GUJARAT UNIVERSITY
Syllabus for First Year B. Sc.: Semester - I
PHYSICS
Effective from June 2017

PHY - 101
Unit – I : Vector Analysis:

Introduction, Applications of Vector Multiplication, Triple Scalar Product, Triple Vector Product, Differentiation of Vectors, Fields, Directional Derivative, Gradient, Some other expressions involving ∇, Green's Theorem in the plane, The Divergence and the Divergence theorem. Gauss's law, The curl and Stoke's theorem.

Reference Book :
Mathematical Methods in Physical Sciences by M. L. Boas (John Wiley & Sons) Chapter 6
Introduction to Classical Mechanics by R. G. Takwalw and P. S. Puranik (Tata McGraw-Hill Pub. Com. Ltd.) Chapters 1,2.

UNIT – II : Waves:

Traveling Waves
Speed of propagation of waves in a stretched string longitudinal waves in a bar, Plane waves in a fluid, transmission of energy by a traveling wave.
Sound waves
Introduction, Intensity & intensity level, Loudness & pitch radiation from a piston, diffraction, radiation efficiency of a sound source.
Newton's and Langrang correction.
Ultrsonics
Magneostriction method,Piezo-electric oscillator, Piezo-electric detectors, Measurement of velocity of ultrasonic waves, diffraction effect & its application to determine the velocity of the waves, the ultrasonic waves & its use.

Reference Book :
Mechanics, Wave motion & Heat by Francis Weston Sears (Addision Wesley Publication)
Articles : 16.3 to 16.6, 18.1, 18.2, 18.3, 18.6, 18.7
A text book on oscillations, waves & Acoustics by M. Ghosh, D. Bhattacharya (S. Chand)
Chapter 23 : Art 23.1 to 23.6

Unit – III : Optics:

Farmat's principle and its applications:
Farmat's principle of least time, laws at reflection, 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.
Matrix Method in Optics :
Introduction, The matrix method, Unit planes, Nodal point planes, A system of two thin lenses.

Reference 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)

Optics – Ajay Ghatak, TMH Edition, Articles : 3.1 to 3.5
Principle of optics – B. K. Mathur

Unit – IV : 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:
A text book of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhnulu, S. Chand Publication: Chapter 22 (including all sub articles)
Fiber Optics and optoelectronics by R. P. Khare, Oxford University Press.
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 2017
PHYSICS Practicals : PHY-102

1. **Newton's Ring**
   To find the wave length of light of given monochromatic source
   To find the radius of curvature of given lens.

2. **Spectrometer**

   Calibration of spectrometer and find the wavelength of unknown line of a mercury spectrum

3. **Melde's Experiment.**
   (i)   To prove P/L constant.   (ii)   To prove T/l^2 constant

4. **Resonator**
   To test the accuracy of relation $n^2 (V + Kv)$ = constant and to determine the frequency of unknown fork.

5. **Flywheel**
   To determine the moment of inertia.

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

7. **Diagonalization of given matrix (2x2). Evaluate trace of a matrix.**
   Remuneration to the Deputy Coordinator

8. **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.

9. **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.

10. **Study of Transformer**
    To determine (i) turn ratio (ii) percentage efficiency (iii) energy loss due to copper, for a given transformer.

11. **Decay Constant**
    To verify the exponential law for the decay of a charged capacitor and determine the decay constant of the capacitor.

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 2017
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. upto the differntial equation only).

AC Bridges:
Condition for bridge balance, Maxwell bridge, Hay bridge, Schering bridge, Wein bridge

Reference Book:
Modern Electronic Instrumentation and Measurement Techniques
Helfrick and Cooper, PHI
Articles: 5.5 to 5.8, 5.10

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 :
Mechanics and Electrodynamics, Brijlal, N. Subrahamanyam, Jiven Seshan, S. Chand
Articles : 15.5, 15.6, 15.7
Electrocity and Magnetism, D. C. Tayal Articles : 13.3
Electronics Devices and Circuits, Allen Mottershead
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 Boylstead Article : 2.9

UNIT – II : Electrostatic:

Differential form of Gauss law, Poison and Laplace Equation, Field between Two concentric spheres which have equal and opposite charges. A useful Theorem in electrostatics, electrostatic potential, Determination of potential Due to uiniformly charged spherical shell. Determination of potential and field by a ring of charges at a point on the axis of the ring. Determination of field of a semicircular uniform distribution of line charge of linear charge density. Determination of a potential and field on the axis and rim of a uniformly charged disc. Electrostatic energy of a continuous distribution of charges, field of a dipole In plane polar coordinate, spherical polar coordinate, Cartesian coordinate System, electric dipole in a non uniform electric field, Mutual potential Energy of two dipoles.

Reference Book :
Electromagnetics by B. B. Laud, New Age International Publishers
Articles: 1.7 to 1.18.

UNIT – III : Plasma Physics:
Introduction, Composition & characteristics of a plasma, Collisions, Surface phenomena, Transport (or transfer) phenomena, Diffusion & Mobility : Ambipolar Diffusion, Viscosity : Conductivity, Recombmation, Ohm's law, Gas Discharge, Comparision 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. Culcutta.

UNIT – IV : Nuclear Physics:

Radioactivity :
The law of radioactive decay (review), Radioactive growth and decay, ideal equilibrium, Transient equilibrium and secular equilibrium, Radio active 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:
Measurment 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 2017
PHYSICS Practicals: P – 104

1. **Stefan Constant**
   To verify the Stefan Boltzman's fourth power law by using dc power source.
2. **Radioactive decay**
   Simulation of Nuclear Radioactive decay using Calculator.
3. **'g' by Bar pendulum**
   To obtain the value of 'g' by bar pendulum.
4. **Deflection Magnetometer**
   To determine the magnetic moment (M) of given bar magnate using deflection magnetometer in Gauss A and B position.
5. **To determine Cauchy's constant A and B using given formula**
6. **X-ray diffraction.**
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.