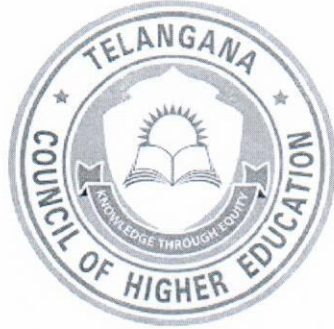


**TELANGANA COUNCIL OF HIGHER EDUCATION
HYDERABAD**



**Scheme of Instructions and syllabus
(Choice Based Credit System)
of
B.Sc. PHYSICS**

With effect from: 2025-2026

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Annexure-I (Credits)

Proposed CBCS Structure from 2025-2026 for Under Graduate Courses

Courses		Papers	Total Credits	Credits for each paper/ Semester					
				B.Sc					
				I	II	III	IV	V	VI
Core Courses (DSC)	Major-1	6	30	5	5	5	5	5	5
	Major-2	6	30	5	5	5	5	5	5
	Minor-1	4	20	5	5	5	5	---	---
MIL/AEC (First language)	English	4	20	5	5	5	5	---	---
Second Language (Telugu, Hindi, Urdu etc.,)		4	20	5	5	5	5	---	---
Multi Disciplinary Course	MDC-1	1	4	---	---	---	---	4	---
SEC 1,2		2	4	---	---	---	---	2	2
SEC 3,4		2	4	---	---	---	---	2	2
Value added course (VAC)	VAC 1,2	2	6	---	---	---	---	3	3
Internships	Internship/Project	1	4	---	---	---	---	---	4
Total Credits in each semester		----	142	25	25	25	25	21	21
Total Credits in UG		---	142						

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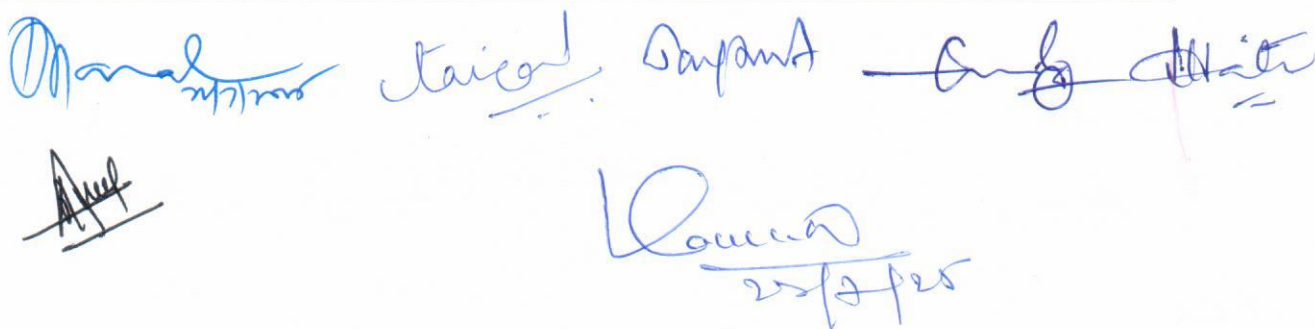
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B.Sc. PHYSICS SYLLABUS

SCHEME OF INSTRUCTIONS UNDER CBCS (w.e.f. 2025-26 academic year onwards)

Year	Semester	Title of the Paper [Theory and Practical]	Instructions Hrs/week	Number of Credits	Total Credits	Marks	
1st Year	I Sem	Paper – I : Mechanics and Oscillations	4	4	5	100	
		Practicals – I :Mechanics and Oscillations Lab	3	1		25	
	II Sem	Paper – II: Thermal Physics	4	4	5	100	
		Practicals – II : Thermal Physics lab	3	1		25	
2nd Year	III Sem	Paper – III : Electromagnetic Theory	4	4	5	100	
		Practicals – III : Electromagnetic Theory Lab	3	1		25	
	IV Sem	Paper – IV : Optics	4	4	5	100	
		Practicals – IV : Optics lab	3	1		25	
3rd Year	V Sem	Paper –V : Modern Physics	4	4	5	100	
		Practical's – V: Modern Physics lab	3	1		25	
		Multi Disciplinary Courses (MDC-1):					
		Radiation Physics		4	4	4	100
		Skill Enhancement Courses (SEC):					
		SEC-1: Communications Skills/Professional Development Skills/ Entrepreneurship & Starts up		2	2	2	50
		SEC-3: Fundamentals of AI Tools/Ability Skills (Competitive Mathematics)		2	2	2	50
		Value Added Course (VAC)					
		VAC-1-Paper-1: Environmental Science (EVS)/ Cyber Security & Cyber laws		3	3	3	75
		VI Sem	Paper – VI : Solid State Physics Solid State Devices	4	4	5	100
	Practicals VI : do		3	1	25		
	Skill Enhancement Courses (SEC):						
	SEC-2: Professional Development Skills /Communications Skills/Entrepreneurship & Starts up		2	2	2	50	
	SEC-4: Biomedical instrumentation		2	2	2	50	
	Value Added Course (VAC)						
	VAC-2--Paper-2: Cyber Security & Cyber laws/Environmental Science (EVS)		3	3	3	75	
	Project work /Internship:						
(Innovative Products making Skill (IPMS))			4	4	4	100	

Total Credits: 52



(Under Graduate Courses (Under CBCS 2025–2026 onwards))

B.Sc. (Physics) - I Year
Semester – I
Paper – I: Mechanics and Oscillations

Unit – I

Vector Analysis (5)

Scalar and Vector fields, Gradient of a Scalar field, Divergence and Curl of a Vector field and their physical significance and related problems. Vector integration, line, surface and volume integrals. Applications of Stokes', Gauss's and Green's theorems.

Rigid Body Dynamics (7)

Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equation, precession of a top, Gyroscope.

Unit – II

Central Forces (7)

Central forces – definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws.

Special theory of Relativity (7)

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

Unit – III

Oscillations(10)

Simple harmonic oscillator, and solution of the differential equation– Physical characteristics of SHM, torsion pendulum measurements of rigidity modulus, compound pendulum, measurement of g.

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance.

Unit – IV

Waves(12)

Fundamentals of Waves -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, energy transport, 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 mid point iii) bar free at both ends iv) bar fixed at one end. Transverse vibrations in a bar - wave equation and its general solution.

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

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Reference books:

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - Tata-McGraw hill Company Edition 2008.
2. **Fundamentals of Physics**. Halliday/Resnick/Walker Wiley India Edition 2007.
3. **First Year Physics - Telugu Academy.**
4. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. McGraw Hill.
5. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman Pearson Education Eleventh Edition.
6. **Theory of relativity - Resnick**
7. **Fundamentals of Physics** by Alan Giambattista et al Tata-McGraw Hill Company Edition, 2008.
8. **University Physics** by Young and Freeman, Pearson Education, Edition 2005.
9. **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow. The McGraw Hill Companies.
10. **Mechanics**. Hans & Puri. TMH Publications.

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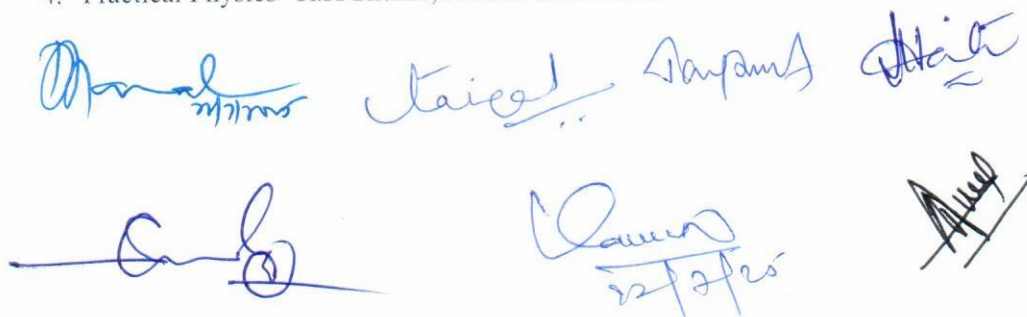
B.Sc. (Physics)- I Year
Semester – I
Paper – I: Mechanics and Oscillations practicals

1. Measurement of errors –simple Pendulum.
2. Calculation of slope and intercept of a $Y = mX + C$ graph by theoretical method (simple pendulum experiment)
3. Study of a compound pendulum- determination of 'g' and 'k'.
4. Moment of Inertia of a fly wheel.
5. Rigidity moduli by torsion Pendulum.
6. Determine surface tension of a liquid through capillary rise method.
7. Determination of Surface Tension of a liquid by any other method.
8. Determine of Viscosity of a fluid.
9. Study of oscillations of a mass under different combination of springs-Series and parallel
10. Study of Oscillations under Bifilar suspension-Verification of axis theorems.
11. Verification of Laws of a stretched string (Three Laws).
12. Velocity of Transverse wave along a stretched string
13. Determination of frequency of a Bar-Melde's experiment
14. Verification of Stokes, Gauss-Divergence and Green's theorem using simulation.
15. Experimental analysis of gyroscope using simulation.

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Reference books:

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastava.

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B.Sc. (Physics)- 1 Year
Semester - II
Paper - II: Thermal Physics

Unit - I

Kinetic theory of gases: (3)

Introduction - Deduction of Maxwell's law of distribution of molecular speeds, Transport Phenomena - Viscosity of gases - thermal conductivity - diffusion of gases.

Thermodynamics: (7)

Basics of Thermodynamics- Carnot's engine (qualitative)-Carnot's theorem -Kelvin's and Clausius statements - Thermodynamic scale of temperature - Entropy, physical significance - Change in entropy in reversible and irreversible processes - Entropy and disorder - Entropy of universe - Temperature- Entropy (T-S) diagram - Change of entropy of a perfect gas-change of entropy when ice changes into steam. Application of entropy in waste management.

Unit - II

Thermodynamic potentials and Maxwell's equations: (6)

Thermodynamic potentials - Derivation of Maxwell's thermodynamic relations - Clausius-Clapeyron's equation - Derivation for ratio of specific heats - Derivation for difference of two specific heats for perfect gas.

Low temperature Physics: (8)

Joule Kelvin effect - liquefaction of gas using porous plug experiment. Joule expansion - Distinction between adiabatic and Joule Thomson expansion - Expression for Joule Thomson cooling - Liquefaction of helium, Kapitza's method - Adiabatic demagnetization - Production of low temperatures - Principle of refrigeration, vapour compression type, Thermocouple- seebeck effect, Peltier effect and Thomson's effect.

Unit - III

Quantum theory of radiation: (12)

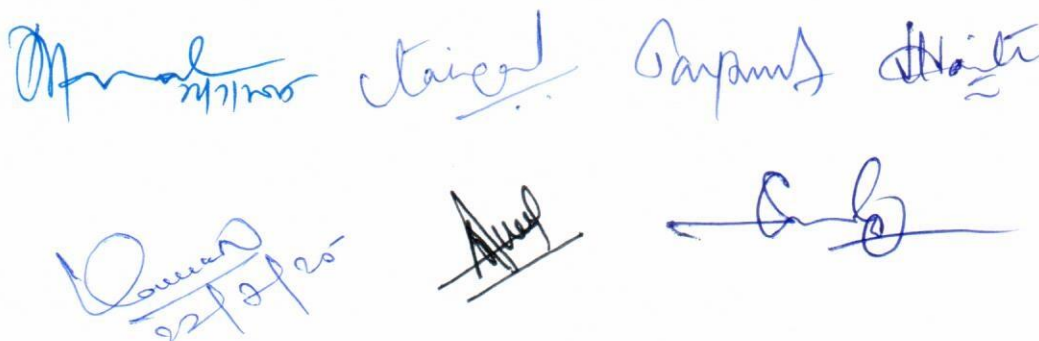
Black body-Ferry's black body - distribution of energy in the spectrum of Black body - Wein's displacement law, Wein's law, Rayleigh-Jean's law - Quantum theory of radiation - Planck's law - deduction of Wein's law, Rayleigh-Jeans law, Stefan's law from Planck's law. Measurement of radiation using pyrometers - Disappearing filament optical pyrometer - experimental determination - Angstrom pyro heliometer - determination of solar constant, effective temperature of sun.

Unit - IV

Statistical Mechanics: (12)

Introduction, postulates of statistical mechanics. Phase space, concept of ensembles and some known ensembles, classical and quantum statistics and their differences, concept of probability, Maxwell-Boltzmann's distribution law -Molecular energies in an ideal gas- Maxwell-Boltzmann's velocity distribution law (qualitative), Bose-Einstein Distribution law- application to Photon energy, Fermi-Dirac Distribution law- free electron gas, comparison of three distribution laws.

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



Suggested books:

1. Fundamentals of Physics. Halliday / Resnick/Walker.C. Wiley India Edition 2007
2. Second Year Physics- Telugu Academy.
3. Modern Physics by R. Murugesan and Kiruthiga Siva Prasath (For statistical Mechanics) S. Chand & co.
4. Modern Physics by G. Aruldas and P. Rajagopal, Eastern Economy Education.
5. Berkeley Physics Course. Volume-5. Statistical Physics by F. Reif. The McGraw-Hill companies.
6. An Introduction to Thermal Physics by Daniel V. Schroeder. Pearson Education Low Price Edition.
7. Thermodynamics by R. C. Srivastava, Subit K. Saha & Abhay K. Jain Eastern Economy Edition.
8. Modern Engineering Physics by A.S. Vasudeva. S. Chand & Co. Publications.
9. B.B. Laud "Introduction to statistical Mechanics" (Macmillan 1981).

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B.Sc. (Physics) – I year
Semester - II
Paper – II: Thermal Physics Practicals

1. Co-efficient of thermal conductivity of a bad conductor by Lee's method.
2. Measurement of Stefan's constant.
3. Specific heat of a liquid by applying Newton's law of cooling correction.
4. Heating efficiency of electrical kettle with varying voltages.
5. Calibration of thermo couple
6. Cooling Curve of a metallic body
7. Resistance thermometer
8. Thermal expansion of solids
9. Study of conversion of mechanical energy to heat.
10. Determine the Specific heat of a solid (graphite rod)
11. Simulations for T-S diagram

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Reference books:

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastava

Anchal Srivastava *Pragati* *Worsnop*

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B.Sc. (Physics)- II year
Semester –III
Paper- III: Electromagnetic Theory

Unit 1: Electrostatics and Dielectrics (14hrs)

Electrostatics

Electric field:-Concept of electric field lines and electric flux, Gauss law (integral and differential forms), applications to linear, plane and spherical charge distributions. Conservative nature of electric field 'E', irrotational field. Electric potential: - concept of electric potential, relation between electric potential and electric field, potential energy of a system of charges. Energy density in an electric field. Calculation of potential from electric field for a spherical charge distribution.

Dielectrics

Dielectric properties of matter, Electric field in matter, polarization, polarization charge, electric susceptibility & dielectric constant, capacitors (Parallel, Spherical, Cylindrical plates) filled with dielectrics, Displacement vector D, Gauss Law in dielectrics, Relation of E, P & D.

Unit 2: Magnetostatics (12hrs)

Concept of magnetic field 'B' and magnetic flux, Biot-Savart's law, B due to straight current carrying conductor. Force on a point charge in a magnetic field. Properties of B, curl and divergence of B, solenoidal field. Integral form of Ampere's law, Applications of Ampere's law: field due to straight, circular and solenoidal currents. Energy stored in magnetic field. Magnetic energy in terms of current and inductance. Magnetic force between two current carrying conductors. Magnetic field intensity. Ballistic Galvanometer: Torque on a current loop in a uniform magnetic field, working principle of B.G., current and charge sensitivity, electromagnetic damping, critical damping resistance.

Unit 3:-Electromagnetic induction and Electromagnetic waves (10hrs)

Faraday's law of induction (differential and integral form), Lenz's law, self and mutual induction, Continuity equation, modification of Ampere's law, displacement current.

Maxwell's equations. Maxwell's equations in vacuum and dielectric medium, boundary conditions, plane wave equation. Transverse nature of EM waves, velocity of light in vacuum and in medium. Poynting's theorem.

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Unit 4:-

Varying and Alternating currents (7)

Growth and decay of currents in LR, CR and LCR circuits- Critical damping, Alternating current, relation between current and voltage in pure R, C and L- vector diagrams- Power in ac circuits. LCR series and parallel resonant circuit- Q-factor. AC and DC motors- single, three phase (basics only). RC low pass, High pass filters.

Network Theorems (7)

Passive elements, power sources, Active elements, Network models: T and π Transformations, Superposition theorem, Thevenin's theorem, Norton's theorem. Reciprocity theorem and Maximum power transfer theorem (problems).

Text Books

1. Fundamentals of electricity and magnetism By Arthur F. Kip (McGraw-Hill, 1968).
2. Telugu Academy.
3. Electricity and magnetism by J.H. Fewkes and John Yarwood, Vol.1 (Oxford Univ. Press, 1991).
4. Introduction to Electrodynamics, 3rd edition, by David J. Griffiths, (Benjamin cummings, 1998).
5. Electricity and magnetism by Edward M. Purcell (McGraw-Hill Education, 1986).
6. Electricity and magnetism by D.C. Tayal (Himalaya Publishing House, 1988).
7. Electromagnetics by Joseph A. Edminister 2nd edition (New Delhi: Tata McGraw Hill, 2006).

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B.Sc. (Physics) – II year
Semester - III
Paper – III: Electromagnetic Theory Practicals

PHYSICS LABORATORY

1. To verify the Thevenin's Theorem
2. To verify Norton's Theorem
3. To verify Superposition Theorem
4. To verify maximum power transfer theorem.
5. To determine a small resistance by Carey Foster's bridge.
6. To determine the (a) current sensitivity, (b) charge sensitivity, and (c) CDR of a B.G.
7. To determine high resistance by leakage method.
8. To determine the ratio of two capacitances by De Sauty's bridge.
9. To determine self-inductance of a coil by Anderson's bridge using AC.
10. To determine self-inductance of a coil by Rayleigh's method.
11. To determine coefficient of Mutual inductance by absolute method.
12. LR circuit
13. RC circuit
14. LCR series circuit
15. LCR parallel circuit

Note: Minimum of eight experiments should be performed.

Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books for Reference:

1. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, New Delhi.
2. InduPrakash and Ramakrishna, A Text Book of Practical Physics, KitabMahal

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B.Sc. (Physics) - II Year
Semester - IV
Paper - IV: Optics

Unit I: Interference: (11)

Principle of superposition - coherence - temporal coherence and spatial coherence - conditions for Interference of light.

Interference by division of wave front: Fresnel's biprism- determination of wavelength of light. Determination of thickness of a transparent material using Fresnel's biprism- Change of phase on reflection- Lloyd's mirror experiment.

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) - Colors of thin films - Non-reflecting films - interference by a plane parallel film illuminated by a point source - Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) - Determination of diameter of wire-Newton's rings in reflected light with and without contact between lens and glass plate, Newton's rings in transmitted light (Haidinger Fringes) - Determination of wave length of monochromatic light .

Unit II: Diffraction: (11)

Introduction - Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction: - Diffraction due to single slit and circular aperture - Limit of resolution - Fraunhofer diffraction due to double slit - Fraunhofer diffraction pattern with N slits (diffraction grating).

Resolving Power of grating - Determination of wavelength of light in normal and oblique incidence methods using diffraction grating.

Fresnel diffraction-Fresnel's half period zones - area of the half period zones -zone plate - Comparison of zone plate with convex lens - Phase reversal zone plate - diffraction at a straight edge - difference between interference and diffraction.

Unit III: Polarization (12)

Polarized light: Methods of Polarization, Polarization by reflection, refraction, Double refraction, selective absorption, scattering of light - Brewster's law - Malus law - Nicol prism polarizer and analyzer - Refraction of plane wave incident on negative and positive crystals (Huygens's explanation) - Quarter wave plate, Half wave plate - Babinet's compensator - Optical activity, analysis of light by Laurent's half shade polarimeter.

Unit-IV: LASERS and Holography (11)

Lasers: Einstein's A and B coefficients. Metastable states. Spontaneous and Stimulated emissions. Optical Pumping and Population Inversion. Three-Level and Four-Level Lasers. Construction and working of Semiconductor laser. Applications of Lasers.

Holography: Basic Principles of Holography- Recording of amplitude and phase- The recording medium- Reconstruction of original wave front- Image formation by wave front reconstruction. Gaber Hologram- Limitations of Gaber Hologram-Off axis Hologram- Fourier transforms Holograms- Volume Holograms, Applications of Holograms.

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

Principles of Optics *Interference* *Diffraction* *Polarization*

Lasers *Holography* *Applications*

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Suggested books

1. Optics by Ajoy Ghatak. The McGraw- Hill companies.
2. Optics by Subramaniam and Brijlak. S. Chand & Co.
3. Second Year Physics- Telugu Academy.
4. Modern Engineering Physics by A.S. Vasudeva. S. Chand & Co. Publications.
5. Fundamentals of Optics by Jenkin's A. Francis and White E. Harvey, McGraw Hill Inc.
6. K. Ghatak, Physical Optics
7. D.P. Khandelwal, 'Optical and Atomic Physics' (Himalaya Publishing House, Bombay, 1988).
8. Jenkin and White, 'Fundamental of Optics' (McGraw Hill).
9. Smith and Thomson, 'Optics' (John Wiley and sons).

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B.Sc. (Physics) – II year
Semester - IV
Paper – IV: Optics Practicals

1. Thickness of a wire using wedge method.
2. Determination of wavelength of light using Biprism.
3. Determination of Radius of curvature of a given convex lens by forming 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. Wavelength of light using diffraction grating – normal incidence method.
9. Resolving power of a telescope.
10. Refractive index of a liquid and glass (Boys Method).
11. Pulfrich refractometer – determination of refractive index of liquid.
12. Wavelength of Laser light using diffraction grating.
13. To determine the wavelength of laser source using diffraction of single slit.
14. To determine the wavelength of laser source using diffraction of double slits.

Note: Minimum of eight experiments should be performed Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastav.

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B.Sc. (Physics)- III Year
Semester- V
Paper – V: Modern Physics

Unit –I: SPECTROSCOPY (12 Hrs)

Atomic spectra: Introduction- Drawbacks of Bohr's atomic model (qualitative)- Sommerfeld's elliptical orbits (qualitative)- relativistic correction (no derivation). Stern-Gerlach experiment, Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Spectral terms, selection rules, intensity rules- spectra of alkali atoms, doublet fine structure, Zeeman Effect, Paschen-Back Effect and Stark effect (basic idea).

Molecular Spectroscopy: Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule. Determination of inter nuclear distance. Vibrational energies and spectrum of diatomic molecule. Raman Effect, classical theory of Raman Effect. Experimental arrangement for Raman Effect and its applications.

Unit-II: Quantum Mechanics (14 Hrs)

Inadequacy of classical Physics: Spectral Radiation- Planck's law (only discussion). Photoelectric effect- Einstein's photoelectric equation. Compton's Effect- experimental verification.

Matter waves & Uncertainty principle: de-Broglie's hypothesis- wavelength of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Double slit experiment. Standing de-Broglie waves of electron in Bohr orbits. Heisenberg's uncertainty principle for position and momentum (x & P_x). Energy and Time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Complementary principle of Bohr.

Schrodinger Wave equation

Schrodinger's time independent and time dependent wave equations. Wave function properties- Significance. Basic postulates of quantum mechanics. Operators, Eigen functions and Eigen values, expectation values.

Unit-III: Nuclear Physics (10 Hrs)

Nuclear Structure: Basic properties of nucleus- size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment (Qualitative). Binding energy of nucleus, deuteron binding energy, p-p, n-n and n-p scattering (concepts), nuclear forces, nuclear models- liquid drop model, shell model.

Alpha and Beta Decays: Range of alpha particles, Geiger- Nuttall law. Gamow's theory of alpha decay. Geiger- Nuttall law from Gamow's theory. Beta spectrum- neutrino hypothesis, Particle detectors- GM counter, Proportional counter, Scintillation counter. Tunnel diode- characteristics of Tunnel diode. Cosmic Rays and its characteristics.

Unit-IV: Basics of Quantum Computing

Introduction to quantum information science, Qubits and quantum superposition- Dirac notation, Bloch sphere representation, quantum gates and circuits, single-qubit and multi-qubit gates, entanglement. Applications of quantum computing.

Introduction to quantum dots. Characteristics of quantum dots, precursors, synthesis of quantum dots- top-bottom and bottom-top colloidal method, Applications of quantum dots.

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Anil Kumar, 22/2/25, Rajat, 22/2/25, 22/2/25, 22/2/25, 22/2/25

Suggested books

1. Modern Physics by G. Aruldas & P. Rajagopal. Eastern Economy Edition.
2. Concepts of Modern Physics by Arthur Beiser. Tata McGraw Hill Edition.
3. Modern Physics by R. Murugesan and Kiruthiga Siva Prasath. S. Chand & Co.
4. Nuclear Physics by D.C. Tayal, Himalaya Publishing House.
5. Molecular Structure and Spectroscopy by G. Aruldas. Prentice Hall of India, New Delhi.
6. Spectroscopy- Atomic and Molecular by Gurdeep R. Chatwal and Shyam Anand- Himalaya Publishing House.
7. Third Year Physics- Telugu Academy.
8. Elements of Solid State Physics by J.P. Srivastava. (For Chapter on nanomaterials)- Printice Hall of India Pvt. Ltd.
9. Quantum dots: Emerging materials for versatile applications, N. Thejo Kalyani, Sanjay J. Dhoble, Marta Michalska- Domanska, B. Vengadaesvaran, H. Nagabhushana, Abdul Kariem Arof. Woodhead publishing Series in Electronic and optical materials

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B.Sc. (Physics Practical) – III year

Semester – V

Paper - V: Modern Physics Practicals

1. Measurement of Planck's constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
3. To determine the Planck's constant using LEDs of at least 4 different colors.
4. To determine the ionization potential of mercury.
5. To determine the absorption lines in the rotational spectrum of Iodine vapour.
6. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
7. To setup the Millikan oil drop apparatus and determine the charge of an electron.
8. To show the tunneling effect in tunnel diode using I-V characteristics.
To determine the value of e/m for electron by long solenoid method.
9. Photo Cell – Determination of Planck's constant.
10. To verify the inverse square law of radiation using a photo-electric cell.
11. To find the value of photo electric work function of a material of the cathode using a photo-electric cell.
12. Measurement of magnetic field – Hall probe method.
13. To determine the dead time of a given G.M. tube using double source.
14. Hydrogen spectrum – Determination of Rydberg's constant
15. Energy gap of intrinsic semi-conductor

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal

Note: Minimum of eight experiments should be performed

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B.Sc. (Physics)- III year
Semester – VI
Paper- VI :: Solid State Physics and Solid State Devices

Unit-I (12Hrs)

Crystal Structure: Crystalline nature of matter. Crystal lattice, Unit Cell, elements of symmetry, Crystal systems, Bravais lattices. Miller indices. Simple crystal structures (S.C., BCC, FCC, CsCl, NaCl, diamond and Zinc Blende)

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

Band theory and P-N junction

Basics of band theory- valence band, conduction band and forbidden energy gap in conductors, insulators and semiconductors. Semiconductors-intrinsic and extrinsic semiconductors, N-type semiconductor, P-type semiconductors, Fermi level, continuity equation (qualitative). Diodes: P-N junction diode, Half-wave and full-wave rectifier, Bridge rectifier (qualitative). Zener diode & characteristics, Zener diode as voltage regulator.

Unit -II (12 Hrs)

Bipolar Junction Transistor (BJT)- p-n-p and n-p-n transistors, current components in transistors, CB, CE and CC configuration-transistor biasing- Voltage divider biasing, transistor characteristics – input and Output characteristics– CE configuration, AC and DC load line analysis- Transistor as an amplifier- RC coupled amplifier- frequency response (Qualitative Analysis).

Feedback concept & Oscillators: Feedback, General concepts and oscillators: Feedback, General theory of feedback- characteristics of negative feedback, concepts of oscillators, Barkhausen's criteria, Phase shift oscillator- Expression for frequency of oscillations.

Unit-III: (10Hrs)

Special devices- Construction and Characteristics: Photo diode- Shockley diode- Solar cell, solar panel, Opto- couplers, Field Effect Transistor(FET)- Transfer characteristics of JFET, FET as an amplifier- Uni Junction Transistor(UJT), UJT as a relaxation oscillator- Silicon controlled rectifier (SCR)- SCR as a switch- LDR and its characteristics.

Unit-IV: (14 Hrs)

Digital Electronics

Introduction of number system, Hexadecimal number system. Conversion from binary and decimal to hexadecimal and vice-versa, Binary addition & subtraction (1's and 2's complements method), Logic gates- AND, OR, NOT gates & Truth tables, Realization of these gates with discrete components, NAND & NOR as universal gates, Exclusive-OR gate, half adder and Full adder, De-Morgan's Laws, Boolean laws simplification using Karnaugh map (k-map).

Data processing circuits: Multiplexer, Demultiplexer, Decoders, Encoders.

Integrated circuits: Active and passive components, Discrete components wafer, advantages and drawbacks of ICs, scale of integrated SSI, MSI, LSI & VLSI (basic idea & definitions), classification of linear and digital ICs.

Pranav

Jaigal

Sampat

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Quamir

Arjun

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Suggested books

1. Elements of Solid State Physics by J.P. Srivastava. (for chapter on nanomaterials)-Prentice-hall of India Pvt.Ltd.
2. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
3. Modern Physics by R. Murugesan and Kiruthiga SivaPrasath. S. Chand & Co.
4. Electronic devices and circuits-Millman and Halkias .Mc Graw-Hill Education.
5. Principles of Electronics by V.K.Mehta-S.Chand& Co.
6. Basic Electronics (Solid state)-B.L.Theraja , S.Chand& Co.
7. A First Course in Electronics- Anwar A. Khan and Kanchan K. Dey, PHI.
8. Physics of Semiconductor devices- S.M. Sze.
9. Physics of Semiconductors- Streetman.
10. Basic Electronics- Bernod Grob.
11. Third Year Electronics- Telugu Academy.
12. Digital Principles & applications- A.P. Malvino& D.P. Leech.

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B.Sc. (Physics Practical) – III year
Semester – VI
Paper- VI :: Solid State Physics and Solid State Devices

1. P-N junction diode V- I characteristics.
2. Zener diode V-I characteristics.
3. Zener diode as a voltage regulator
4. Characteristics of a Transistor in CE configuration.
5. R.C. coupled amplifier – frequency response.
6. R C phase shift Oscillator –determination of output frequency.
7. Transfer characteristics of FET.
8. Construction of logic gates (AND, OR, NOT, NAND and NOR gates) with discrete components – Truth table Verification
9. Construction of logic gates (AND, OR, NOT, NAND, NOR and Ex-OR gates) using ICs – Truth table Verification
10. AND, OR, NOT – gates constructions using universal gates – Verification of truth tables.
11. Construction of Half-adder and Full adder. Verification of truth tables.
12. Construction of a model D.C. power supply.

❖ Every student should complete minimum 06 experiments.

Reference books:

1. B.Sc. Practical Physics – C. L. Arora – S. Chand & Co.
2. Viva-voce in Physics – R.C. Gupta, Pragathi Prakashan, Meerut.
3. Laboratory manual for Physics Course by B.P. Khandelwal.
4. Practical Physics by M. Arul Thakpathi by Comptex Publishers.
5. B.Sc. practical physics – Subbi Reddy.

Arul
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Jaigal

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**Skill Enhancement Course IV
VI-SEM**

BIOMEDICAL INSTRUMENTATION

(Credits: 02)

30 hours

Unit I (15 hours)

FUNDAMENTALS OF BIOMEDICAL ENGINEERING

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues - Basic mechanics of spinal column and limbs -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO₂, pO₂, finger-tip oxymeter - ESR, GSR measurements.

Unit II (15 hours)

ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS

Electrodes – Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipments.

IMAGING MODALITIES AND ANALYSIS

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems - Analysis of digital images.

LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery – Advanced 3D surgical techniques- Orthopedic prostheses fixation.

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

References:

1. R. S. Khandpur, Handbook of Biomedical Instrumentation, Tata Mc Graw Hill
2. J. G. Webster, Medical Instrumentation, Application and Design, John Wiley and Sons

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Multi Disciplinary Course (MDC-1)
SEM - V

Question paper pattern

Faculty of Science

Physics

Title of the paper:

Paper:

Duration: 3Hrs]

[Max. Marks : 80

Section-A: Short Answer Questions

(8 x 4 = 32)

Answer any EIGHT questions

1. Unit – I
2. Unit – I
3. Unit – I (Problem)
4. Unit – II
5. Unit – II
6. Unit – II (Problem)
7. Unit – III
8. Unit – III
9. Unit – III (Problem)
10. Unit – IV
11. Unit – IV
12. Unit – IV (Problem)

Section B: Essay Answer Questions

(4 x 12 = 48)

13 (a) Unit – I

OR

(b) Unit – I

14 (a) Unit – II

OR

(b) Unit – II

15 (a) Unit – III

OR

(b) Unit – III

16 (a) Unit – IV

OR

(b) Unit – IV

Practical class *Capacitor* *Unit*

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