



DEPARTMENT OF PHYSICS

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR

(Affiliated to Adikavi Nannaya University)

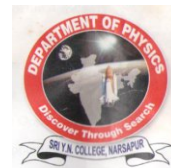
Thrice Accredited by NAAC at 'A' Grade

Recognized by UGC as 'College with Potential for Excellence'

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

I B.Sc. PHYSICS SEMESTER – I-MAJOR

COURSE 1: INTRODUCTION TO MATHEMATICAL PHYSICS



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.

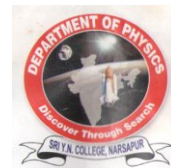
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I B.Sc. PHYSICS SEMESTER – I-MAJOR COURSE 1: INTRODUCTION TO MATHEMATICAL PHYSICS

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 2025-2028 Batch [w.e.f. 2025-2026]
I B.Sc. SEMESTER – I-MAJOR
COURSE 2: MECHANICS AND PROPERTIES OF MATTER

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:

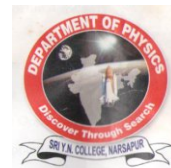
1. B.Sc Physics -Telugu Academy, Hyderabad
2. Mechanics - D.S. Mathur, Sulthan Chand & Co, New Delhi
3. Mechanics - J.C. Upadhyaya, Ramprasad & Co., Agra
4. Properties of Matter - D.S. Mathur, S. Chand & Co, New Delhi, 11th Edn., 2000
5. Physics Vol. I - Resnick- Halliday- Krane, Wiley, 2001
6. Properties 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



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



B.Sc. (HONOURS) PHYSICS SINGLE MAJOR
For 2025-2028 Batch [w.e.f. 2025-2026]
I B.Sc. SEMESTER II PHYSICS SYLLABUS
Major Course 4: HEAT AND THERMODYNAMICS

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 Academy, 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



DEPARTMENT OF PHYSICS
SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR
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Accredited by NAAC at 'A+' Grade



B.Sc. (HONOURS) PHYSICS SINGLE MAJOR
For 2025-2028 Batch [w.e.f. 2025-2026]
I B.Sc. SEMESTER – II PHYSICS SYLLABUS
COURSE 3: WAVES AND OPTICS

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.

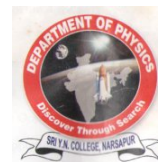
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COURSE 3: MECHANICS AND PROPERTIES OF MATTER

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



DEPARTMENT OF PHYSICS
SRI Y. N. COLLEGE (A), NARSAPUR
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Accredited by NAAC at 'A+' Grade (IV cycle)



II B.Sc. SEMESTER – III

(MAJOR) COURSE 5: OPTICS

SYLLABUS {for 2024-2028 Batch (w.e.f. 2024-2025)}

UNIT-I: Aberrations (9Hrs)

Introduction – Monochromatic aberrations: Spherical aberration, methods of minimizing Spherical aberration: Coma, Astigmatism, Distortion and Curvature of field. Chromatic aberration, Achromatic doublet, Achromatism for two lenses when (i) in contact and (ii) separated by a distance.

UNIT-II: Interference (9Hrs)

Principle of superposition – Coherence, Conditions for interference of light, Fresnel's bi-Prism experiment and determination of wavelength of light – change of phase on Reflection, Oblique incidence of a plane wave on a thin film - Interference 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, Michelson Interferometer -- Determination of wavelength of monochromatic light.

UNIT-III: Diffraction (9Hrs)

Introduction, Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer Diffraction due to single slit -- Fraunhofer diffraction pattern with N slits (diffraction grating), Resolving power of a 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 -- Comparison of Zone plate with Convex lens -- Difference between Interference and Diffraction.

UNIT-IV: Polarization (9Hrs)

Introduction, Methods of polarization by reflection, refraction, double refraction, Brewster's law, Malus's law, Nicol prism – Construction and working as a Polarizer and Analyzer, Quarter wave plate, Half wave plate, Optical activity, Determination of specific rotation by Laurent's half shade Polarimeter.

UNIT-V: Lasers and Holography (9Hrs)

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

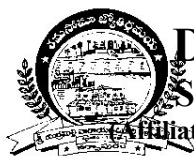
Holography: Basic principle of holography, Gabor hologram and its limitations, Applications of holography.

REFERENCE BOOKS:

1. BSc Physics, Vol.2, Telugu Academy, Hyderabad
2. A Text Book of Optics-N Subramanyam, L Brijlal, S.Chand& Co.
3. Unified Physics Vol.II Optics & Thermodynamics – Jai Prakash Nath&Co.Ltd., Meerut
4. Optics,F.A. Jenkins and H.G. White, Mc Graw-Hill
5. Optics, AjayGhatak,Tata Mc Graw-Hill.
6. Introduction of Lasers – Avadhanulu, S.Chand& Co.
7. Principles of Optics- BK Mathur, Gopala Printing Press, 1995

BLUE PRINT**SEMESTER – III**
COURSE 5: OPTICS

Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: Aberrations	1	1	1
UNIT-II: Interference	1+1 (Problem)	1	1
UNIT-III: Diffraction	1+1 (Problem)	1	1
UNIT-IV: Polarization	1+1 (Problem)	1	1
UNIT-V: Lasers and Holography	1	1	1



DEPARTMENT OF PHYSICS

SRI Y. N. COLLEGE (A), NARSAPUR

Affiliated to Adikavi Nannaya University, Rajamahendravaram

Accredited by NAAC at 'A+' Grade (IV cycle)



II B.Sc. SEMESTER – III

(MAJOR) COURSE 6: HEAT AND THERMODYNAMICS

SYLLABUS *{for 2024-2028 Batch (w.e.f. 2024-2025)}*

UNIT-I: THERMODYNAMICS (9 hrs)

Introduction— Reversible and Irreversible processes, Carnot's Engine and its Efficiency, Carnot's theorem, Second law of thermodynamics, Entropy -- Physical significance, Change in Entropy in Reversible and Irreversible processes, Temperature-Entropy (T-S) diagram and its uses, Change of Entropy when ice changes into Steam.

UNIT-II: 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, Applications: (i) Claussius - Clayperon's equation (ii) Joule – Kelvin coefficient for Ideal gas.

UNIT-III: LOW TEMPERATURE PHYSICS (9hrs)

Methods for producing very low temperatures, Joule-Kelvin effect -- Porous plug experiment, Joule expansion, Distinction between Adiabatic and Joule-Thomson expansion, Expression for Joule-Thomson cooling, Production of low temperatures by Adiabatic demagnetization (Qualitative).

UNIT-IV: QUANTUM THEORY OF RADIATION (9 hrs)

Ferry's Black Body -- Spectral energy distribution of black body radiation, Planck's law of black body radiation – Derivation, Deduction of Wien's law and Rayleigh-Jean's law from Planck's law, Solar constant and its determination using Angstrom Pyrheliometer, Estimation of surface temperature of Sun.

UNIT-V: KINETIC THEORY OF GASES (9hrs)

Introduction, Maxwell's law of distribution of molecular velocities, Mean free path, Principle of equipartition of energy, Transport phenomenon in ideal gases: Viscosity and Thermal conductivity.

REFERENCE BOOKS

1. BScPhysics, Vol.2, TeluguAkademy, Hyderabad
2. Thermodynamics, R.C.Srivastava, S.K.Saha & Abhay K.Jain, Eastern Economy Edition.
3. UnifiedPhysics Vol.2, Optics & Thermodynamics, JaiPrakash Nath & Co. Ltd., Meerut
4. Fundamentals of Physics. Halliday/Resnick/Walker. C. Wiley India Edition 2007
5. Heat and Thermodynamics - N Brij Lal, P Subrahmanyam, S. Chand & Co., 2012
6. Heat and Thermodynamics - M S Yadav, Anmol Publications Pvt. Ltd, 2000
7. University Physics, H D Young, M W Zemansky, F W Sears, Narosa Publishers, New Delhi

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SEMESTER – III

COURSE 6: HEAT AND THERMODYNAMICS

Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: Thermodynamics	1+1 (Problem)	1	1
UNIT-II: Maxwell's Thermodynamic Potentials and Equations	1	1	1
UNIT-III: Low Temperature Physics	1+1 (Problem)	1	1
UNIT-IV: Quantum Theory of Radiation	1+1 (Problem)	1	1
UNIT-V: Kinetic Theory of Gases	1	1	1

II B.Sc. SEMESTER – III

(MAJOR) COURSE 7: ELECTRONIC DEVICES AND CIRCUITS **SYLLABUS {for 2024-2028 Batch (w.e.f. 2024-2025)}**

UNIT I: P-N JUNCTION DIODES (9 hrs)

P-N junction Diode, Formation of depletion region, Forward and Reverse bias of Ideal Diode, Tunnel Diode – Construction and working, V-I characteristics and Applications, Zener diode – V-I characteristics, Zener Diode as a Voltage Regulator -- Applications.

UNIT –II: BI-POLAR JUNCTION TRANSISTOR AND ITS BIASING (D.C) (9 hrs)

Transistor construction, Working of PNP and NPN Transistors, CB, CE, and CC Configurations of Transistor, Input and Output Characteristics of CB and CE configurations, Hybrid parameters of a Transistor and equivalent circuit, Bi-Polar Junction Transistor Biasing – Need for stabilization, Biasing methods – Voltage - Divider Bias.

UNIT-III: FIELD EFFECT TRANSISTORS & POWER ELECTRONIC DEVICES (9 hrs)

Difference between JFET and BJT, Construction and working of JFET, Drain and Transfer Characteristics, MOSFET - Depletion-type, and Enhancement-Type MOSFETs. UJT - Construction, working and V-I characteristics, SCR – Construction, Working and Characteristics.

UNIT IV: PHOTO ELECTRIC DEVICES (9 hrs)

Light-Emitting Diodes (LEDs) - Construction, working, characteristics and Applications, Photo diode - Construction, working characteristics and Applications, Photo-Transistors - Construction, working, characteristics and Applications, Structure and operation of LDR and its Applications

UNIT-V: POWER SUPPLIES (9 hrs)

Rectifiers: Half wave, Full wave and Bridge rectifiers - Efficiency (with derivations), Ripple factor - Filters - Choke input (inductor), L-section, π -section filters. Three terminal fixed voltage IC- regulators (78XX and 79XX)

REFERENCE BOOKS:

1. Electronic Devices and Circuit Theory --- Robert L. Boylestad & Louis Nashelsky.
2. Electronic Devices and Circuits I – T.L.Floyd- PHI Fifth Edition
3. Integrated Electronics – Millmam & Halkias.
4. Electronic Devices & Circuits – Bogart.
5. Sedha R.S., A Text Book Of Applied Electronics, S.Chand & Company Ltd

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SEMESTER – III

COURSE 7: ELECTRONIC DEVICES AND CIRCUITS

Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
Unit I: P-N Junction Diodes	1	1	1
Unit –II: Bi-Polar Junction Transistor and its Biasing (D.C)	2	1	1
Unit-III: Field Effect Transistors & Power Electronic Devices	2	1	1
Unit IV: Photo Electric Devices	1	1	1
Unit-V: Power Supplies	2	1	1

II B.Sc. SEMESTER – III

(MAJOR) COURSE 8: ANALOG AND DIGITAL ELECTRONICS **SYLLABUS** {for 2024-2028Batch (w.e.f. 2024-2025)}

UNIT-I: OPERATIONAL AMPLIFIERS (9 hrs)

- a) Concept of feedback in CE amplifier, Negative and Positive feedback, Advantages and Disadvantages of Negative feedback, Basic concepts of differential amplifier, Block diagram of Op-Amp and its equivalent circuit, IC Diagram (IC 741), Ideal voltage transfer curve, Open loop Op-Amp configurations- differential, inverting and non-inverting Op-Amps.
- b) Voltage Series Feedback Amplifier (Non-Inverting Op amp): Gain and Bandwidth derivations, Voltage Shunt Feedback Amplifier (Inverting Op amp): Gain and Bandwidth derivations

UNIT-II: PRACTICAL OPERATIONAL AMPLIFIER AND APPLICATIONS (9 hrs)

- a) Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Input offset voltage, Input bias current, Input offset current, Total output offset voltage, CMRR, Slew rate and concept of Virtual ground.
- b) Applications of Op-Amp: Linear Applications: Voltage Follower, Summing Amplifier, Subtracting Amplifier, Averaging Amplifier, Difference Amplifier, Integrator and Differentiator, Square Wave response of Integrator and Differentiator (Brief explanation only)

UNIT-III: NUMBER SYSTEMS, CODES AND LOGIC GATES (9 hrs)

- a) Number Systems and Codes: Decimal, Binary, Octal and Hexadecimal number systems, conversions, Binary addition, Binary subtraction using 1's and 2's complement methods, BCD code and Gray code – Conversions
- b) Logic Gates: Construction and truth tables of OR, AND, NOT gates, Universal gates – Basic construction and truth tables of NOR & NAND, Realization of logic gates using NAND and NOR, XOR and XNOR Logic gates symbol and their truth tables. De Morgan's Laws, Boolean Laws, Simplification of Boolean Expressions using Boolean Laws

UNIT-IV: ARITHMETIC CIRCUITS & DATA PROCESSING CIRCUITS (9 hrs)

- a) Half Adder and Full Adder: Explanation of truth tables and Circuits. Half Subtractor and Full Subtractor: Explanation of truth tables and Circuits, 4 - bit binary Adder/Subtractor.
- b) Multiplexers - 2 to 1 Multiplexer, 4 to 1 multiplexer, De-multiplexers: 1 to 2 Demultiplexer, 1 to 4 Demultiplexer, Applications of Multiplexers and Demultiplexers Decoders: 1 of 2 decoders, 2 of 4 decoders, Encoders: 4 to 2 Encoder, 8 to 3 Encoder, Applications of decoders and encoders

UNIT-V: SEQUENTIAL LOGIC CIRCUITS & CODE CONVERTERS 9 hrs

- a) Combinational Logic vs Sequential Logic Circuits, Sequential Logic circuits: Flip-flops, Basic NAND, NOR Latches, Clocked SR Flip-flop, JK Flip-flop, D Flip-flop, Master-Slave Flip-flop, Conversion of Flipflops.
- b) Code Converters: BCD to Decimal Converter, BCD to Gray Code Converter, BCD to 7 segment Decoders

Reference Books:

1. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall
2. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011,
3. Digital Principles and Applications, A.P. Malvino, D.P. Leach and Saha, 7th Ed., TMH
4. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
5. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)
6. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)

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SEMESTER – III

COURSE 8: ANALOG AND DIGITAL ELECTRONICS

Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
Unit-I: Operational Amplifiers	2	1	1
Unit-II: Practical Operational Amplifier And Applications	1	1	1
Unit-III: Number Systems, Codes And Logic Gates	2	1	1
Unit-IV: Arithmetic Circuits & Data Processing Circuits	1	1	1
Unit-V: Sequential Logic Circuits & Code Converters	2	1	1



DEPARTMENT OF PHYSICS
SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR
(Affiliated to Adikavi Nannaya University)

Accredited by NAAC at 'A+' Grade

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

SEMESTER – IV

II B.Sc.: PHYSICS SYLLABUS-MAJOR

COURSE 11: INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS

Hours: 45

Credits: 3

3 hrs/week



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

Nuclear Structure: General Properties of Nuclei, Mass defect, Binding energy; Nuclear forces: Characteristics of nuclear forces- Nuclear Models-Liquid drop model-Semi empirical mass formula, nuclear shell model.

UNIT-II: ELEMENTARY PARTICLES AND INTERACTIONS (9hrs)

Discovery and classification of elementary particles, properties of leptons, mesons and baryons; Types of interactions-strong, electromagnetic and weak interactions; Conservation laws – Isospin, parity, charge conjugation

UNIT-III: NUCLEAR REACTIONS AND NUCLEAR DETECTORS (9hrs)

Nuclear Reactions: Types of reactions, Conservation Laws in nuclear reactions, Reaction energetic, Threshold energy, nuclear cross-section; Nuclear detectors: Geiger-Muller counter, Scintillation counter, Wilson's cloud chamber

UNIT-IV: NUCLEAR DECAYS AND NUCLEAR ACCELERATORS (9hrs)

Nuclear Decays: Gamow's theory of alpha decay, Fermi's theory of Beta- decay, Energy release in Beta-decay, selection rules. Nuclear Accelerators: Types-Electrostatic and electrostatic accelerators; Cyclotron-construction, working and applications; Synchrocyclotron-construction, working and applications.

UNIT-V: APPLICATIONS OF NUCLEAR AND PARTICLE PHYSICS (9hrs)

Medical Applications: Radiation therapy and imaging techniques, nuclear energy: nuclear reactors and power generation, Particle physics in high-energy Astrophysics.

(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. Nuclear Physics, Irving Kaplan, Narosa Pub. (1998).
2. Nuclear Physics, Theory and experiment – P.R. Roy and B.P. Nigam, New Age Int.1997.
3. Atomic and Nuclear Physics (Vol.2), S.N. Ghoshal, S. Chand & Co. (1994).
4. Nuclear Physics, D.C. Tayal, Himalaya Pub. (1997).
5. Atomic and Nuclear Physics, R.C. Sharma, K. Nath& Co., Meerut.
6. Nuclei and Particles, E. Segre.
7. Introduction to Nuclear Physics, H.A. Enge, Addison Wesley (1975).

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SEMESTER – 1V**

COURSE 11: INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: Introduction to Nuclear Physics	2	1	1
UNIT-II: Elementary Particles and Interactions	1	1	1
UNIT-III: Nuclear Reactions and Nuclear Detectors	2	1	1
UNIT-IV: Nuclear Decays and Nuclear Accelerators	2	1	1
UNIT-V: Applications of Nuclear and Particle Physics	1	1	1



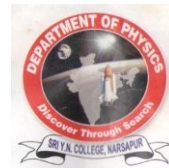
DEPARTMENT OF PHYSICS
SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR
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For 2024-2028 Batch [w.e.f 2024-2025]

SEMESTER – IV

II B.Sc.: PHYSICS SYLLABUS-MAJOR
COURSE 10: MODERN PHYSICS



Hours: 45

Credits: 3

3 hrs/week

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

Bohr's model of the hydrogen atom -Derivation for radius, energy and wave number - Hydrogen spectrum, Vector atom model – Stern and Gerlach experiment, Quantum numbers associated with it, Coupling schemes, Spectral terms and spectral notations, Selection rules. Zeeman effect, Experimental arrangement to study Zeeman effect.

UNIT-II: MOLECULAR STRUCTURE AND SPECTROSCOPY: (9 hrs)

Molecular pure 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. Spectroscopic techniques: IR, UV-Visible, and Raman spectroscopy.

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: QUANTUM MECHANICS: (9 hrs)

Basic postulates of quantum mechanics, Schrodinger time independent and time dependent wave equations- Derivations, Physical interpretation of wave function, Eigen functions, Eigen values, Application of Schrodinger wave equation to (one-dimensional potential box of infinite height (Infinite Potential Well)

UNIT-V: SUPERCONDUCTIVITY: (9 hrs)

Introduction to Superconductivity, Experimental results-critical temperature, critical magnetic field, Meissner effect, Isotope effect, Type I and Type II superconductors, BCS theory, high T_c superconductors, Applications of superconductors.

(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:

- ❖ BSc Physics, Vol.4, Telugu Academy, Hyderabad
- ❖ Atomic Physics by J.B. Rajam; S.Chand& Co.,
- ❖ Modern Physics by R. Murugesan and Kiruthiga Siva Prasath. S. Chand & Co.
- ❖ Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
- ❖ Nuclear Physics, D.C.Tayal, Himalaya Publishing House.
- ❖ S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publ.Co.)
- ❖ K.K.Chattopadhyay&A.N.Banerjee, Introd.to Nanoscience and Technology (PHI LearningPriv.Limited).
- ❖ Nano materials, A K Bandopadhyay. New Age International Pvt Ltd (2007)
- ❖ Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj,BB Rath and J Murday-Universities Press-IIM

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SEMESTER – 1V
COURSE 10: MODERN PHYSICS

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: Introduction to Atomic Structure and Spectroscopy	1+1 (Problem)	1	1
UNIT-II: Molecular Structure and Spectroscopy	1+1 (Problem)	1	1
UNIT-III: Matter waves & Uncertainty Principle	1+1 (Problem)	1	1
UNIT-IV: Quantum Mechanics	1	1	1
UNIT-V: Superconductivity	1	1	1



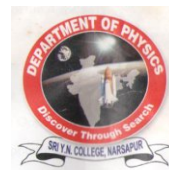
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For 2024-2028 Batch [w.e.f 2024-2025]

SEMESTER – IV

II B.Sc.: PHYSICS SYLLABUS-MAJOR
COURSE 9: ELECTRICITY AND MAGNETISM



Hours: 45

Credits: 3

3 hrs/week

UNIT-I: ELECTROSTATICS AND DIELECTRICS

9hrs

Gauss's law-Statement and its proof, Electric field intensity due to (i) 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

9hrs

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

UNIT-III: MAGNETOSTATICS

4hrs

Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, Ampere's Circuital Law and its application to Solenoid, Hall effect, determination of Hall coefficient and applications.

Electromagnetic Induction

5 hrs

Faraday's laws of electromagnetic induction, Lenz's law, Self-induction and Mutual induction, Self-inductance of a long solenoid, Magnetic Energy density. Mutual inductance of a pair of coils. Coefficient of coupling.

UNIT-IV ELECTROMAGNETIC WAVES-MAXWELL'S EQUATIONS

9hrs

Basic laws of electricity and magnetism- Maxwell's equations-integral and differential forms Derivation, concept of displacement current. Plane electromagnetic wave equation, Hertz experiment-Transverse nature of electromagnetic waves. Electromagnetic wave equation in conducting media. Pointing vector and propagation of electromagnetic waves.

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. BSc Physics, Vol.3, Telugu Academy, 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 R. Murugesan, Kiruthiga Sivaprasath, and M. Saravanapandian
6. Electricity and Magnetism: Theory and Applications" by Ajoy Ghatak and S. 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 SEMESTER – 1V COURSE 9: ELECTRICITY AND MAGNETISM

Chapter / Unit	Section A (4 marks)	Section – B (8 marks)	Section – C (8 marks)
UNIT-I: Electrostatics and Dielectrics	1+1 (Problem)	1	1
UNIT-II: Current electricity	1	1	1
UNIT-III: Magnetostatics Electromagnetic Induction	1+1 (Problem)	1	1
UNIT-IV Electromagnetic waves-Maxwell's equations	1	1	1
UNIT-V Varying and Alternating currents	1+1 (Problem)	1	1



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III B.Sc: SEMESTER – V

PHYSICS 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 B

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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III B.Sc: SEMESTER – V
PHYSICS 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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III B.Sc: SEMESTER – V
PHYSICS 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). $3\frac{1}{2}$ displays and $4\frac{1}{2}$ 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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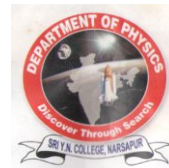
III BSc SEMESTER – V COURSE 13

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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III B.Sc: SEMESTER – V: PHYSICS MAJOR

COURSE 12: APPLICATIONS OF ELECTRICITY AND 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