

GUJARAT UNIVERSITY
Syllabus for First Year B.Sc.: Semester – I
Effective from June 2023
PHYSICS PHY-101

UNIT – I: WAVES

Velocity of Acoustic Waves

Velocity of plane longitudinal waves, discuss on the velocity of sound through gases (Newton's value, Laplace's correction), Velocity of longitudinal wave in a solid medium, Velocity of transverse wave propagating along a string stretched under tension.

Speech and Hearing

Human voice, Hearing ear and its structure, mechanism of hearing, Threshold of hearing.

Musical Sound

Musical sound, Musical scale.

Ultrasonics

Magnetostriction method, Piezo-electric oscillator to generate ultrasonics, Measurement of velocity of ultrasonic waves, the ultrasonic waves & its uses.

Reference Books:

1. A text book on oscillations, waves & Acoustics by M. Ghosh, D. Bhattacharya, (S. Chand) Articles: 9.1 to 9.3, 9.5, 18.1, 18.2, 18.4, 19.1, 19.2, 23.1, 23.2, 23.4 and 23.6
2. Mechanics, Wave motion & Heat by Francis Weston Sears (Addison Wesley Publication)

UNIT – II: OPTICS

Farmat's principle and its applications:

Farmat's principle of least time, First and second laws of reflection, First and second laws of refraction.

Interference in thin films: Thin film, Plane parallel film, Interference due to transmitted light, Haidinger fringes, variable thickness (wedge-shaped) film, Newton's ring. Michelson Interferometer, Applications of Michelson interferometer, Fabry-Perot interferometer and etalon

Reference Books:

1. A text book of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhnu, S. Chand Publication. Articles: 2.2, 2.5, 2.6, 15.1 to 15.8, 15.12 (including all sub articles, except 15.2.5, 15.6.10 and 15.12.3)
2. Optics – Ajay Ghatak, TMH Edition
3. Principle of optics – B. K. Mathur

UNIT – III: LASERS

Introduction, Attenuation of light in an optical medium, Thermal equilibrium, Interaction of light with matter, Einstein coefficients and their relations, Light amplification, Meeting the three requirements, Components of Laser, Lasing action, Principal pumping schemes, Type of lasers (excluding Carbon Dioxide Laser), Semiconductor laser, Laser beam characteristics, Applications

Reference Books:

1. A text book of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhanulu, S. Chand Publication:
Chapter 22 (including all sub articles)
2. Fibre Optics and optoelectronics by R. P. Khare, Oxford University Press.
3. An introduction to LASERS- Theory and Applications by M. N. Avadhanulu, S. Chand & Comp. Ltd

GUJARAT UNIVERSITY
Syllabus for First Year B.Sc.: Semester – I
Effective from June 2023
PHYSICS PRACTICAL PHY-102

1. **Spectrometer**
Calibration of spectrometer and find the wavelength of unknown line of a mercury spectrum
2. **Melde's Experiment.**
(i) To prove P/L constant. (ii) To prove T/L^2 constant
3. **Resonator**
To test the accuracy of relation $n^2 (V + Kv) = \text{constant}$ and to determine the frequency of unknown fork.
4. **Flywheel**
To determine the moment of inertia.
5. **To measure a threshold current of a LASER diode at room temperature.**
6. **Study of travelling microscope**
To find distance between two given points, to find diameter of a ring, to find inner and outer diameter of a rubber tube
7. **Least Square Method**
8. **Value of capacitance**
For given two capacitors determine the value of capacitance for each of them (i) by connecting them in series and (ii) by connecting them parallel.
9. **Value of inductance**
For given two inductors determine the value of inductance for each of them (i) by connecting them in series and (ii) by connecting them parallel.
10. **Study of Transformer**
To determine (i) turn ratio (ii) percentage efficiency (iii) energy loss due to copper, for a given transformer.
11. **'g' by Bar pendulum**
To obtain the value of 'g' by bar pendulum.
12. **Logic Gates (AND, OR, NOT) (Using discrete components)**
Verification of truth tables and giving understanding of voltage level for '0' and '1' level.
13. **Half-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.
14. **Series Resonance**
To determine the frequency of a.c. emf by series resonance circuit varying capacitor.

GUJARAT UNIVERSITY
Syllabus for First Year B.Sc.: Semester – II
Effective from June 2023
PHYSICS PHY-103

UNIT – I: Electric & Electronic Circuits

DC Circuits

RL circuits (Growth and decay of current), RC circuit (Charging and discharging of capacitor), L-C-R circuit in series with DC source only the case if $R^2/(4L^2) = 1/LC$ (i.e., up to the differential equation only).

AC Bridges

Condition for bridge balance, Maxwell bridge, Schering bridge, Wein bridge, Owen's bridge

Diode circuits

Load line analysis of a diode circuit, use of diode in rectifier, Half wave, full wave and bridge rectifier with their performance, Capacitor input filter.

Reference Book:

Modern Electronic Instrumentation and Measurement Techniques Helfrick and Cooper, PHI

Articles: 5.5, 5.6, 5.8, 5.10

Mechanics and Electrodynamics, Brijlal, N. Subrahmanyam, Jiven Seshan, S. Chand

Articles: 15.5, 15.6, 15.7

Electricity and Magnetism, D. C. Tayal Articles: 13.3

Electronics Devices and Circuits, Allen Mottershed

Articles: 2.1, 2.3, 2.8, 3.1, 3.4, 3.9, 3.10, 3.13, 4.1, 4.4, 4.6

Basic Electronics and Linear Circuits, Bhargva Kulshreshtha and Gupta TMH Edition

Articles: 4.6, 4.6.1, 4.6.2, 4.7.2, 4

Electronics Devices and Circuit Theory (7th Edition), Robert Boylestead Article: 2.9

UNIT – II: Plasma Physics

Introduction, Composition & characteristics of a plasma, Collisions, Surface phenomena, Transport (or transfer) phenomena, Diffusion & Mobility: Ambipolar Diffusion, Viscosity, Conductivity, Recombination, Ohm's law, Gas Discharge, Comparison of various natural & man-made plasma, Plasma diagnostics, plasma waves & Instabilities confinement of plasma, space plasma.

Reference Book:

Element of Plasma physics by S. N. Goswami, New Central Book Agency (P) Ltd. Calcutta.

UNIT – III: Nuclear Physics

Radioactivity

The law of radioactive decay (review), Radioactive growth and decay, ideal equilibrium, Transient equilibrium and secular equilibrium, Radioactive series, Radioactive isotopes of lighter elements, Artificial radioactivity, Age of earth, Carbon dating (Archaeological time scale)

The Q Equation

Types of Nuclear Reactions, The balance of mass and Energy in Nuclear reactions, The Q Equation, Solution of the Q Equation.

Constituents of the nucleus properties

Measurement of Nuclear radius, Constituents of the nucleus and their properties.

Reference Book:

Nuclear Physics – An introduction, S. B. Patel, New Age International Limited.
Article: 2.3, 2.6 to 2.13, 3.2 to 3.5, 4.1.3,4.1.4.

GUJARAT UNIVERSITY
Syllabus for First Year B.Sc.: Semester – II
Effective from June 2023
PHYSICS PRACTICAL PHY-104

1. **Stefan Constant**
To verify the Stefan Boltzmann's fourth power law by using dc power source.
2. **Radioactive decay**
Simulation of Nuclear Radioactive decay using Calculator.
3. **Newton's rings**
To find the wave length of light of given monochromatic source
To find the radius of curvature of given lens.
4. **Deflection Magnetometer**
To determine the magnetic moment (M) of given bar magnet using deflection magnetometer in Gauss A and B position.
5. **To determine Cauchy's constant A and B using given formula**
6. **Decay Constant**
To verify the exponential law for the decay of a charged capacitor and determine the decay constant of the capacitor.
7. **LDR Characteristics**
Obtain IV characteristics of given LDR and calculate its resistance (for at least three different light levels).
8. **Projection Method**
To find the value of low resistance by the method of projection of potential.
9. **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.
10. **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.
11. **Owen's Bridge**
To find the value of an inductance of an unknown inductor by using Owen's bridge circuit.
12. **I-V Diode characteristics of a PN-junction diode and its load line analysis.**
13. **Parallel Resonance**
To determine the frequency of a.c. emf by series resonance circuit by varying capacitor.
14. **Universal Logic Gates NAND, NOR (Using discrete components)**
Verification of truth tables and giving understanding of voltage level for '0' and '1' level.