sources. Renewable energy and its resources Solar energy-Generation, energy storage. Grid Integration and Smart Grids Green energies- Wind energy, Biomass energy, Tidal energy and green energy, Fuel cells.

TEXTBOOKS / REFERENCES:

1. Quantum Mechanics: Concepts and Applications – Nouredine Zettili
2. Principles of Quantum Mechanics – R. Shankar
3. A Textbook of Quantum Mechanics – P.M. Mathews and K. Venkatesan (*Indian Author*)
4. Classical Mechanics – H. Goldstein, C. Poole, and J. Safko
5. Introduction to Classical Mechanics – R.G. Takwale and P.S. Puranik (*Indian Author*)
6. Classical Mechanics – J.C. Upadhyaya (*Indian Author*)
7. Computer Organization and Architecture – William Stallings
8. Quantum Computation and Quantum Information – Michael A. Nielsen and Isaac L. Chuang
9. Fundamentals of Computers – V. Rajaraman (*Indian Author*)
10. Quantum Mechanics and Path Integrals – Richard P. Feynman and A.R. Hibbs
11. Introduction to Nanotechnology – Charles P. Poole Jr. and Frank J. Owens
12. Nanoscience and Nanotechnology – M.A. Shah and Tokeer Ahmad (*Indian Author*)
13. Renewable Energy Resources – John Twidell and Tony Weir
14. Non-Conventional Energy Sources – G.D. Rai (*Indian Author*)
15. Solar Energy: Principles of Thermal Collection and Storage – S.P. Sukhatme and J.K. Nayak (*Indian Author*)

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II B.Sc. PHYSICS SEMESTER – IV MAJOR

COURSE 10: ADVANCES IN PHYSICS

Chapter / Unit	Section - A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: CONCEPTS OF QUANTUM MECHANICS	2	1	1
UNIT-II: LAGRANGIAN MECHANICS	1	1	1
UNIT III: EVOLUTION OF COMPUTERS	1	1	1
UNIT IV: FUNDAMENTALS OF NANOTECHNOLOGY	2	1	1
UNIT V: RENEWABLE ENERGY	2	1	1



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For 2024-2028 Batch [w.e.f. 2025-2026]
III B.Sc. SEMESTER – V MAJOR

COURSE 12: APPLICATIONS OF ELECTRICITY & ELECTRONICS

SYLLABUS

UNIT-I: INTRODUCTION TO PASSIVE ELEMENTS

a) Passive elements: Resistor - Types of Resistors, Color coding, Ohms Law and its limitation. **Inductor** - Principle, EMF induced in an Inductor, Combinations of Inductors, and Types of Inductors. **Capacitor** - Principle, Charging and discharging of a Capacitor, Types of Capacitors, Energy store in a capacitor.

b) Applications of Passive elements: Applications of a Resistor as a heating element in heaters and as a fuse element. Applications of Inductors-Application of choke in a fan and in a radio tuning circuit, **Series resonance circuit as a Radio tuning circuit (additional information)**. Applications of capacitor in motors (for example fan).

UNIT-II POWER SOURCES (BATTERIES)

a) Power sources: Types of power sources-DC & AC sources, Different types of batteries, Rechargeable batteries –Lead acid batteries and Li-ion batteries. **Series, Parallel & Series-Parallel configuration of batteries (additional information)**.

b) Network Theorems for DC circuits: Maximum Power transfer theorem, Constant Voltage source- Constant Current Source-Applications of Current sources & Voltage sources, SMPS used in computers.

UNIT-III ALTERNATING & DIRECT CURRENTS

a) Alternating & Direct Currents Alternating & Direct Currents: A.C Generator-Construction and its working principle, Types of AC Generators, DC Generator-Construction and its working principle, advantages and disadvantages, Applications, Types of DC Generators, Differences between DC and AC generators.

b) Transformers: Transforms -Construction and its working principle, EMF equation, Types of Transformers -Step-down and Step-up Transformers, Relation between primary turns and secondary turns of the transformer with emf, Single phase motor – working principle, Applications of motors (for example fan).

UNIT-IV MODULATION CIRCUITS

a) Modulation Circuits: Types of modulation, Amplitude modulation- modulation index, Waveforms, Power relations, Demodulation, Diode detector.

b) Transmitters and Receivers: AM Transmitter, AM Receiver, Frequency modulation-modulation index, Waveforms, FM Transmitter, FM Receiver.

UNIT-V APPLICATIONS OF EM INDUCTION & POWER SUPPLIES

a) Applications of EM Induction : DC motor – Construction and operating principle, Calculation of power, voltage and current in a DC motor, Design of a simple Motor (for example Fan) with suitable turns of coil.

b) Power Supplies : Working of a DC regulated power supply, Construction of a 5 volts regulated power supply, Design of a step-down (ex:220-12V) and step-up (ex:120-240V) Checking the output voltage of a battery eliminator using a Multimeter. **(Trouble shooting).** Design of a simple 5 volts DC charger.

(NOTE: 1. Topics in Bold letters are added topics.

2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

1. Grob's Basic Electronics by Mitchel Schultz, TMH or McGraw Hill
2. Electronic and Electrical Servicing by Ian Robertson Sinclair, John Dunton, Elsevier Publications
3. Troubleshooting Electronic Equipment by R.S.Khandapur, TMH
4. Web sources suggested by the teacher concerned and the college librarian including reading material.

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III BSc: SEMESTER – V COURSE 12

COURSE 12: APPLICATIONS OF ELECTRICITY AND ELECTRONICS

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: INTRODUCTION TO PASSIVE ELEMENTS	2	1	1
Unit-II: POWER SOURCES (BATTERIES)	2	1	1
UNIT-III: ALTERNATING & DIRECT CURRENTS	1	1	1
Unit-IV: MODULATION CIRCUITS	2	1	1
Unit-V: APPLICATIONS OF EM INDUCTION & POWER SUPPLIES	1	1	1



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For 2024-2028 Batch [w.e.f. 2025-2026]
III B.Sc. SEMESTER – V MAJOR

COURSE 13: ELECTRONIC INSTRUMENTATION

SYLLABUS

UNIT-I INTRODUCTION TO INSTRUMENTS

- a) Basics of measurements:** Classification of Instruments, Analog instruments & Digital Instruments, DC Voltmeter and AC Voltmeter, Sensitivity, PMMC instruments-Construction and working.
- b) Specifications of Multimeter and their significance.** Construction and working of an Analog Multimeter and Digital Multimeter (Block diagram approach). 3½ displays and 4½ display Digital Multimeter.

UNIT-II OSCILLOSCOPE

- a) Cathode ray oscilloscope – Principle and block diagram of CRO, Cathode Ray Tube (CRT) – functioning –various controls.**
- b) Applications of CRO:** Measurement of voltage (DC and AC), frequency & time period, Different types of oscilloscopes and their uses, Digital storage Oscilloscope.

UNIT-III TRANSDUCERS AND BRIDGES

- a) Linear Variable Differential Transformer (LVDT), Resistive, Capacitive & Inductive transducers, piezoelectric transducer.**
- b) DC Bridge -Wheatstone's bridge, AC Bridges for measurement of inductance- Maxwell's Bridge, AC Bridges for measurement of frequency -Wien's bridge.**

UNIT-IV ADC AND DAC & DISPLAY INSTRUMENTS

- a) A/D converters –successive approximation type, D/A converters - Binary ladder.**
- b) Introduction to Display devices-LED Displays - Seven Segment Displays, Construction and operation (Display of numbers), Types of SSDs (Common Anode & Common Cathode type)- Limitations of SSDs, Liquid Crystal Displays (LCDs)-Principle and working of 2x16 display, Applications of LCD modules.**

UNIT-V AMPLIFIERS, OSCILLATORS & BIOMEDICAL INSTRUMENTS

- a) Amplifiers– Classification of amplifiers, coupling amplifiers–RC coupled amplifier – frequency response characteristics (no derivation), RC phase shift oscillator.**
- b) Basic operating principles and uses of (i) ECG machine (ii) Ventilator (iii) Ultrasound scanning (iv) Pulse Oximeter.**

- (NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

1. Electronic Instrumentation by H.S.Kalsi, TMH Publishers
2. Electronic Instrument Hand Book by Clyde F. Coombs, McGraw Hill
3. Introduction to Biomedical Instrumentation by Mandeep Singh, PHI Learning.
4. Electronic Instrumentation – WD Cooper
5. Electrical and Electronic Instrumentation – AK Sawhany
6. A text book in electrical technology by B.L. Thereja (S.Chand & Co)
7. *Biomedical Instrumentation and Measurements* by Leslie Cromwell, Prentice Hall India.
8. Electronic Measurements and Instrumentation by Kishor, K Lal, Pearson, New Delhi
9. Electrical and Electronic Measurements by Sahan, A.K., Dhanpat Rai, New Delhi
10. Electronic Instruments and Measurement Techniques by Cooper, W.D. Halfrick, A.B., PHI Learning, New Delhi
11. Web sources suggested by the teacher concerned and the college librarian including reading material.

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III BSc SEMESTER – V

COURSE 13: ELECTRONIC INSTRUMENTATION

Chapter / Unit	Section A (5 marks)	Section – B (10 marks)	Section – C (10 marks)
UNIT-I: INTRODUCTION TO INSTRUMENTS	2	1	1
UNIT-II OSCILLOSCOPE	2	1	1
UNIT-III TRANSDUCERS AND BRIDGES	1	1	1
UNIT-IV ADC AND DAC & DISPLAY INSTRUMENTS	1	1	1
UNIT-V AMPLIFIERS, OSCILLATORS & BIOMEDICAL INSTRUMENTS	2	1	1



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For 2024-2028 Batch [w.e.f. 2025-2026]
III B.Sc. SEMESTER – V MAJOR

COURSE 14: OPTICAL INSTRUMENTS AND OPTOMETRY

SYLLABUS

UNIT-I OPTICAL MICROSCOPES

Simple Microscope-Construction, Magnifying power, normal adjustment; Compound Microscope-Construction, Magnifying power, normal adjustment, Phase contrast microscope-Operating principle, travelling microscope-Construction, working and uses.

UNIT-II TELESCOPES

Refracting telescopes and Reflecting telescopes, construction, working and magnifying power of Astronomical Telescope and Terrestrial Telescopes, Binoculars – working principle and applications.

UNIT-III APPLICATIONS OF OPTICAL INSTRUMENTS

Introductory ideas and applications of various microscopes viz.,(i) Electron microscope (TEM, SEM) (ii) Scanning Acoustic microscope and (iii) X-ray microscope. Introductory ideas and applications of various telescopes viz.,(i) Solar telescope (ii) Ultraviolet telescope (iii) Infrared telescope.

UNIT-IV OPTICAL VISION

Introduction to optical Vision, Eye as an optical instrument, Formation of image in the eye and the camera, Ophthalmic lenses, Myopia and Hypermetropia defects, Removal of defects in vision using ophthalmic lenses, Contact lenses-Working principle, **Different types of Contact lenses.**

UNIT-V OPHTHALMIC TECHNIQUES AND OPTOMETRY

Ophthalmoscope and keratometer and their working principles, Evaluation of eye disorders, Guidelines for standardized eye chart preparation, Simple phoropter and its working principle and its uses, Principles of Computer based eye testing.

(NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

1. Optics and Optical Instruments: An Introduction by B. K. Johnson, Dover Publications.
2. Modern Optical Instruments and their construction by or ford Henry-Publisher: Biblio Life, LLC.
3. A Text Book of Optics by Brij Lal and N.Subramanyam, S.Chand & Co.
4. Practical Optics by Menn Naftly, Elsevier Science Publishing.
5. Applications of Optics in daily life | CK-12 Foundation. <https://flexbooks.ck12.org> ›
6. Web sources suggested by the teacher concerned and the college librarian including Reading material.

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III BSc SEMESTER – V COURSE 15 B

COURSE 14 A: OPTICAL INSTRUMENTS AND OPTOMETRY

Chapter / Unit	Section A (5 marks)	Section – B (10 marks)	Section – C (10 marks)
UNIT-I OPTICAL MICROSCOPES	2	1	1
UNIT-II TELESCOPES	2	1	1
UNIT-III APPLICATIONS OF OPTICAL INSTRUMENTS	1	1	1
UNIT-IV OPTICAL VISION	1	1	1
UNIT-V OPHTHALMIC TECHNIQUES AND OPTOMETRY	2	1	1



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For 2024-2028 Batch [w.e.f. 2025-2026]
III B.Sc. SEMESTER – V MAJOR

COURSE 15: SOLAR ENERGY AND ITS APPLICATIONS

SYLLABUS

UNIT - I: BASIC CONCEPTS OF SOLAR ENERGY

(10hrs)

Spectral distribution of solar radiation, Solar constant, zenith angle and Air-Mass, direct, diffuse and total radiations. Solar energy - importance and global warming, solar pond. Pyrheliometer - working principle, direct radiation measurement, Pyranometer-working Principle, diffuse radiation measurement, **Distinction between the two meters.**

UNIT - II: SOLAR THERMAL COLLECTORS

(10hrs)

Solar Thermal Collectors-Introduction, Types of Thermal collectors, Flat plate collector – liquid heating type, Energy balance equation and efficiency, Evacuated tube collector, solar water heating system. Solar cookers, Solar dryers, Solar Desalinators. Solar green houses.

UNIT - III: FUNDAMENTALS OF SOLAR CELLS

(10hrs)

Semiconductor interface, Types, homo junction, hetero junction and Schottky barrier, advantages and drawbacks, Photovoltaic Effect, Solar photovoltaic cell-its working principle and applications, Measurement of I-V characteristics, series and shunt resistance of a solar cell, **output parameters.**

UNIT -IV: TYPES OF SOLAR CELLS AND MODULES

(10 hrs)

Types of solar cells, Crystalline silicon solar cells, poly-Si cells, Thin film solar cells- CdTe/CdS cell configurations, structures, advantages and limitations, Module fabrication steps, Modules in series and parallel. **Solar PV system and its components.**

Unit – V: SOLAR PHOTOVOLTAIC SYSTEMS

(10hrs)

Energy storage in PV systems: Need of energy storage, Energy storage modes, Batteries: Primary and secondary, Solid-state battery, Molten solvent battery, lead acid battery and dry batteries-Nickel Cadmium Batteries, Electrical storage –Super capacitor. Role of carbon Nano-tubes in electrodes.

- (NOTE: 1. Topics in Bold letters are added topics.
2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

1. Solar Energy Utilization by G. D. Rai, Khanna Publishers
2. Solar Energy- Fundamentals, design, modelling and applications by G.N. Tiwari, Narosa Publications, 2005.
3. Solar Energy-Principles of thermal energy collection & storage by S.P. Sukhatme, Tata Mc-Graw Hill Publishers, 1999.
4. Science and Technology of Photovoltaics, P. Jayarama Reddy, CRC Press (Taylor & Francis Group), Leiden & BS Publications, Hyderabad, 2009.
5. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,
6. Web sources suggested by the teacher concerned and the college librarian including reading material.
 - (a) https://courses.edx.org/c4x/DelftX/ET.3034TU/asset/solar_energy_v1.1.pdf
 - (b) [https://www.sku.ac.ir/Datafiles/BookLibrary/45/John%20A.%20Duffie,%20William%20A.%20Beckman\(auth.\)-Solar%20Engineering%20of%20Thermal%20Processes,%20Fourth%20Edition%20\(2013\).pdf](https://www.sku.ac.ir/Datafiles/BookLibrary/45/John%20A.%20Duffie,%20William%20A.%20Beckman(auth.)-Solar%20Engineering%20of%20Thermal%20Processes,%20Fourth%20Edition%20(2013).pdf)

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III BSc SEMESTER – V COURSE 15

SOLAR ENERGY AND ITS APPLICATIONS

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: BASIC CONCEPTS OF SOLAR ENERGY	2	1	1
Unit-II: SOLAR THERMAL COLLECTORS	2	1	1
UNIT-III: FUNDAMENTALS OF SOLAR CELLS	1	1	1
Unit-IV: TYPES OF SOLAR CELLS AND MODULES	1	1	1
Unit-V: SOLAR PHOTOVOLTAIC SYSTEMS	2	1	1



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For 2025-2029 Batch [w.e.f. 2026-2027]

II B.Sc. SEMESTER – III MINOR

COURSE 1: MECHANICS AND PROPERTIES OF MATTER

SYLLABUS

Hours: 45

Credits: 3

3 hrs/week

UNIT-I: MECHANICS OF PARTICLES

(9 hrs.)

Newton's Laws of motion, motion of variable mass system, Equation of 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-II: CENTRAL FORCES

(9 hrs.)

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, conservative force as a negative gradient of potential energy, equations of motion under a central force, derivation of Kepler's laws, **motion of satellites, Geo-stationary satellites.**

UNIT III: ELASTICITY AND BENDING OF BEAMS

(9 hrs)

Stress and strain, Hooke's Law, Elastic moduli – Young's, bulk, and shear modulus, Poisson's ratio – Physical meaning, Bending of beams – Types, point and distributed load, Cantilever and uniform bending (Qualitative treatment), Torsional pendulum – working principle and uses.

UNIT IV: FLUID MECHANICS

(9 hrs)

Fluids – Characteristics and classification, Streamline Vs turbulent flow, Bernoulli's theorem – Statement, simple derivation and applications (Venturimeter), Equation of continuity – Concept, Viscosity – Poiseuille's law (statement and qualitative explanation), **Surface tension – Examples and qualitative ideas (Additional Information).**

UNIT V: SPECIAL THEORY OF RELATIVITY

(9 hrs.)

Galilean relativity, Michelson-Morley experiment, negative result, postulates of special theory of relativity, Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation.

REFERENCE BOOKS:

1. B.Sc 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. Mechanics-EM Purcell, Mc Graw Hill
8. University Physics-FW Sears, MW Zemansky & HD Young, Narosa Publications, Delhi
9. College Physics-I. T. Bhima sankaram and G. Prasad. Himalaya Publishing House.
10. Mechanics, S. G. Venkata chalapathy, Margham Publication, 2003.
11. Fluid Mechanics – Frank M. White, McGraw Hill.
12. Textbook of Fluid Dynamics – M. D. Raisinghania, S. Chand & Co.

BLUE PRINT**I B.Sc. SEMESTER –I MAJOR
COURSE 2: MECHANICS AND PROPERTIES OF MATTER**

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: MECHANICS OF PARTICLES	2	1	1
UNIT-II: CENTRAL FORCES	2	1	1
UNIT III: ELASTICITY AND BENDING OF BEAMS	1	1	1
UNIT IV: FLUID MECHANICS	1	1	1
UNIT V: SPECIAL THEORY OF RELATIVITY	2	1	1



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For 2025-2029 Batch [w.e.f. 2026-2027]
II B.Sc. SEMESTER – IV MINOR

COURSE 2: WAVES AND APPLIED OPTICS

SYLLABUS

Hours: 45

Credits: 3

3hrs/week

UNIT-I: SIMPLE HARMONIC, DAMPED & FORCED OSCILLATIONS (9 Hrs.)

Simple Harmonic Oscillator: Solution of differential equation, and physical characteristics, Combination of two mutually perpendicular SHMs (1:1 and 1:2 frequencies), Lissajous figures. Damped Harmonic Oscillator: Solution of differential equation, Logarithmic decrement, relaxation time, quality factor, Forced Oscillations: Solution of differential equation.

UNIT-II: INTERFERENCE AND DIFFRACTION (9 hrs)

Interference: Principle of superposition – coherence Conditions for interference of light. Fresnel's biprism determination of wavelength of light, change of phase on reflection, Oblique incidence of a plane wave on a thin film due to reflected light (cosine law) –Newton's rings in reflected light. Determination of wavelength of monochromatic light using Newton's rings.

Diffraction: Introduction, distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction – Diffraction due to single slit, **Difference between interference and diffraction.**

UNIT-III: POLARIZATION (9 hrs)

Polarized light: methods of polarization by reflection, refraction, double refraction, Brewster's law, Maule's law, Nicol prism polarizer and analyser, Quarter wave plate, Half wave plate, optical activity - Determination of specific rotation by Laurent's half shade Polarimeter. **Idea of elliptical and circular polarization.**

UNIT-IV: LASERS (9 hrs)

Lasers: Introduction, Spontaneous emission, Stimulated emission, Population Inversion, Laser principle, Einstein coefficients, Types of lasers: He-Ne laser, Ruby laser, Semiconductor laser, Applications of laser.

UNIT-V: OPTICAL FIBERS AND HOLOGRAPHY (9 hrs)

Optical Fibers: Principle of Optical fibers, Acceptance angle, Acceptance cone, Numerical aperture, Types of optical fibers - Graded and Stepped index, Types Signal attenuation mechanisms in optical fibers, Applications of Optical fibers - Sensors, Imaging, Communication.

Holography: Basic principle of holography-Gabor hologram and its limitations, Applications of holography.

REFERENCE BOOKS:

1. B.Sc Physics Vol.1, Telugu Academy, Hyderabad.
2. Fundamentals of Physics. Halliday/Resnick/Walker, Wiley India Edition 2007.
3. Waves & Oscillations. S. Badami, V. Balasubramanian and K.R. Reddy, Orient Longman
4. B.Sc Physics, Vol .2, Telugu Academy, Hyderabad
5. A Text Book of Optics-N Subramanyam, L Brijlal, S. Chand & Co.
6. Unified Physics Vol. II Optics & Thermodynamics –Jai Prakash Nath & Co. Ltd., Meerut
7. Optics, F.A. Jenkins and H.G. White, Mc Graw-Hill 5. Optics, Ajay Ghatak, Tata Mc Graw-Hill. Introduction of Lasers –Avadhanulu, S. Chand & Co.
8. Principles of Optics-BK Mathur, Gopala Printing Press, 1995.

BLUE PRINT SEMESTER – IV

COURSE 2: WAVES AND APPLIED OPTICS

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: <i>SIMPLE HARMONIC, DAMPED & FORCED OSCILLATIONS</i>	2	1	1
UNIT-II: <i>INTERFERENCE AND DIFFRACTION</i>	2	1	1
UNIT-III: <i>POLARIZATION</i>	2	1	1
UNIT-IV: <i>LASERS</i>	1	1	1
UNIT-V: <i>OPTICAL FIBERS AND HOLOGRAPHY</i>	1	1	1



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For 2024-2028 Batch [w.e.f. 2025-2026]
III B.Sc. SEMESTER – V MINOR

COURSE 5: APPLICATIONS OF ELECTRICITY & ELECTRONICS

SYLLABUS

UNIT-I: INTRODUCTION TO PASSIVE ELEMENTS

a) Passive elements: Resistor - Types of Resistors, Color coding, Ohms Law and its limitation. **Inductor** - Principle, EMF induced in an Inductor, Combinations of Inductors, Types of Inductors. **Capacitor** - Principle, Charging and discharging of a Capacitor, Types of Capacitors, Energy store in a capacitor.

b) Applications of Passive elements: Applications of a Resistor as a heating element in heaters and as a fuse element. Applications of Inductors-Application of choke in a fan and in a radio tuning circuit, **Series resonance circuit as a Radio tuning circuit (additional information)**. Applications of capacitor in motors (for example fan).

UNIT-II POWER SOURCES (BATTERIES)

a) Power sources: Types of power sources-DC & AC sources, Different types of batteries, Rechargeable batteries –Lead acid batteries and Li-ion batteries. **Series, Parallel & Series-Parallel configuration of batteries (additional information)**.

b) Network Theorems for DC circuits: Maximum Power transfer theorem, Constant Voltage source- Constant Current Source-Applications of Current sources & Voltage sources, SMPS used in computers.

UNIT-III ALTERNATING & DIRECT CURRENTS

a) Alternating & Direct Currents Alternating & Direct Currents: A.C Generator-Construction and its working principle, Types of AC Generators, DC Generator-Construction and its working principle, advantages and disadvantages, Applications, Types of DC Generators, Differences between DC and AC generators.

b) Transformers: Transforms -Construction and its working principle, EMF equation, Types of Transformers -Step-down and Step-up Transformers, Relation between primary turns and secondary turns of the transformer with emf, Single phase motor – working principle, Applications of motors (for example fan).

UNIT-IV MODULATION CIRCUITS

a) Modulation Circuits: Types of modulation, Amplitude modulation- modulation index, Waveforms, Power relations, Demodulation, Diode detector.

b) Transmitters and Receivers: AM Transmitter, AM Receiver, Frequency modulation- modulation index, Waveforms, FM Transmitter, FM Receiver.

UNIT-V APPLICATIONS OF EM INDUCTION & POWER SUPPLIES

a) Applications of EM Induction : DC motor – Construction and operating principle, Calculation of power, voltage and current in a DC motor, Design of a simple Motor (for example Fan) with suitable turns of coil.

b) Power Supplies : Working of a DC regulated power supply, Construction of a 5 volts regulated power supply, Design of a step-down (ex:220-12V) and step-up (ex:120-240V) Checking the output voltage of a battery eliminator using a Multimeter. **(Trouble shooting)**. Design of a simple 5 volts DC charger.

(NOTE: 1. Topics in Bold letters are added topics.

2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

1. Grob's Basic Electronics by Mitchel Schultz, TMH or McGraw Hill
2. Electronic and Electrical Servicing by Ian Robertson Sinclair, John Dunton, Elsevier Publications
3. Troubleshooting Electronic Equipment by R.S.Khandapur, TMH
4. Web sources suggested by the teacher concerned and the college librarian including reading material.

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III BSc: SEMESTER – V

COURSE 5: APPLICATIONS OF ELECTRICITY AND ELECTRONICS

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: INTRODUCTION TO PASSIVE ELEMENTS	2	1	1
Unit-II: POWER SOURCES (BATTERIES)	2	1	1
UNIT-III: ALTERNATING & DIRECT CURRENTS	1	1	1
Unit-IV: MODULATION CIRCUITS	2	1	1
Unit-V: APPLICATIONS OF EM INDUCTION & POWER SUPPLIES	1	1	1



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For 2024-2028 Batch [w.e.f. 2025-2026]

III B.Sc. SEMESTER – V MINOR

COURSE 6: ELECTRONIC INSTRUMENTATION

SYLLABUS

UNIT-I INTRODUCTION TO INSTRUMENTS

a) Basics of measurements: Classification of Instruments, Analog instruments & Digital Instruments, DC Voltmeter and AC Voltmeter, Sensitivity, PMMC instruments-Construction and working.

b) Specifications of Multimeter and their significance. Construction and working of an Analog Multimeter and Digital Multimeter (Block diagram approach). 3½ displays and 4½ display Digital Multimeter.

UNIT-II OSCILLOSCOPE

a) Cathode ray oscilloscope – Principle and block diagram of CRO, Cathode Ray Tube (CRT) – functioning –various controls.

b) Applications of CRO: Measurement of voltage (DC and AC), frequency & time period, Different types of oscilloscopes and their uses, Digital storage Oscilloscope.

UNIT-III TRANSDUCERS AND BRIDGES

a) Linear Variable Differential Transformer (LVDT), Resistive, Capacitive & Inductive transducers, piezoelectric transducer.

b) DC Bridge -Wheatstone's bridge, AC Bridges for measurement of inductance- Maxwell's Bridge, AC Bridges for measurement of frequency -Wien's bridge.

UNIT-IV ADC AND DAC & DISPLAY INSTRUMENTS

a) A/D converters –successive approximation type, D/A converters - Binary ladder.

b) Introduction to Display devices-LED Displays - Seven Segment Displays, Construction and operation (Display of numbers), Types of SSDs (Common Anode & Common Cathode type)- Limitations of SSDs, Liquid Crystal Displays (LCDs)-Principle and working of 2x16 display, Applications of LCD modules.

UNIT-V AMPLIFIERS, OSCILLATORS & BIOMEDICAL INSTRUMENTS

a) Amplifiers– Classification of amplifiers, coupling amplifiers–RC coupled amplifier – frequency response characteristics (no derivation), RC phase shift oscillator.

b) Basic operating principles and uses of (i) ECG machine (ii) Ventilator (iii) Ultrasound scanning (iv) Pulse Oximeter.

(NOTE: 1. Topics in Bold letters are added topics.

2. Problems should be solved at the end of every chapter of all units)

REFERENCE BOOKS:

1. Electronic Instrumentation by H.S.Kalsi, TMH Publishers
2. Electronic Instrument Hand Book by Clyde F. Coombs, McGraw Hill
3. Introduction to Biomedical Instrumentation by Mandeep Singh, PHI Learning.
4. Electronic Instrumentation – WD Cooper
5. Electrical and Electronic Instrumentation – AK Sawhany
6. A text book in electrical technology by B.L.Thereja (S.Chand & Co)
7. *Biomedical Instrumentation and Measurements* by Leslie Cromwell, Prentice Hall India.
8. Electronic Measurements and Instrumentation by Kishor, K Lal, Pearson, New Delhi
9. Electrical and Electronic Measurements by Sahan, A.K., Dhanpat Rai, New Delhi
10. Electronic Instruments and Measurement Techniques by Cooper, W.D. Halfrick, A.B., PHI Learning, New Delhi
11. Web sources suggested by the teacher concerned and the college librarian including reading material.

BLUE PRINT**III BSc SEMESTER – V COURSE 6 MINOR****ELECTRONIC INSTRUMENTATION**

Chapter / Unit	Section A (5 marks)	Section – B (10 marks)	Section – C (10 marks)
UNIT-I: INTRODUCTION TO INSTRUMENTS	2	1	1
UNIT-II OSCILLOSCOPE	2	1	1
UNIT-III TRANSDUCERS AND BRIDGES	1	1	1
UNIT-IV ADC AND DAC & DISPLAY INSTRUMENTS	1	1	1
UNIT-V AMPLIFIERS, OSCILLATORS & BIOMEDICAL INSTRUMENTS	2	1	1



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For 2026-2030 Batch [w.e.f. 2023-2024]

SEMESTER – II
MULTI DISCIPLINARY COURSE
PRINCIPLES OF PHYSICAL SCIENCES

SYLLABUS

Credits: 2

2hrs/week

UNIT 1: INTRODUCTION TO PHYSICS

Nature of Physics: Overview of physics as a discipline, its scope, and its relationship to other sciences. Scientific Method in Physics: Introduction to the scientific method and its application in the study of physics. Measurement and Units: Understanding the principles of measurement, SI units, and the importance of accurate and precise measurements. Scalars and Vectors: Differentiating between scalars and vectors, understanding vector addition and subtraction.

UNIT 2: MECHANICS FOR ARTS STUDENTS

Motion and Forces: Introduction to the principles of motion, including velocity, acceleration, and the laws of motion. Energy and Work: Understanding the concept of energy, different forms of energy, and the relationship between work and energy. Circular Motion: Exploring the principles of circular motion, centripetal force, and applications in real-world scenarios. Gravity: Introduction to the concept of gravity, Newton's law of universal gravitation, and its implications.

UNIT 3: WAVES AND OPTICS FOR ARTS STUDENTS

Waves: Understanding the properties and characteristics of waves, including wave types, wave motion, and wave interference. Sound Waves: Exploring the nature of sound waves, including properties of sound, sound propagation, and the Doppler Effect. Light and Optics: Introduction to the behavior of light, reflection, refraction, and the formation of images by mirrors and lenses. Wave Optics: Understanding the principles of interference, diffraction, and polarization of light waves.

REFERENCE BOOKS:

1. "Principles of Physics" by David Halliday, Robert Resnick, and Jearl Walker: This textbook covers the fundamental principles of physics, including mechanics, electromagnetism, thermodynamics, and modern physics. It provides a comprehensive introduction to the subject and includes numerous examples and exercises for practice.

2. "University Physics" by Hugh D. Young and Roger A. Freedman: This textbook is widely used in university-level physics courses. It covers a wide range of topics in classical physics, modern physics, and thermodynamics. It is known for its clear explanations and problem-solving approach.

3. "Concepts of Modern Physics" by Arthur Beiser: This book provides an introduction to the principles and concepts of modern physics, including quantum mechanics, atomic and nuclear physics, and relativity. It is suitable for students with a basic background in physics and mathematics.

4. "The Feynman Lectures on Physics" by Richard P. Feynman, Robert B. Leighton, and Matthew Sands: This three-volume set is based on the famous lectures given by physicist Richard Feynman. It covers a wide range of topics in physics, including mechanics, electromagnetism, quantum mechanics, and statistical mechanics. The lectures are known for their engaging style and intuitive explanations.

5. "Physical Science" by Bill Tillery: This textbook provides a comprehensive introduction to the principles of physical science, covering topics such as motion, forces, energy, waves, electricity, and magnetism. It is designed for introductory-level courses and includes numerous examples, illustrations, and practice problems.

6. "Fundamentals of Physics" by Jearl Walker, David Halliday, and Robert Resnick: This textbook is widely used in physics courses and covers the fundamental principles of classical physics. It includes a strong emphasis on problem-solving and conceptual understanding.

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SEMESTER – II
MDC: PRINCIPLES OF PHYSICAL SCIENCES

Chapter / Unit	Section- A (10 marks)	Section – B (5 marks)
UNIT-I Introduction to Physics	2	2
UNIT-II Mechanics for Arts Students	2	2
UNIT-III Waves and Optics for Arts Students	1	2



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For 2026-2030 Batch [w.e.f. 2025-2026]

I B.Sc. SEMESTER – I MAJOR

PRACTICAL - COURSE 1:
INTRODUCTION TO MATHEMATICAL PHYSICS

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded.

- 01. Graphing standard functions: $\sin(x)$, $\cos(x)$, e^x , $\ln(x)$, x^2 , $\sqrt{x}$ etc. using Excel/Python/Graph paper**
- 02. Experimental determination and vector diagram verification of vector addition and scalar product using graphical methods.**
03. Using MATLAB/Python to visualize vector fields and compute gradient, divergence, and curl.
- 04. Solve simple non-linear equations (e.g., $x^3 - x - 1 = 0$) using graphical methods and Bisection/newton-raphson method (Python or Excel).**
- 05. Fit experimental data (e.g., Hooke's law) to a straight line using least squares Method in Excel or Python.**
06. Linear equation Solution and System of linear equation solution using MATLAB/OCTAVE
07. Fourier approximation of a square wave up to 5 terms using Python/MATLAB and plotting the result.
08. Numerical solution of $dy/dx = x + y$, given initial condition using Euler's method.
09. Single coin tossing and four coin tossing using MATLAB/OCTAVE and verification of statistical laws
- 10. Use Python/Excel to perform addition, multiplication, and finding inverse of 2x2 And 3x3 matrices.**
11. Simulate and plot s-t, v-t graphs using $s = ut + 0.5gt^2$ using Excel or Python.
12. Calculate mean, standard deviation, and percentage error for a given data set using Excel/Python/Manual calculations
- 13. Represent the given complex numbers on graph paper.**
14. Determine the Eigen Values of the given matrix using characteristic equation.



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I B.Sc. SEMESTER – I MAJOR

PRACTICAL COURSE 2:
MECHANICS AND PROPERTIES OF MATTER

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be conducted and recorded.

- 1. Young's modulus by uniform bending**
- 2. Young's modulus by non-uniform bending**
- 3. Rigidity modulus using Torsional pendulum**
- 4. Surface tension by capillary rise method**
5. Flywheel – Determination of moment of inertia
- 6. Bifilar suspension – moment of inertia of a rectangular body**
7. Radius of capillary tube by Hg threads method
8. Simulation of rocket motion using water rocket or computer simulation.
9. Verification of Kepler's third law using orbit simulation.
10. Simulation-based study of Rutherford scattering.
11. Determination of modulus of rigidity using Maxwell's needle.
12. Measurement of Poisson's ratio of a rubber tube.
13. Verification of Bernoulli's theorem using a horizontal tube setup.
14. Demonstration of lift on an airfoil using airflow setup.
15. Simulation of Michelson-Morley experiment.
16. Visualization of time dilation and length contraction using simulation.
- 17. Determine the Viscosity of a liquid by the flow method.**



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For 2026-2030 Batch [w.e.f. 2025-2026]

I B.Sc. SEMESTER – II MAJOR

PRACTICAL COURSE 3:
WAVES AND OPTICS

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded.

- 1. Determination of 'g' by compound/bar pendulum**
- 2. Simple pendulum normal distribution of errors-estimation of time period and the error of the mean by statistical analysis.**
3. Solving equation of motion for DHO & FHO using MATLAB/OCTAVE/Python
- 4. Determination of the force constant of a spring by static and dynamic method.**
5. Verification of laws of vibrations of stretched string –sonometer.
6. Determination of radius of curvature of a given convex lens-Newton's rings.
7. Resolving power of grating.
8. Study of optical rotation – polarimeter.
9. Fourier transform simulation of single slit diffraction
10. Fourier transform simulation of diffraction at circular, rectangular aperture, edge
- 11. Dispersive power of a prism.**
12. Determination of wavelength of light using diffraction grating-normal incidence method.
13. Determination of wavelength of laser light using diffraction grating.
- 14. Resolving power of a telescope.**
15. Refractive index of a liquid-hallow prism.
- 16. Determination of thickness of a thin wire by wedge method.**



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For 2026-2030 Batch [w.e.f. 2025-2026]

I B.Sc. SEMESTER – II MAJOR

PRACTICAL COURSE 4:
HEAT AND THERMODYNAMICS

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded.

- 1. Specific heat of a liquid – Joule's calorimeter –Barton's radiation correction**
- 2. Thermal conductivity of bad conductor - Lee's method**
3. Thermal conductivity of rubber.
- 4. Measurement of Stefan's constant.**
5. Specific heat of a liquid by applying Newton's law of cooling correction.
- 6. Heating efficiency of electrical kettle with varying voltages.**
7. Thermo emf- thermo couple - Potentiometer
8. Thermal behavior of an electric bulb (filament/torch light bulb)
- 9. Study of variation of resistance with temperature - Thermister.**
10. Thermal expansion of solids using metal ball and a ring.
- 11. Determination of Plank's constant.**



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For 2025-2029 Batch [w.e.f. 2026-2027]
II B.Sc. SEMESTER – III MAJOR

PRACTICAL COURSE 5:
ATOMIC, MOLECULAR AND NUCLEAR PHYSICS

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded.

- 1. e/m of an electron by Thomson method**
- 2. Determination of Planck's constant using a photocell**
- 3. Verification of inverse square law of light using photovoltaic cell**
4. Determination of work function of the filament material using directly heated vacuum diode
- 5. GM counter – Determination of dead time**
- 6. Study of characteristic curve of GM counter and estimation of its operating voltage**
7. Estimation of efficiency for a gamma source using GM counter
8. Estimation of efficiency for a beta source using GM counter
- 9. Study of sodium doublet using a diffraction grating**
10. IR or UV-Vis spectroscopy of samples using a portable spectrometer
11. Single slit diffraction of laser beam to illustrate uncertainty principle
12. Study of absorption of beta particles in aluminum sheets
13. Study of Compton scattering (demo or simulation)
14. Study of counting statistics using GM counter
15. Study of plateau region and dead time using a counting system



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For 2025-2029 Batch [w.e.f. 2026-2027]
II B.Sc. SEMESTER – III MAJOR

PRACTICAL COURSE 6:
BASIC ELECTRONICS

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded.

1. Verification of Ohm's Law using resistive networks (series and parallel combinations).
- 2. Series and Parallel Combination of Capacitors and Inductors**
3. Capacitor charging and discharging curves using RC circuits and a stopwatch / multimeter.
4. **V-I characteristics of a PN junction diode** (forward and reverse bias)
- 5. Temperature Dependence of Resistance (Using Thermistor).**
6. **Zener diode characteristics** and voltage regulation behavior.
7. Study of LED and photodiode characteristics under different light conditions.
8. BJT transistor as a switch: ON/OFF control of an LED.
- 9. Construction of half-wave and full-wave rectifiers and measurement of output voltage.**
10. Design and analysis of simple π -filtered power supply circuits.
11. **Verification of logic gates (AND, OR, NOT, NAND, NOR)** using digital ICs or simulation.



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For 2025-2029 Batch [w.e.f. 2026-2027]
II B.Sc. SEMESTER – III MAJOR

PRACTICAL COURSE 7:
APPLIED OPTICS

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded

- 1. Wavelength of laser using Diffraction grating**
- 2. Refractive index of liquid using Hollow prism**
- 3. Resolving power of telescope**
- 4. Resolving power of grating**
5. Spectrometer: i-d curve
6. Laser Reflection grating using metal scale
7. Optical fiber - Numerical Aperture
8. Rabi Oscillations Octave program
9. Two lens system power pairs plot (Python/Octave)
- 10. Focal length and verification of matrix method for thick and thin lenses**
- 11. Achromatic combination of two lenses – in contact and at a distance**
12. Measurement of beam divergence and spot size of a laser
13. Verification of Malus' Law using a laser and polarizers
14. Study of diffraction pattern from circular aperture (Airy disk) – resolving limit
15. Young's double-slit experiment using laser – interference fringes and fringe width
16. Study of bending losses in optical fiber



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For 2025-2029 Batch [w.e.f. 2026-2027]
II B.Sc. SEMESTER – IV MAJOR

PRACTICAL COURSE 8:
ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC THEORY

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded.

- 1. LCR circuit series resonance, Q factor.**
- 2. LCR circuit parallel resonance, Q factor.**
- 3. Determination of AC-frequency –Sonometer.**
- 4. Verification of Kirchhoff's laws and Maximum Power Transfer theorem.**
- 5. Field along the axis of a circular coil carrying current-Stewart & Gee's apparatus.**
- 6. Charging and discharging of CR circuit-Determination of time constant**
- 7. A.C Impedance and Power factor**
- 8. Determination of specific resistance of wire by using Carey Foster's bridge.**
- 9. Study of electric field and equipotential lines using conducting paper/Solution**
- 10. Measurement of inductance using bridge method (Maxwell's or Anderson's bridge)**
- 11. Demonstration of electromagnetic shielding (Faraday cage effect)**
- 12. Study of skin effect using high-frequency AC and measuring resistance variation**
- 13. Simulation of electromagnetic wave propagation using MATLAB/Python**
- 14. Poynting vector direction demonstration using polarizers and wave sources (conceptual demo)**
- 15. Q factor and resonance frequency using CRO in LCR circuits (with variable frequency AC generator).**
- 16. Figure of merit of a moving coil galvanometer.**



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For 2025-2029 Batch [w.e.f. 2026-2027]
II B.Sc. SEMESTER – IV MAJOR

PRACTICAL COURSE 9:
ANALOG ELECTRONICS

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded.

1. CE amplifier design and performance: Measure voltage gain and bandwidth.
2. Transistor biasing circuits: Fixed bias and voltage divider bias—measurement of Q-point.
3. Class-B push-pull amplifier: Construction and efficiency estimation.
4. Negative feedback amplifier: Study gain variation with and without feedback.
5. Study of IC 741 op-amp parameters: Offset voltage, bias current, and CMRR.
- 6. Op-amp inverting and non-inverting amplifiers: Gain and phase comparison.**
- 7. Op-amp adder and subtractor circuits: Build and verify output equations.**
- 8. Op-amp integrator and differentiator: Observe and sketch output waveforms.**
9. Wein's bridge oscillator using op-amp or transistor: Frequency and waveform measurement.
10. Phase-shift oscillator using RC networks and op-amp.
- 11. Verification of De Morgan's theorems.**
- 12. Construction of Half adder and full adders-Verification of truth tables.**
- 13 Logic gates-OR, AND, NOT and NAND gates-Verification of truth tables.**



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For 2025-2029 Batch [w.e.f. 2026-2027]
II B.Sc. SEMESTER – IV MAJOR

PRACTICAL COURSE 10:
ADVANCES IN PHYSICS

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded

1. Photoelectric Effect using UV LED and LDR
2. Determination of Boltzmann Constant from Diode Characteristics
3. Simple Pendulum – Time Period vs. Lagrangian Prediction
4. Atwood Machine – Verification of Newton's Laws
5. LCR Circuit and Impedance Measurement
6. Synthesis of Iron Oxide Nanoparticles (Green Method)
7. Surface Area to Volume Ratio Demonstration Using Sugar Cubes/Sponge
8. Wind Energy Demonstration (Fan + Mini Turbine Setup)
9. Hydrogen Generation via Electrolysis and Fuel Cell Demonstration
10. Efficiency Comparison between LED and Incandescent Bulbs
11. Solar Panel Efficiency under Different Light and Load Conditions
12. Battery/Fuel Cell Voltage Measurement with Varying Load

Simulation-Based or Digital Experiments

13. 1D Particle in a Box – Simulation using PhET/Python
14. Rutherford Scattering Simulation
15. Spin- $\frac{1}{2}$ System and Pauli Matrices – Qiskit or QuTiP
16. Visualization of Kepler's Laws and Satellite Orbits
17. Lagrangian and Hamiltonian Simulation (e.g., Double Pendulum)
18. Basic Quantum Circuit Simulation using IBM Quantum Lab (Qiskit)



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For 2024-2028 Batch [w.e.f. 2025-2026]
III B.Sc. SEMESTER – V MAJOR

PRACTICAL COURSE 12:
APPLICATIONS OF ELECTRICITY & ELECTRONICS

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded

- 1. Acquainting with the soldering techniques**
- 2. Resistor values using color code.**
- 3. Construction of a Step down Transformer and measurement of its output voltage and to compare it with the calculated value.**
- 4. Identification and functionally checking using multimeter.**
- 5. Use the Digital Multimeter and Analog Multimeter to measure the output voltage of an AC & DC power supply and also the voltage and frequency of a AC signal using CRO.**
- 6. Use the Multimeter to check the functionality of a Diode and Transistor. Also test Whether the given transistor is PNP or NPN.**
- 7. Construct a series electric circuit with R, L and C having an AC source and study the frequency response of this circuit. Find the Resonance Frequency (LCR Series).**
- 8. Construct a Parallel electric circuit with R, L & C having an AC source and study the frequency response of this circuit .Find the resonant frequency (LCR Parallel)..**
- 9. Test whether a circuit is a Open circuit or Short Circuit by measuring continuity with a Multimeter and record your readings.**



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For 2024-2028 Batch [w.e.f. 2025-2026]
III B.Sc. SEMESTER – V MAJOR

PRACTICAL COURSE 13:
ELECTRONIC INSTRUMENTATION

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded.

- 1. Familiarization and measurements usage of digital multimeter**
- 2. Measure the AC and DC voltages, frequency using a CRO**
- 3. Study of different wave forms using CRO measure their frequencies and amplitudes.**
4. Display the numbers from 0 to 9 on a single Seven Segment Display module by applying voltages.
5. Displacement transducer-LVDT
6. A.C - Impedance and Power Factor.
7. Maxwell's Bridge – Determination of Inductance.
- 8. Measurement of body temperature using a digital thermometer and list out the error and corrections.**
- 9. Measurement of Blood Pressure of a person using a B.P. meter and record your values and analyze them.**
- 10. Pulse Oximeter.**



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For 2024-2028 Batch [w.e.f. 2025-2026]
III B.Sc. SEMESTER – V MAJOR

PRACTICAL COURSE 14:
OPTICAL INSTRUMENTS AND OPTOMETRY

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded.

1. Evaluation of magnifying power of simple microscope.
2. Measurement of reflection and transmission coefficient of certain materials using a microscope.
3. Resolving power of telescope
4. Determination of radii of different capillary tubes using travelling microscope.
5. Determination of Refractive index of a liquid (water) and convex lens by Boy's method.
6. Removal of refractive errors of eye using combination of lenses.
7. Determination of power of a convex lens by finding its focal length.
8. Aberrations- determination of longitudinal and spherical aberration of a given convex lens.
9. Determination of radius of curvature of given convex lens by forming Newton's rings.



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For 2024-2028 Batch [w.e.f. 2025-2026]
III B.Sc. SEMESTER – V MAJOR

PRACTICAL COURSE 15:
SOLAR ENERGY AND ITS APPLICATIONS

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded.

- 1. Measurement of direct radiation using pyrhelimeter.**
- 2. Measurement of global and diffuse radiation using pyranometer.**
- 3. Evaluation of performance of a flat plate collector**
- 4. Evaluation of solar cell / module efficiency by studying the I – V measurements.**
- 5. Determination of series and parallel of a solar cell / module.**
- 6. Determination of efficiency of two solar cells / modules connected in series.**
- 7. Determination of efficiency of two solar cells / modules connected in parallel.**
- 8. Study the effect of input intensity on the performance of solar cell / module.**
- 9. Study the influence of cell / module temperature on the efficiency.**
- 10. Study the effect of cell / module inclination (tilt angle) on the efficiency of solar PV panel.**
- 11. Study the performance of solar cooker.**



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For 2025-2029 Batch [w.e.f. 2026-2027]
II B.Sc. SEMESTER – III MINOR

PRACTICAL COURSE 1:
MECHANICS AND PROPERTIES OF MATTER

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be conducted and recorded

- 1. Young's modulus by uniform bending**
- 2. Young's modulus by non-uniform bending**
- 3. Rigidity modulus using Torsional pendulum**
- 4. Viscosity of liquid by Poiseuille's method**
- 5. Surface tension by capillary rise method**
- 6. Flywheel – Determination of moment of inertia**
- 7. Viscosity of liquid by Searle's viscometer method**
- 8. Bifilar suspension –moment of inertia of a rectangular body**
- 9. Radius of capillary tube by Hg thread method**
- 10. Optional Simulation-based activity: Time dilation or projectile simulation.**



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For 2025-2029 Batch [w.e.f. 2026-2027]
II B.Sc. SEMESTER – IV MINOR

PRACTICAL COURSE 2:
WAVES AND APPLIED OPTICS

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded.

- 1. Determination of 'g' by compound/bar pendulum**
- 2. Simple pendulum normal distribution of errors-estimation of time period and the error of the mean by statistical analysis**
- 3. Verification of inverse square law of light using photovoltaic cell.**
3. Determination of radius of curvature of a given convex lens-Newton's rings.
4. Resolving power of grating.
5. Study of optical rotation – polarimeter.
- 6. Dispersive power of a prism.**
- 7. Determination of wavelength of light using diffraction grating-minimum deviation method.**
8. Determination of wavelength of light using diffraction grating-normal incidence method.
- 9. Determination of thickness of a thin wire by wedge method**
10. Refractive index of liquid using laser and rectangular container
11. Optical fiber – Numerical Aperture.



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For 2024-2028 Batch [w.e.f. 2025-2026]

III B.Sc. SEMESTER – V MINOR

PRACTICAL COURSE 5:
APPLICATIONS OF ELECTRICITY & ELECTRONICS

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded

- 1. Acquainting with the soldering techniques**
- 2. Resistor values using color code.**
- 3. Construction of a Step down Transformer and measurement of its output voltage and to compare it with the calculated value.**
- 4. Identification and functionally checking using multimeter.**
- 5. Use the Digital Multimeter and Analog Multimeter to measure the output voltage of an AC & DC power supply and also the voltage and frequency of a AC signal using CRO.**
- 6. Use the Multimeter to check the functionality of a Diode and Transistor. Also test Whether the given transistor is PNP or NPN.**
- 7. Construct a series electric circuit with R, L and C having an AC source and study the frequency response of this circuit. Find the Resonance Frequency (LCR Series).**
- 8. Construct a Parallel electric circuit with R, L & C having an AC source and study the frequency response of this circuit .Find the resonant frequency (LCR Parallel)..**
- 9. Test whether a circuit is a Open circuit or Short Circuit by measuring continuity with a Multimeter and record your readings.**



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III B.Sc. SEMESTER – V MINOR

PRACTICAL COURSE 6:
ELECTRONIC INSTRUMENTATION

Hours: 30

Credits: 1

2 hrs/week

Minimum of 6 experiments to be done and recorded.

- 1. Familiarization and measurements usage of digital multimeter**
- 2. Measure the AC and DC voltages, frequency using a CRO**
- 3. Study of different wave forms using CRO measure their frequencies and amplitudes.**
- 4. Display the numbers from 0 to 9 on a single Seven Segment Display module by applying voltages.**
- 5. Displacement transducer-LVDT**
- 6. A.C - Impedance and Power Factor.**
- 7. Maxwell's Bridge – Determination of Inductance.**
- 8. Measurement of body temperature using a digital thermometer and list out the error and corrections.**
- 9. Measurement of Blood Pressure of a person using a B.P. meter and record your values and analyze them.**
- 10. Pulse Oximeter.**
