# NISHITHA DEGREE COLLEGE

## (AUTONOMOUS)

**Accredited with "A "Grade by NAAC**
**UGC Recognized Under Section 2(f) & 12B**

## *Department of physics*

**Under CBCS**

# B.Sc. physics

**System**

**Scheme w.e.f A.Y 2022-23**

PRINCIPAL
Nishitha Degree College
NIZAMABAD.

V.C. NOMINEE
Board of Studies
Dept. of.....Physics

Head
Department of Physics
Nishitha Degree College, Nizamabad.

| Semester | Paper [ Theory and Practical ] | Instructions Hrs/week | Marks | Credits |
|---|---|---|---|---|
| I | Paper – I : Mechanics & Oscillations | 4 | 100 | 4 |
| | Practicals – I : Mechanics & Oscillations | 3 | 50 | 1 |
| II | Paper – II: Thermal Physics | 4 | 100 | 4 |
| | Practicals – II : Thermal Physics | 3 | 50 | 1 |
| III | Paper – III : Electromagnetic Theory | 4 | 100 | 4 |
| | Practicals – III : Electromagnetic Theory | 3 | 50 | 1 |
| IV | Paper – IV : Waves & Optics | 4 | 100 | 4 |
| | Practicals – IV : Waves & Optics | 3 | 50 | 1 |

**Total credits: 30**

**Skill Enhancement Courses (SEC):**

1. Experimental methods and Errors analysis
2. Electrical circuits and Networking
3. Basic Instrumentation
4. Biomedical Instrumentation
5. Digital Electronics

PRINCIPAL
Nishitha Degree College
NIZAMABAD.

Head
Department of Physics
Nishitha Degree College, Nizamabad.

# Internal Examination Model Paper

**Max.Marks: 30** **Time Duration: 2 Hours**

**SECTION-A**

10 Multiple Choice Questions each carries ½ Mark 10 X ½ = 5 Marks

**SECTION-B**

10 Fill in Blanks Questions each carries ½ Mark 10 X ½ = 5 Marks

**SECTION-C**

5 Short Questions each carries 1 Mark 5 X 1= 5 Marks

**SECTION-D**

1 Assignment Topic minimum 150 words carries 5 Marks 1 X 5= 5 Marks

**SECTION-E**

1Perfoamance Topic either Chart Preparation/Seminar/Experiment/Activity and Attendance carries 10 Marks

1 X 10=10 Marks

## AECC/ SEC Model Paper

**Max.Marks: 35** **Time Duration: 2 Hours**

**SECTION-A**

Answer any Two Questions. Each Carries 2 ½ Marks. 2 X 2 ½ =5 Marks

1. From Unit 1
2. From Unit 1
3. From Unit 2
4. From Unit 2

**SECTION-B**

Answer any Two Questions. Each Carries 15 Marks. 2 X 15 =30 Marks

1. From Unit 1
   or
2. From Unit 1

3. From Unit 2
   or
4. From Unit 2

PRINCIPAL
Nishitha Degree College
NIZAMABAD.

Head
Department of Physics
Nishitha Degree College, Nizamabad.

***B.Sc (Computer Science)***
***Theory Question Paper Pattern***
***Subject :Physics***

Time: 3 hours [Max. Marks: 70]

## Section - A

Answer any **SIX** Questions. All questions carry equal marks. ( 6*5=30 Marks)

1. From Unit I
2. From Unit I
3. From Unit II
4. From Unit II
5. From Unit III
6. From Unit III
7. From Unit IV
8. From Unit IV
9. From Unit I (OR) III
10. From Unit II (OR) IV

## Section - B

Answer ALL questions. All questions carry equal marks. ( 4*10=40 Marks )

11. a) From Unit I
    (OR)
    b) From Unit I

12. a) From Unit II
    (OR)
    b) From Unit II

13. a) From Unit III
    (OR)
    b) From Unit III

14. a) From Unit IV
    (OR)
    b) From Unit IV

Recd. the original.

3.1.'23
DIRECTOR
Nishitha Degree College
NIZAMABAD.

NISHITHA DEGREE COLLEGE ★ Department of Physics ★ NIZAMABAD.

## B.Sc. (Physics) – I year
## Semester - I
### Paper – I: Mechanics and Oscillations
### (DSC - Compulsory)

**Unit – I**

**Vector Analysis (10)**

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

**Unit – II**

**Mechanics of Particles (6)**

Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section.

**Mechanics of Rigid Bodies (6)**

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 – III**

**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 – IV**

**Oscillations(12)**

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

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

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

PRINCIPAL
Nishitha Degree College
NIZAMABAD.

Head
Department of Physics
Nishitha Degree College, Nizamabad.

**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*


**INTERNAL ASSESSMENT TEST - I**

**INTERNAL ASSESSMENT TEST - II**

**SKILL BASED TEST :**

* **ATTENDANCE**
* **CHAT PRESENTATIONS**
* **SEMINARS**
* **MINI PROJECTS**

PRINCIPAL
Nishitha Degree College
NIZAMABAD.

**Head**
**Department of Physics**
Nishitha Degree College, Nizamabad.

## B.Sc. (Physics) – I year
## Semester - I
### Paper – I: Mechanics and Oscillations Practicals
### (DSC - Compulsory)

1. Measurement of errors –simple Pendulum.
2. Calculation of slope and intercept of a Y= mX +C graph by theoretical method (simplependulum experiment)
3. Study of a compound pendulum- determination of 'g' and 'k'.
4. Y by uniform Bending
5. Y by Non-uniform Bending.
6. Moment of Inertia of a fly wheel.
7. Rigidity moduli by torsion Pendulum.
8. Determination of Surface Tension of a liquid by any other method.
9. Observation of Lissajous figures from CRO-Frequency ratio.Amlitude and phase difference oftwo waves.
10. Study of oscillations of a mass under different combination of springs-Series and parallel
11. Study of Oscillations under Bifilar suspension-Verification of axis theorems

*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.


PRINCIPAL
Nishitha Degree College
NIZAMABAD.

Head
Department of Physics
Nishitha Degree College, Nizamabad.

## B.Sc. (Physics)- I Year

**Semester – II**

**Paper – II: Thermal Physics**

**(DSC - Compulsory)**

**Unit – I**

**Kinetic theory of gases: (4)**

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

**Thermodynamics: (8)**

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.

**Unit – II**

**Thermodynamic potentials and Maxwell's equations: (6)**

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

**Low temperature Physics: (6)**

Joule Kelvin effect – liquefaction of gas using porous plug experiment—Thomson cooling – Liquefaction of helium, Kapitza's method – Adiabatic demagnetization – Production of low temperatures.

**Unit – III**

**Quantum theory of radiation: (12)**

Black body – distribution of energy in the spectrum of Black body – Wein's displacement 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 – Angstrompyro 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 - Maxwell-Boltzmann's velocity distribution law, Bose-Einstein Distribution law, Fermi-Dirac Distribution law, comparison of three distribution laws.

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

PRINCIPAL
Nishitha Degree College
NIZAMABAD.

Head
Department of Physics
Nishitha Degree College, Nizamabad.

**Reference books:**


1. **Fundamentals of Physics**. Halliday/Resnick/Walker.*C. Wiley India Edition 2007.*
2. **Second Year Physics** – *Telugu Academy.*
3. **Modern Physics** by R. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co.*
4. **Modern Physics** by G. Aruldhas 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 statistics Mechanics"**(Macmillan 1981)


**INTERNAL ASSESSMENT TEST - I**

**INTERNAL ASSESSMENT TEST - II**

**SKILL BASED TEST :**

* **ATTENDANCE**
* **CHAT PRESENTATIONS**
* **SEMINARS**
* **MINI PROJECTS**

PRINCIPAL
Nishitha Degree College
NIZAMABAD.

Head
Department of Physics
Nishitha Degree College, Nizamabad.

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

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. Study of conversion of mechanical energy to heat.
8. Determine the Specific heat of a solid ( graphite rod )

*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 Srivasta


PRINCIPAL
Nishitha Degree College
NIZAMABAD.

Head
Department of Physics
Nishitha Degree College, Nizamabad.

## B.Sc. (Physics)- II Year

**Semester – III**

**Paper – III: Electromagnetic Theory**

**(DSC - Compulsory)**

**Unit I : Electrostatics (11 hrs)**

Electric Field:- Concept of electric field lines and electric flux, Gauss's law (Integral and differential forms), application 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.

**Unit II : Magnetostatics (12 hrs)**

Concept of magnetic field 'B' and magnetic flux, Biot-Savart's law, B due to a 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.

**Unit III: Electromagnetic Induction and Electromagnetic waves (13)**

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

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 IV: Varying and alternating currents (6)**

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 resonant circuit - Q-factor. AC & DC motors-single phase, three phase (basics only).

**Network Theorems(6)**:

Passive elements, Power sources, Active elements, Network models: T and $\pi$ Transformations, Superposition theorem, Thevenin's theorem, Norton's theorem. Maximum power transfer theorem (Simple problems).

PRINCIPAL
Nishitha Degree College
NIZAMABAD.

**Head**
**Department of Physics**
Nishitha Degree College, Nizamabad.

**Reference 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& John Yarwood. Vol.I (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 ed.(New Delhi: Tata McGraw Hill, 2006).


**INTERNAL ASSESSMENT TEST - I**

**INTERNAL ASSESSMENT TEST - II**

**SKILL BASED TEST :**

* **ATTENDANCE**
* **CHAT PRESENTATIONS**
* **SEMINARS**
* **MINI PROJECTS**

PRINCIPAL
Nishitha Degree College
NIZAMABAD.

**Head**
**Department of Physics**
Nishitha Degree College, Nizamabad.

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

1. To verify the Thevenin Theorem.
2. To verify Norton 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

PRINCIPAL
Nishitha Degree College
NIZAMABAD.

Head
Department of Physics
Nishitha Degree College, Nizamabad.

**B.Sc. (Physics) - II Year**
**Semester – IV**
**Paper – IV: Waves and Optics**
**(DSC - Compulsory)**

**Unit-I : 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 free at both ends. Transverse vibrations in a bar- wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

**Unit II: Interference: (12)**

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 wave length of light. Determination of thickness of a transparent material using 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) – Colours of thin films – Non-reflecting films – interference by a plane parallel film illuminated by a point source –Determination of diameter of wire-Newton's rings in reflected light with and without contact between lens and glass plate– Determination of wave length of monochromatic light – Michelson Interferometer – types of fringes –Determination of wavelength of monochromatic light.

**Unit III: Diffraction: (12)**

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 .

Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating.

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

**Unit IV: Polarization (12)**

Polarized light : Methods of Polarization, Polarizatioin 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 (Huygen's explanation) – Quarter wave plate, Half wave plate – Babinet's compensator – Optical activity, analysis of light by Laurent's half shade polarimeter.

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

PRINCIPAL
Nishitha Degree College
NIZAMABAD.

**Head**
**Department of Physics**
Nishitha Degree College, Nizamabad.

**Reference books:**


1. Optics by Ajoy Ghatak. *The McGraw-Hill companies.*
2. Optics by Subramaniyam and Brijlal. *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 Jenkins 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. Jenkins and White: 'Fundamental of Optics' (McGraw-Hill)
9. Smith and Thomson: 'Optics' (John Wiley and sons).


**INTERNAL ASSESSMENT TEST - I**

**INTERNAL ASSESSMENT TEST - II**

**SKILL BASED TEST :**

* **ATTENDANCE**
* **CHAT PRESENTATIONS**
* **SEMINARS**
* **MINI PROJECTS**

PRINCIPAL
Nishitha Degree College
NIZAMABAD.

Head
Department of Physics
Nishitha Degree College Nizamabad.

**B.Sc(Physics) – II year**
**Semester - IV**
**Paper – IV:Waves and Optics Practicals**
**(DSC - Compulsory)**

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. Verification of Laws of a stretched string (Three Laws).
14. Velocity of Transverse wave along a stretched string
15. Determination of frequency of a bar-Melde□s experiment

***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 threehours per week.*

**Suggested Books**


1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (VaniPublishing 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.


PRINCIPAL
Nishitha Degree College
NIZAMABAD.

Head
Department of Physics
Nishitha Degree College, Nizamabad.