Shree Govind Guru University

GODHRA

Syllabus of B.Sc. Sem.-I & Sem.-II

PHYSICS

Theory & Practicals

(Based on CBCS)

Effective from June 2016

Semester – I

PHYSICS Paper – 101 (Credits – 04)   48 Lectures

UNIT – 1 :   Vector Algebra

(1) Introduction, (1.4) Product of Two Vectors, (1.11) Triple Scalar Product, (1.13) Triple Vector Product, (2.1) Differentiation of Vectors, (2.2) Differentiation with respect to time, Velocity & Accelaration (2.3) Integration of Vectors, (2.4) Partial Differentiation, (2.5) Gradient, (2.6) Divergence of a Vector, (2.8) Curl of a Vector, (2.11) Multiple Operations involving ∇, (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 Chapter 6 (John Wiley & Sons)

UNIT – 2 :   Waves

1. **Travelling waves**
   -Speed of propagation of waves in a stretched string
   -longitudinal waves in a bar
   -plane waves in fluid
   -Transmission of energy by a travelling wave

   Text Book- Mechanics,Wavemotion & Heat
   By - Francis Wetson Sears
   Pub.- Addision Wesley pub.
   Art. 16.3 to 16.6

2. **Sound waves**
   - Introduction
   -Intensity and Intensity level
   -Loudness and Pitch
   -Radiation from a piston
   -Diffraction
   -Radiation efficiency of a sound source

Text Book- Mechanics,Wavemotion & Heat By - Francis Wetson Sears
Pub.- Addision Wesley pub. Art. 18.1, 18.2, 18.3, 18.6, 18.7

3. Doppler effect
-Defination
-Stationary source,Observer in motion
-The source is in motion,Observer is stationary
- limitations of Doppler principle
-Verification of Doppler's principle

Text Book- A text book on Oscillations, Waves and Acoustics
By - M.GHOSH , D. BHATTACHARYA By PUB - S. CHAND
Art. - 8.13 (A) 1,2 ,(B),(C)

4. Ultrasonics
-Magnetostriction method
- Piezoelectric oscillator
-Piezoelectric detectors
-Measurement of velocity of ultrasonic waves
-Diffraction effect and it's application to determine the velocity of ultrasonic waves
-The Ultrasonic waves & it's Uses

Text Book- A text book on Oscillations, Waves and Acoustics
By - M.GHOSH , D. BHATTACHARYA (Pub. S.Chand, Art. No. 23.1 to 23.6)

UNIT – 3 :   Optics & Gravitation

1. Farmat's principle and its applications:
Farmat's principle of least time, laws at reflection, laws of refraction.

2. Interference in thin films:
Thin film, Plane parallel film, Interference due to transmitted light, Haidinger fringes, variable thickness (wedge-shaped) film, Newton's ring.

Text Book :
A text book of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhnulu, S. Chand
Publication: Articles : 2.2, 2.5, 2.6, 15.1 to 15.6 (including all sub articles)

3. Gravitation
6.1 Newton's Law of Gravitation
6.2 Gravitational Field
6.3 Gravitational Potential
6.12 Escape Velocity
6.13 Kepler's Laws of Planetary Motion (all three)
6.14 Proof of Kepler's Laws (all three)
6.15 Satellites
6.16 Time Period of satellite
6.17 State of weightlessness
6.18 Gravity
6.23 Determination of 'g' by Bar Pendulum

Text Book :   Engineering physics   By   R.K. Gaur & S.L. Gupta.
(Dhanpat Rai Publications.)

Reference Book :
Optics– Ajay Ghatak, TMH Edition
Principle of optics – B. K. Mathur
Introduction to Classical Mechanics by R. G. Takwalw and P. S. Puranik (Tata McGraw-Hill Pub. Com. Ltd.)

UNIT – 4   :   Introduction to LASER

1: Fundamentals of LASERS

22.1 – Introduction
22.2 – Attenuation of light in an optical medium
22.3 – Thermal equilibrium
22.4 – Interaction of light with matter
        22.4.1 – Absorption
        22.4.2 - Spontaneous emission
        22.4.3 - Stimulated emission
22.5 – Einstein co-efficients and their relations
        22.5.1 - Einstein co-efficients
        22.5.2 - Einstein Relations
22.7 - Meeting the three requirements
        22.7.1 - Population inversion
        22.7.2 - Matastable states
        22.7.3 - Confining Radition within the medium
22.8 – Components of LASER
        22.8.1 - Active medium
        22.8.2 - Pumping
        22.8.3 - Optical resonant cavity

2: Production and Applications

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
22.16 – LASER beam characteristics
22.17 – Applications

TEXT BOOK : A TEXTBOOK OF OPTICS by Dr.N.SUBRAHMANYAM, BRIJLAL, Dr.M.N.AVADHANULU, S.Chand Publication (Chapter No. :- 22)

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 Eddition by Ajay Ghatak

Other Reference Books for all units :
1. Mechanics by H S Hans & S P Puri. (Tata McGraw Hill Education Private Limited
2. Principles of Physics by Halliday, Resnick, Jearl Walker (9th Addition) Wiley India Pvt. Ltd.
3. University Physics by Hugh D. Young, Roger A. Freedman, A. Lewis Ford (Pearson)
4. Mechanics and Electrodynamics by Brijlal, N. Subramanyam, Jeevan Seshan (S.Chand)
5. Physics Galaxy (Vol. I to IV) by Ashish Arora. (G. K. Publications)

PHYSICS Paper – 102   Practicals   (Credits – 02)

Minimum 10 practicals 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. **Moment of Inertia of Fly wheel**
4. **Cauchy's Constant** To determine Cauchy's constant A and B graphically and to find the wavelength of unknown line of a mercury spectrum.
5 **'g' by Bar pendulum** To obtain the value of 'g' by bar pendulum.
6 **Resonator** To test the accuracy of relation $n^2 (V + Kv) =$ constant and to determine the frequency of unknown fork
7 **To Determine Wave length of LASER light**
8. **Diagonalization of given matrix (2x2). Evaluate trace of a matrix.**

Group B

1 **Value of capacitance**
For given two capacitors determine the value of capacitance for each of them. AND (i) by connecting them in series. (ii) by connecting them parallel.
2. **Value of inductance**
For given two inductors determine the value of inductance for each of them and (i) by connecting them in series (ii) by connecting them parallel.
3. **Study of Transformer**
To determine (i) turn ratio (ii) percentage efficiency (iii) energy loss due to copper, for a given transformer.
4. **Decay Constant**
To verify the exponential law for the decay of a charged capacitor and determine the decay constant of the capacitor.
5. **Logic Gates (AND, OR, NOT)** (Using discrete components)
Verification of truth tables and giving understanding of voltage level for '0'and '1'level.
6 **Series Resonance** : To determine the frequency of a.c. emf by series resonance circuit varying capacitor.
7 **Parallel Resonance**: To determine the frequency of a.c. emf by series resonance circuit by varying capacitor.
8 **How to use Multimeter**
Measuring Resistance R, AC & DC Voltage and Current, checking electrical fuse

Reference Books :
1. Practical Physics   by   Anchal Srivastava & R.K. Shukla
New Age International Publishers
2. Practical Physics   by   D. Chattopadhyay & P.C. Rakshit
New Central Book Agency (P) Ltd.

Semester – II

PHYSICS Paper – 103   (Credits – 04)   48 Lectures

UNIT – 1   :   Electric and Electronic Circuits

1. Diode Circuit
2.2   Half wave rectifier
2.8   Full wave rectifier
2.9   Bridge rectifier
3.1   The inductor filter
3.3   The capacitor filter
3.9.1 L-C filter

Text Book :
Electronic devices and circuits-an introduction by Allen Mottershead, Chapter 2-3,Publish by PHI Learning private Ltd., New Delhi.
        Chapter 2 & 3

2. AC Bridge
5.5   Condition for bridge balance
5.6   Maxwell bridge
5.7   Hay bridge
5.8   Schering bridge
5.10   Wein bridge

Text Book:
Modern Electronic Instrumentation and Measurement Techniques by Albert D. Helfrick, William D. Cooper published by PHI Learning private Ltd., New Delhi, Chapter. 5, Article 5.5 to 5.8, 5.10

3. DC Circuits:
15.5 & 15.6 Growth and Decay of current in L-R Circuit
15.7   Nature of Graphs
15.8 & 15.9 Growth and Discharge of Charge in C-R Circuit
15.12   Discharge of Capacitor through an Inductance

Text Book :
Mechanics and Electrodynamics by Brijlal, N. Subramanyam, Jeevan Seshan (S.Chand)

UNIT – 2 : Electrostatics

1.1   Coulomb's Law
1.3   Electric Field
1.5   Electric Flux
1.6   Gauss' Law (Integral Form)
1.7   Gauss' law (Differential Form)
1.8   Application of Gauss Law (i) The Field due to an infinite layer of positive charge with uniform surface density (ii) The field outside an isolated charged sphere
1.10   Electrostatic Potential
1.11   Relation between the field and the potential. Ex. The potential and field produced by a ring of charges at a point on the axis of ring.
1.12   Two important relations
1.14   Electrostatic Energy.
1.15   Electric Dipole. Potential due to dipole, Electric Field in Cartesian & Polar Co-ordinates.
1.16   Dipole in Uniform Electric field.
1.18   Mutual Potential Energy of Two Dipoles.

Text Book : Elecromagnetics by B.B. Laud.
(New Age International Publishers)

Reference Book :
Fundamentals of Electricity and Magnetism by R.B.Singh & A.K.Shukla
(New Age International Publishers)

UNIT – 3 : Plasma Physics

1.1 - Inrtoduction
1.2 - Composition and characteristics of plsma
1.3 - Collision
1.4 - Surface phenomena
1.5 - Transport phenomena
1.6 - Diffusion and Mobility- Ambipolar diffusion
1.7 - VViscosity : Conductivity
1.8 - Recombination
1.9 - Ohm's Law
1.11 - Comparison of various natural and man made plsma
1.12 - Plasma dignostics
1.13 - Plasma waves and instabilities : confinement of plsma
1.14 - Space plasma

Text Book - Element of plasma physics, By - S.N.Goswami
Pub.- New Central Book Agency (p) Ltd. Culcutta, India.
Art. 1.1 to 1.9 & 1.11 to 1.14

UNIT – 4 : 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

2.7 – Ideal Equilibrium

2.8 – Transient Equilibrium and Secular Equilibrium

2.9 - Radioactive Series

2.10 - Radioactive Isotopes of Lighter Elements

2.11 - Artificial Radioactivity

2.12 - Determination of the age of the Earth

2.13 - Carbon Dating- Archeological Time Scale

3: The Q Equation

3.1 - Introduction

3.2 - Types of Nuclear Reactions

3.3 - Balance of Mass and Energy In Nuclear Reactions

3.4 - The Q Equation

3.5 - Solution of Q Equation

3.6 - Centre of Mass Frame in Nuclear Physics

TEXT BOOK: Nuclear Physics – An introduction, S. B. Patel,
New Age Internationa 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

Other Reference Books for all units :

1. Mechanics by H S Hans & S P Puri. (Tata McGraw Hill Education Private Limited
2. Principles of Physics by Halliday, Resnick, Jearl Walker (9th Addition) Wiley India Pvt. Ltd.
3. University Physics by Hugh D. Young, Roger A. Freedman, A. Lewis Ford (Pearson)
4. Mechanics and Electrodynamics by Brijlal, N. Subramanyam, Jeevan Seshan (S.Chand)
5. Physics Galaxy (Vol. I to IV) by Ashish Arora. (G. K. Publications)

PHYSICS Paper – 104 Practicals (Credits – 02)

Minimum 10 practicals must be performed (5 in each group)

Group A

1 **Optical Lever**
   To determine the flatness and refractive index of glass plate and radius of curvature of lenses by optical lever

2 **Newton's Ring**
   To find the wave length of light of given monochromatic source

3 **Refractive Index of Liquid using Convex Lens**

4 **Activation energy of a semiconductor**.

5 **Analysis of Errors**

6 **Deflection Magnetometer**
   To determine the Ratio (M/H) for given bar magnate using deflection magnetometer in Gauss A and B position.

7 **Radioactive decay**
   Simulation of Nuclear Radioactive decay using Calculator

8 **Thermal expansion coefficient of metal and semiconductor**

Group B

1. **Stefan Constant**
   To verify the Stefan Boltzman's fourth power law by using dc power source

2 **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.

3 **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.

4 **Projection Method**
   To find the value of low resistance by the method of projection of potential.

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

6 **Owen's Bridge**
   To find the value of an inductance of an unknown inductor by using Owen's bridge circuit.

7 **Universal Logic Gates NAND, NOR** (Using discrete components)
   Verification of truth tables and giving understanding of voltage level for '0'and '1'level.

8 **LDR Characteristics**
   Obtain IV characteristics of given LDR and calculate its resistance (for at least three different light levels).

Reference Books :

1. Practical Physics by Anchal Srivastava & R.K. Shukla
   New Age International Publishers

2. Practical Physics by D. Chattopadhyay & P.C. Rakshit
   New Central Book Agency (P) Ltd.