

**GUJARAT UNIVERSITY**  
**Syllabus for First Year B. Sc.: Semester - II**

**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.

**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. 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 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 (7<sup>th</sup> Edition), Robert Boylestead Article : 2.9

**UNIT – II : Electrostatic:**

Differential form of Gauss law, Poisson 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 uniformly 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, Wiley Eastern Limited

**UNIT – III : 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 – 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:**

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

**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, 4.1.5

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**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 magnet using deflection magnetometer in Gauss A and B position.
5. **Thermal expansion coefficient of metal and semiconductor**
6. **Activation energy of a semiconductor.**
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.

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**PHYSICS Practicals: P – 104**

**Group – A:**

- 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 magnet using deflection magnetometer in Gauss A and B position.
- 5. Thermal expansion coefficient of metal and semiconductor**
- 6. Activation energy of a semiconductor.**
- 7. Universal Logic Gates NAND, NOR (Using discrete components)**  
Verification of truth tables and giving understanding of voltage level for '0' and '1' level.

**Group – B:**

- 1. LDR Characteristics**  
Obtain IV characteristics of given LDR and calculate its resistance (for at least three different light levels).
- 2. Projection Method**  
To find the value of low resistance by the method of projection of potential.
- 3. 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.
- 4. 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.
- 5. Owen's Bridge**  
To find the value of an inductance of an unknown inductor by using Owen's bridge circuit.
- 6. I-V Diode characteristics of a PN-junction diode and its load line analysis.**
- 7. Parallel Resonance**  
To determine the frequency of a.c. emf by series resonance circuit by varying capacitor.