Shri Govind Guru University

GODHRA

Syllabus of

B. Sc. Semester - I

PHYSICS

(Based on NEP-2020)

Effective from August, 2023

B.Sc. – Semester -I (PHYSICS)

Major-1:
BS23MJ1PH1 : PHYSICS(Credit -4)

UNIT -1: Introduction to Classical Mechanics
1. Vector Algebra
    1.0   Introduction
    1.4   Product of two vectors
    1.6   Definition of a vector in terms of its component
    1.11   Triple Scalar Product
    1.12   Reciprocal Vectors
    1.13   Triple Vector Product

2. Vector Analysis
    2.1   Differentiation of Vectors with respect to a scalar
    2.2   Differentiation with respect to time, Velocity and Acceleration
    2.3   Integration of vectors
    2.4   Partial differentiation
    2.5   Gradient of a scalar point function
    2.6   Divergence of a vector
    2.7   The equation of continuity
    2.8   Curl of a vector point function
    2.14   Gauss' theorem
    2.17   Stokes' theorem

> **Text Book: Introduction to Classical Mechanics** by R. G. Takwale& P. S. Puranik
>   (Tata McGraw-Hill Publishing Co. Ltd.)
> ❖ **Reference Book:Mathematical Methods in Physical Sciences** by M. L. Boas
>   Chapter6 (John Wiley &Sons)

UNIT-2: Waves
1. Travelling waves
    16.3   Speed of propagation of waves in a stretched string
    16.4   Longitudinal waves in a bar
    16.5   Plane waves in fluid
    16.6   Transmission of energy by a travelling wave

2. Sound waves

    18.1   Introduction

    18.2   Intensity and Intensity level

    18.3   Loudness and Pitch

> **TextBook: Mechanics, Wave motion & Heat** by - Francis Wetson Sears, (Addision Wesley pub.)

3. Ultrasonics

    23.1   Magnetostriction method

    23.2   Piezoelectric oscillator

    23.3   Piezoelectric detectors

    23.4   Measurement of velocity of ultrasonic waves

    23.6   The Ultrasonic waves & it's Uses

> **Text Book- A Textbook on Oscillations, Waves and Acoustics** by - M. Ghosh, D.Bhattacharya (S. Chand and Company Ltd.)

UNIT-3: Optics

1. Fermat's Principle and its Applications

    2.1   Introduction

    2.2   Fermat's principle of least time

    2.3   Rectilinear propagation of light

    2.4   Reversibility of light rays

    2.5   Laws at reflection

    2.6   Laws of refraction

2. Interference in Thin Films

    15.1   Thin film

    15.2   Plane parallel film

   15.2.1   Interference due to reflected light

    15.4   Haidinger fringes

    15.5   Variable thickness (wedge-shaped) film

    15.6   Newton's ring (15.6.1 to 15.6.9)

> **Text Book: A text book of Optics by** Dr. N. Subrahmanyam, Brijlal and Dr. M. N. Avadhanulu (S. Chand & Company Ltd.Publication)

UNIT-4: Electric and Electronic Circuits

1. Rectifying Circuits

      2.2   Half wave rectifier

      2.3   Voltage regulation

      2.4   Ripple factor

      2.8   Full wave rectifier

      2.9   Bridge rectifier

2. Filter Circuits

      3.1   The inductor filter

      3.3   The capacitor filter

   3.9.1   L-C filter

    3.13 π filter

    3.14   Comparisons of filter circuits

> ➤ **TextBook**: Electronic devices and circuits-an introduction by Allen Mottershead, (Published by PHI Learning private Ltd., New Delhi)

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Syllabus of

B. Sc. Semester - I

PHYSICS

(Based on NEP-2020)

Effective from August, 2023

B. Sc. - Semester – I (PHYSICS)
MAJOR-2
BS23MJ1PH2 : PHYSICSPRACTICAL(Credit-4)
Minimum 10 practical must be performed (5 in each group)

GROUP A

1. **Melde's Experiment.**

   To prove P/L constant.

2. **Melde's Experiment.**

   To prove T/L^2 constant.

3. **Newton's Ring.**

   To find the wave length of light of given monochromatic source.

4. **Cauchy's Constant.**

   To determine Cauchy's constant A and B graphically and to find the wavelength of unknown line of mercury spectrum.

5. **'g' by Bar pendulum.**

   To obtain the value of 'g' by bar pendulum.

6. **Study of Resonator.**

   To test the accuracy of relation n (V + Kv) = constant and to determine the   frequency of unknown fork.

7. **Refractive Index of Liquid using Convex Lens.**

GROUP B

1. **Series Resonance**:

   To determine the frequency of a.c. emf by series resonance circuit varying capacitor.

2. **Parallel Resonance**:

   To determine the frequency of a.c. emf by series resonance circuit by varying capacitor.

3. **How to use Multimeter.**

   Measuring Resistance R, AC & DC Voltage and Current, checking electrical fuse

4. **Half-Wave & Full-wave Rectifier.**

   Obtain load characteristic and %regulation for Full-wave rectifier with-out filter circuit and by using capacitor filter circuit. Determine ripple factor for Full wave rectifier without filter only.

   Bridge Rectifier.

5. Obtain load characteristic and regulation for Bridge rectifier without   using filter circuit and by using capacitor filter circuit. Obtain ripple factor without filter circuit.

6. **Analysis of Errors.**

   Determine the True value, standard deviation, standard error, probable error and percentageerror For various measurements.

7. **Digonalizationofgivenmatrix(2x2).Evaluatetraceofamatrix.**

   Determine the Eigen values of given matrix.

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Syllabus of Multidisciplinary Course

B. Sc. Semester - I

PHYSICS

(Theory & Practical)

(Based on NEP-2020)

Effective from August, 2023

B. Sc. - Semester – I (PHYSICS)
BS23MD1PH1
MDC (Theory):Ray Optics(Credit-2)

Unit-1: Lenses

4.1 Introduction

4.2 Lenses

4.3 Terminology

4.4 Conjugate Points, Planes and Distances

4.5 Image Tracing

4.6 Location of the Image

4.8 Thin Lens

4.9 Lens Equation

4.10 Lens Maker's Equation

4.11 Newton's Lens Equation

4.12 Magnification

4.16 Power

4.17 Equivalent Focal Length of Two Thin Lenses (All sub section)

Unit-2: Lens Aberrations

9.1 Introduction

9.2 Aberrations

9.5 Spherical Aberration

9.6 COMA

9.7 Astigmatism

9.9 Distortion

Unit-3: Optical Instruments

Text Book: A Text Book of OPTICS by Dr. N. Subrahmanyam, Brijlal and Dr. M. N.

Avadhanulu (S. Chand & Company Ltd. Publishers)

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B. Sc. - Semester – I (PHYSICS)

MULTIDISCIPLINARY COURSE (Practical): Ray Optics(Credit-2)

Minimum 5 practical must be performed

1. To determine the focal length of a convex lens.
2. To determine the focal length of the combined lens.
3. To determine the refractive index of a liquid using convex lens and a plane mirror.
4. To determine the radius of curvature of the convex surface of a lens using Newton's rings.
5. To draw the calibration curve (D-λ curve) of a spectrometer with a given prism.
6. To study the dependence of the refractive index of the material of a prism on the wavelength of light and hence to determine the dispersive power of the material of the prism.
7. To determine the resolving power of Telescope.

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Syllabus of

B. Sc. Semester - I

PHYSICS

(Theory & Practical)

(Based on NEP-2020)

Effective from August, 2023

B. Sc. - Semester – I (PHYSICS)

MINOR (Theory):
BS23MN1PH1 : Fundamentals of Physics   (Credit -2)

UNIT -1: Introduction to Classical Mechanics& Gravitation
1. Vector Algebra and Vector Analysis
    1.0   Introduction
    1.4   Product of two vectors
    1.6   Definition of a vector in terms of its component
    1.11   Triple Scalar Product
    1.12   Reciprocal Vectors
    1.13   Triple Vector Product
    2.1   Differentiation of Vectors with respect to a scalar
    2.2   Differentiation with respect to time, Velocity and Acceleration
    2.3   Integration of vectors
    2.4   Partial differentiation

> **TextBook: Introduction to Classical Mechanics** by R. G. Takwale& P. S. Puranik
> (Tata McGraw-Hill Publishing Co. Ltd.)
❖ **Reference Book:Mathematical Methods in Physical Sciences** by M. L. Boas
    Chapter6 (John Wiley &Sons)

2. Gravitation
    6.1   Newton's Law of Gravitation
    6.2   Gravitational Field
    6.3   Gravitational Potential
    6.12   Escape Velocity
    6.13   Kepler's Law of Planetary Motion (All Three)

> **TextBook:** Engineering Physics by R. K. Gaur & S. L. Gupta (DhanpatRai Publications)

UNIT – 2 Optics
1. Fermat's Principle and its Applications
    2.1   Introduction
    2.2   Fermat's principle of least time
    2.3   Rectilinear propagation of light
    2.4   Reversibility of light rays
    2.5   Laws at reflection
    15.2.1   Interference due to reflected light

- ➢ **Text Book: A text book of Optics** by Dr. N. Subrahmanyam, Brijlal and Dr. M. N. Avadhanulu (S. Chand & Company Ltd. Publication)
- ❖ **Reference Books:**
  1. Fiber optics and optoelectronics by R. P. Khare, Oxford university press
  2. An introduction to LASERS – Theory and Applications by M. N. Avadhanulu, S. Chand & Company Ltd.
  3. Optics – Third Edition by Ajay Ghatak

UNIT: 3 Electric and Electronic Circuits

1. Rectifying Circuits & Filter Circuits

- ➢ **Text Book: Electronic devices and circuits-an introduction** by Allen Mottershead, (Published by PHI Learning private Ltd., New Delhi)

2. AC Bridge

- ➢ **Text Book: Modern Electronic Instrumentation and Measurement Techniques** by

Albert D. Helfrick, William D. Cooper (Published by PHI Learning private Ltd., New Delhi)

B. Sc. - Semester – I (PHYSICS)

MINOR(Practical):Fundamentals of Physics Practical   (Credit-2)
Minimum 8 practical must be performed

1. **Newton's Ring.**

   To find the wave length of light of given monochromatic source

2. **Cauchy's Constant.**

   To determine Cauchy's constant A and B graphically and to find the wavelength of unknown line of mercury spectrum.

3. **'g' by Bar pendulum.**

   To obtain the value of 'g' by bar pendulum.

4. **To Determine Wave length of LASER light.**

5. **Refractive Index of Liquid using Convex Lens.**

6. **Half-Wave & Full-wave Rectifier.**

   Obtain load characteristic and %regulation for Full-wave rectifier with-out filter circuit and by using capacitor filter circuit. Determine ripple factor for Full wave rectifier without filter only.

7. **Bridge Rectifier.**

   Obtain load characteristic and regulation for Bridge rectifier without using filter circuit and by using capacitor filter circuit. Obtain ripple factor without filter circuit.

8. **Maxwell's Bridge.**

   To find the value of an inductance of an unknown inductor by using Maxwell's bridge circuit.

9. **Series Resonance.**

   To determine the frequency of a.c. emf by series resonance circuit varying capacitor.

10. **Parallel Resonance.**

    To determine the frequency of a.c. emf by parallel resonance circuit varying capacitor.

11. LDR Characteristics.

Obtain IV characteristics of given LDR and calculate its resistance.

(For at least three different light levels).

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Shri Govind Guru University

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Syllabus of

B. Sc. Semester - II

PHYSICS

(Theory)
BS23MJ2PH1

(Based on NEP-2020)

Effective from December, 2023

B.Sc. – Semester - II (PHYSICS)

BS23MJ2PH1
Major-1: PHYSICS   (Credit -4)

UNIT -1: Introduction to LASER

  22.4   Interaction of light with matter Absorption
        22.4.1 Absorption
        22.4.2 Spontaneous emission
        22.4.3 Stimulated emission
  22.7   Meeting the three requirements
        22.7.1 Population inversion
        22.7.2 Metastable states
        22.7.3 Confining radiation within the medium
  22.8   Components of LASER
        22.8.1 Active medium
        22.8.2 Pumping
        22.8.3 Optical resonant cavity
  22.9   Lasing Action
  22.10   Principal pumping schemes
        22.10.1 Three-level pumping scheme
        22.10.2 Four-level pumping scheme
  22.14   Types of LASERS
        22.14.1 Ruby Laser
        22.14.3 Helium-Neon Laser
        22.14.4 Carbon Dioxide Laser
  22.15   Semiconductor Laser
        22.15.1 PN-Junction Laser
  22.16   LASER beam characteristics
  22.19   Applications

➢ **Text Book: A text book of Optics** by Dr. N. Subrahmanyam, Brijlal and Dr. M. N. Avadhanulu (S. Chand & Company Ltd. Publication)

❖ **Reference Books:**

1. Fiber optics and optoelectronics by R. P. Khare, Oxford university press

2. An introduction to LASERS – Theory and Applications by M. N. Avadhanulu, S. Chand & Company Ltd.

3. Optics – Third Edition by Ajay Ghatak

UNIT-2: Plasma Physics

    1.1 Introduction
    1.2 Composition and characteristics of plasma
    1.3 Collision
    1.4 Surface phenomena
    1.5 Transport phenomena
    1.6 Diffusion and Mobility- Ambipolar diffusion
    1.7 Viscosity: Conductivity
    1.8 Recombination
    1.9 Ohm's Law
    1.11 Comparison of various natural and manmade plasma
    1.12 Plasma diagnostics

➤ **Text Book:** Elements of Plasma Physics By - S. N. Goswami
                (Published by New Central Book Agency (p) Ltd. Culcutta, India)

UNIT-3: Nuclear Physics

1. Physical Tools for Doing Nuclear Physics

    1.1 Introduction
    1.2 Interaction between Particles and Matter- A Brief Survey
    1.3 Detectors for Nuclear Particles
        1.3.1 Proportional Counter
        1.3.2 Scintillation Counter
        1.3.3 Spark Chamber

2. Radioactivity

    2.1 Introduction
    2.2 Properties of Radioactive Rays
    2.3 The Law of Radioactive Decay
    2.6 Radioactive Growth and Decay
    2.9 Radioactive Series
    2.11 Artificial Radioactivity
    2.12 Determination of the age of the Earth
    2.13 Carbon Dating- Archeological Time Scale

➤ **Text Book:** Nuclear Physics – An introduction By S.B.
    Patel (second edition, New Age International Limited)

❖ **Reference Books:-**
1. Nuclear Physics by Irving Kaplan, Narosa Publishing House
2. A Manual Of Radioactivity by Havest and F. A. Paneth, Oxford University Press
3. Experimental Nuclear Physics - Radioactive Decay by E. Segre, New York: Wiley
4. Atomic & Nuclear Physics by Chittaranjan Basu

B. Sc. - Semester – II
UNIT-4: AC Bridge and Digital Electronics

1. AC Bridge
- 5.5   Condition for bridge balance
- 5.6   Maxwell bridge
- 5.8   Schering bridge
- 5.9   Owen's bridge

2. Logic Circuits
- 1.1   Binary Number System
- 1.5   Boolean Algebra
- 1.6   NOR Gates
- 1.7   NAND Gates
- 2.1   Boolean Laws and Theorem

3. Number Systems and Codes
- 4.2   Binary to Decimal Conversion
- 4.3   Decimal to Binary Conversion
- 4.4   Octal Numbers
- 4.5   Hexadecimal Numbers
- 4.6   The ASCII code
- 4.7   The Excess-3 code
- 4.8   The Gray code

➤ **Text Book:** Modern Electronic Instrumentation and Measurement Techniques by Albert D. Helfrick, William D. Cooper (Published by PHI Learning private Ltd., New Delhi)

➤ **Text Book:** Digital Principles and Applications by Albert Paul Malvino, Donald P. Leach. (4th Edition, McGRAW-HILL)

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Syllabus of

B. Sc. Semester - II

PHYSICS

(Practical)

BS23MJ2PH2

(Based on NEP-2020)

B. Sc. - Semester – II
BS23MJ2PH2

MAJOR-2: PHYSICS PRACTICAL   (Credit-4)

1. **Wavelength of LASER**

   To determine the wavelength of given LASER light.

2. **Radioactive Decay**

   Simulation of Nuclear Radioactive Decay using calculator.

3. **Logic Gates (AND, OR, NOT)**

   To verify the truth tables and understanding of voltage for "0" and "1" level.

4. **Universal Logic Gates (NAND, NOR)**

   To verify the truth tables and understanding of voltage for "0" and "1" level.

5. **Maxwell's Bridge**

   To find the value of inductance for unknown inductor using Maxwell's bridge circuit.

6. **Schering Bridge**

   To find the value of capacitance for unknown capacitor using Schering bridge circuit.

7. **Owen's Bridge**

   To find the value of inductance for unknown inductor using Owen's bridge circuit.

8. **De Morgan's Theorem**

   To verify the De Morgan's theorem.

9. **(i) Gray Code to Binary and Decimal conversion (ii) ASCII Code**

   To convert given Gray code into Binary Code and Decimal system.

   To write ASCII code for given words and sentences and vice-versa.

10. **Decimal to Octal and Hexadecimal conversion**

    To convert Decimal number into Octal and Hexadecimal number system and vice-versa.

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Syllabus of

B. Sc. Semester - II

PHYSICS

(Theory & Practical)

BS23MN2PH1

(Based on NEP-2020)

Effective from December, 2023

B. Sc. - Semester – II (PHYSICS)

BS23MN2PH1
MINOR (Theory): Basic Concepts of Physics   (Credit -2)

UNIT -1: Plasma Physics
    1.1   Introduction
    1.2   Composition and characteristics of plasma
    1.3   Collision
    1.4   Surface phenomena
    1.5   Transport phenomena
    1.6   Diffusion and Mobility- Ambipolar diffusion
    1.7   Viscosity: Conductivity
    1.8   Recombination
    1.9   Ohm's Law
    1.11   Comparison of various natural and manmade plasma
    1.12   Plasma diagnostics

> **Text Book:** Elements of Plasma Physics By - S. N. Goswami
>   (Published by New Central Book Agency (p) Ltd. Culcutta, India)

UNIT – 2: Digital Electronics
  1. Logic Circuits
    1.1   Binary Number System
    1.5   Boolean Algebra
    1.6   NOR Gates
    1.7   NAND Gates
  2. Number Systems and Codes
    4.2   Binary to Decimal Conversion
    4.3   Decimal to Binary Conversion
    4.4   Octal Numbers
    4.5   Hexadecimal Numbers
    4.6   The ASCII code
    4.7   The Excess-3 code
    4.8   The Gray code

> **Text Book:** Digital Principles and Applications by Albert Paul Malvino,
>   Donald P. Leach. (4th Edition, McGRAW-HILL)

B. Sc. - Semester – II

MINOR(Practical):Basic Concepts of Physics Practical   (Credit-2)

1. **Logic Gates (AND, OR, NOT)**

   To verify the truth tables and understanding of voltage for "0" and "1" level.

2. **Universal Logic Gates (NAND, NOR)**

   To verify the truth tables and understanding of voltage for "0" and "1" level.

3. **De Morgan's Theorem**

   To verify the De Morgan's theorem.

4. **(i) Gray Code to Binary and Decimal conversion (ii) ASCII Code**

   To convert given Gray code into Binary Code and Decimal system.

   To write ASCII code for given words and sentences and vice-versa.

5. **Decimal to Octal and Hexadecimal conversion**

   To convert Decimal number into Octal and Hexadecimal number system and vice-versa.

6. **Absorption coefficient of liquid using photocell**

   To find out the absorption coefficient of liquid using photocell.

7. **Demonstration experiment using Plasma Ball.**

   Lightning of Bulb or Light Tube using Plasma Ball. (Demonstration)

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Syllabus of

B. Sc. Semester - II
PHYSICS
(Theory&Practical)

BS23MD2PH1

(Based on NEP-2020)

Effective from December, 2023

BS23MD2PH1

MULTIDISCIPLINARY COURSE (Theory): Digital Electronics   (Credit-2)

UNIT – 1: Logic Circuits and Circuit Analysis

1. Logic Circuits
 1.1 Binary Number System
 1.5 Boolean Algebra
 1.6 NOR Gates
 1.7 NAND Gates

2. Circuit Analysis
 2.1 Boolean Laws and theorem
 2.2 Sum of Products method
 2.3 Truth Table to Karnaugh Map
 2.4 Pairs, Quads and Octets
 2.5 Karnaugh simplification
 2.6 Don't care conditions
 2.7 Product of sums method
 2.8 Product of sums simplification

UNIT – 2: Number Systems and Codes

 4.2 Binary to Decimal Conversion
 4.3 Decimal to Binary Conversion
 4.4 Octal Numbers
 4.5 Hexadecimal Numbers
 4.6 The ASCII code
 4.7 The Excess-3 code
 4.8 The Gray code

> **Text Book:** Digital Principles and Applications by Albert Paul Malvino,
> Donald P. Leach. (4th Edition, McGRAW-HILL)

B. Sc. - Semester – II

MULTIDISCIPLINARY COURSE (Practical): Digital Electronics   (Credit-2)

1. **Logic Gates (AND, OR, NOT)**

   To verify the truth tables and understanding of voltage for "0" and "1" level.

2. **Universal Logic Gates (NAND, NOR)**

   To verify the truth tables and understanding of voltage for "0" and "1" level.

3. **De Morgan's Theorem**

   To verify the De Morgan's theorem.

4. **(i) Gray Code to Binary and Decimal conversion (ii) ASCII Code**

   To convert given Gray code into Binary Code and Decimal system.

   To write ASCII code for given words and sentences and vice-versa.

5. **Decimal to Octal and Hexadecimal conversion**

   To convert Decimal number into Octal and Hexadecimal number system and vice-versa.

6. **Absorption coefficient of liquid using photocell**

   To find out the absorption coefficient of liquid using photocell.

7. **Use of Multimeter for measurement**

   To measure resistance R, AC & DC Voltage, Current, Checking electrical fuse other electronic devices