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 (7^{th} 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.

Gujarat University
Ahmedabad

B. Sc. Semester – III
Syllabus for Physics Theory & Practical
(Effective from June 2018)

Unit	Physics Theory PHY – 201 4 Credit Total 100 Marks Internal : 30 Marks External : 70 Marks	Physics Theory PHY – 202 4 Credit Total 100 Marks Internal : 30 Marks External : 70 Marks	Physics Practical PHY – 203 2.5 Credit Total 100 Marks Internal : 30 Marks External : 70 Marks
Unit – I	Solid State Physics	Mathematical Physics	A, B & C three groups : Each group consists of 06 experiments. Total 18 experiments. External Examination: 70 Marks Group B : 23 Marks Group C : 24 Marks Practical batch size: Maximum 15 students.
Unit – II	Electronics	Classical Mechanics	
Unit - III	Modern Physics and Elementary Quantum Mechanics	Nuclear Physics	
Unit - IV	Wave Optics	Dielectrics & Magnetostatic	

In order to give exposure of industry, research institute and higher learning in the field of Physics, Industrial / Institutional visit may be arrange. It is expected that students of S. Y. B. Sc. with Physics as one of the subject must visit the Industry / Research Institute / Institute of higher learning during either III or IV semester.

GUJARAT UNIVERSITY
B. Sc. (PHYSICS) Semester III
PHYSICS : PHY – 201
(4 Credit)

UNIT-I: Solid State Physics

A. The crystalline State: Crystalline, polycrystalline and glassy materials; Basis of crystal structure; Unit cell-Primitive cell structures; Symmetry operations- translation, point, hybrid operations; Classification of Crystal types-two dimensional crystal lattice and three dimensional crystal lattices; Indices of a lattice direction and a lattice plane (Miller indices); Crystal point groups and space groups, space groups, space groups; Common crystal structures, simple cubic structure, BCC, FCC, closed packed and hexagonal close-packed structure, diamond structure.

B. Reciprocal lattice and Crystal Diffraction : Reciprocal lattice; Bragg Law, Laue's interpretation of X-ray diffraction by crystals, Construction of reciprocal lattice, Relationship between a, b, c and a*, b*, c*, Experimental Diffraction Methods, Laue method, Rotating crystal method, powder method, Determination of lattice constants; Selection of incident beam.

Text book: Elements of Solid State Physics (2 Edition) by J. P. Srivastava, PHI Learning
For A - Chapter 1. Art No. 1.1 to 1.7
For B - Chapter 3. Art. No 3.1, 3.2, 3.3, 3.4, 3.5, 3.8.2, 3.9, 3.10

Reference Books:
1. Solid State Physics (6th Edition) by S.O. Pillai, New Age International Publishers
2. Solid State Physics (4th Edition) by S.L Kakani & C. Hemrajani, Sultan Chand & Sons
3. Introduction to Solid State Physics (7th Edition) by C. Kittle, Wiley (India)

UNIT-II: Electronics

Basic characteristics of the Transistor: Basic Transistor amplifier, Two diode analogy for a transistor, Transistor input characteristics, Transistor collector characteristics, collector cut off current I_{CEO}, Forward current transfer ratio CE , Permissible operating area of a transistor CE, The basic common base amplifier, CB, Forward current transfer ratio CB, relation between α and β, collector cut off current I_{CBO}, physical explanation of CB and CE amplifying action, reduction of CE leakage current to I_{CO}, common collector amplifier, identifying the transistor leads

The common emitter amplifier: Graphical analysis of CE class A amplifier, input and output resistance, effect of adding a class A amplifier, conversion efficiency of class A amplifier with a direct coupled resistive load, phase relationship in CE amplifier, input waveform consideration, comparison of basic transistor amplifier

Solid state electronics Devices: Zener diode, Zener diode specification, the voltage regulator circuit, design of a voltage regulator circuit, effect of supply voltage variation, Zener break down mechanism, the tunnel diode, application of tunnel diode ,Introduction of silicon controlled rectifier and Uni junction transistor

Text Book: **Electronics Devices and Circuits By Allen Mottershed, PHI**
Article no, 9.1 to 9.15, 9.18, 11.1 to 11.6, 11.9, 6.1 to 6.6, 6.11, 6.12, 28.1, 28.5

Reference Book: Electronic Principles (7^{th} Edition) by Albert Malvino & David J. Bates, TMcGHill Pub.
Electronic Devices and Circuits by Sanjeev Gupta, Dhanpatrai & Sons

UNIT- III: Modern Physics and Elementary Quantum mechanics

A. Historical origins of quantum theory, Difficulties with Classical: models, optical spectra Black body radiation, Frank- Hertz experiment, Stationary states of atoms. The correspondence principle, Bohr atom, Spectroscopic series, Quantization of the orbits. The Elliptic Orbits, Particle in a box, rigid rotator, Harmonic oscillator, Compton effect, particle diffraction, Wave packets and Einstein De Broglie relation

Text book: Quantum Mechanics by Powel and Crasemann, Addison and Wesley
Articles Nos.: 1.1, 1.2, 1.3, 1.5, 1.7 to 1.10, 1.12 to 1.16, 2.1, 2.2, 2.7

Concept of Modern Physics, Arthur Beiser, TMH Edition

B. The Schrodinger equation and stationary states, a free particle in one dimension, Generalization to three dimensions, Operator correspondence And the Schrodinger equation for a particle subjected to force, Physical Interpretation of wave function, Normalization, Non normalizable wave functions and box normalization, conservation of probability.

Text book: A textbook of Quantum Mechanics, P.M. Mathews, K. Vankatesan
Article Nos. : 2.1 to 2.6

Reference books:
1. Concept of Modern Physics by Arthur Beiser, Tata McGraw Hill Edition
2. Principles of Modern Physics by A.K. Saxena, Narosa Publishing House
3. Modern Physics by Kenneth Krane, Jon Wiley & Sons

UNIT – IV: Wave Optics

A. Diffraction of Light (Fresnel class): Frensnel's half period zones, zone plate, difference between interference & diffraction,

B. Fraunhofer class: Fraunhofer diffraction at two slits, diffraction at N slits, Plane diffraction grating, Dispersive power of grating, Grating at oblique incidence.

C. Resolving power of optical Instrument: Resolving power, Rayleigh's criterion of resolution, resolving power of telescope, relation between magnifying power & the resolving power of telescope, Resolving power of a plane diffraction grating, difference between resolving power & dispersive power of grating, comparison of prism & grating spectra.

Text Book: Optics & atomic physics by Singh, Agrawal (Pragati Prakashan, Meerat)
For A - Chapter 7. Article Nos. : 7.3 and 7.5
For B - Chapter 8. Article Nos. : 8.6 to 8.8, 8.15,8.16
For C - Chapter 9. Article Nos. : 9.1 to 9.4, 9.8 to 9.10

Reference Books:
1**.** Optics by Ajay Ghatak, Tata McGraw Hill Ltd.
2. A Textbook of Optics by N. Subrahmanyam & Brij Lal (S. Chand & Company Ltd.)

GUJARAT UNIVERSITY
B. Sc. (PHYSICS) Semester – III
PHYSICS : PHY – 202
(4 Credit)

UNIT - I: Mathematical Physics

Fourier series: Introduction, Simple Harmonic motion & wave motion – Periodic functions, Applications of fourier series, Average value of a function, Fourier co-efficients, Dirchlet conditions, complex form of fourier series, other intervals, Even & odd functions, Parsevel's theorem, Applications/Numericals on Fourier series.

Text book: Mathematical Methods in Physical Sciences by Mary L. Boas (John Willey & Sons)
Article Nos. : 7.1 to 7.8. 7.11

Reference Book:
1. Mathematical Physics by H.K. Das, S. Chand Publishing Co.
2. Mathematical Physics by Satya Prakash, Pragati Prakashan

UNIT – II: Classical Mechanics

Motion in a Central force field: General features of the motion, Motion in an inverse square law force field, Equation of the orbit, Kepler's laws of planetary motion

Collision of particles : Elastic & inelastic scattering, Elastic Scattering : Laboratory & Centre of mass system, Kinematics of elastic scattering in the laboratory system, inelastic scattering, cross-section, The Rutherford formula

Text Book: Classical mechanics by R.G. Takewale & P.S. Puranik, Tata McGraw Hill
Article Nos. : 5.2 to 5.6, 7.1 to 7.6

UNIT – III: Nuclear Physics

A. Physical tools: Introduction, Interaction between particles & Matter, brief survey, Detectors for Nuclear particles (i) Proportional counter (ii) The Geiger counter (iii) Scintillation counter (iv) Solid state or semi-conductor detectors (v) Cloud & Bubble chambers (vi) Spark chamber; Particle Accelerators : Need for an accelerator of charged particles, (i) Van de Graff Generator (ii) The cyclotron (iii) Synchrotron (iv) The Betatron; Beta ray spectrometer.

Text book: Nuclear physics, An introduction by S. B. Patel, New Age International (P) Ltd.
For A - Chapter 1: Article Nos.: 1.1.1 to 1.1.5

Reference Book: 1. Nuclear Physics by D.C. Tayal, Himalaya Publishing House

UNIT – IV: Dielectrics & Magnetostatics

A. Electrostatics in dielectrics: Polarization, Laws of electrostatics field in presence of dielectrics, Energy of the field in the presence of a dielectric, Boundary conditions, Gaseous non polar dielectrics, Gaseous polar dielectrics, Non- polar liquids,

B. Magnetostatics: Magnetic effects, The magnetic field, force on a current, Biot Savart law, The laws of magnetostatics, the magnetic potentials, Magnetic dipole in non-uniform magnetic field, Magnetic vector potential due to a small current loop, Magnetic media, Magnetisation, Magnetic field vector, Magnetic susceptibility & permeability, Boundary conditions, Uniformly magnetized sphere in external magnetic field, A comparison of static electric & magnetic fields

Text Book: Electromagnetics by B. B. Laud, Willey Eastern Limited
For A - Chapter 2: Article Nos. : 2.7 to 2.13
For B - Chapter 4: Article Nos. : 4.1 to 4.9, 4.11 to 4.20

Reference books:

1. Introduction to Electrodynamics by D. J. Griffith (3rd edition), PHI learning
2. Electromagnetic Theory & Electrodynamics by Satya Prakash,
Kedar Nath Ram Nath, Meerut

GUJARAT UNIVERSITY
B. Sc. (PHYSICS) Semester – III

PHYSICS PRACTICAL : PHY – 203
(2.5 Credit)

Group A:

1. Y-by Koening's method.
2. Wavelength of prominent spectral lines by diffraction grating.
3. Flatness of plate by Newton's ring.
4. Resolving power of telescope.
5. Numerical Study of Oscillatory Motion.
6. Wavelength of light using Hartmann formula.

Group B:

1. Figure of Merit of a mirror galvanometer.
2. C1/C2 by Desauty's method.
3. Zener diode as a voltage regulator.
4. h-parameters of CE transistor.
5. UJT.
6. Load line and determination of Q point for BJT.

Group C:

1. Absorption coefficient of liquid using photocell.
2. Study of electron diffraction pattern.
3. Resonance pendulum.
4. Fourier Analysis.
5. L by Maxwell's bridge.
6. Liquid Lens.

A, B & C three groups: (Total 100 Marks: Internal 30 marks, External 70 Marks)

Each group consists of 06 experiments.

Total 18 experiments.

External Examination: 70 Marks

Group A : 23 Marks
Group B : 23 Marks
Group C : 24 Marks

Practical batch size: Maximum 15 students.

Gujarat University
Ahmedabad

B. Sc. Semester – IV
Syllabus for Physics Theory & Practical
(Effective from June '2018)

Unit	**Physics Theory PHY – 204** **4 Credit Total 100 Marks Internal : 30 Marks External : 70 Marks**	**Physics Theory PHY – 205** **4 Credit Total 100 Marks Internal : 30 Marks External : 70 Marks**	**Physics Practical PHY – 206** **2.5 Credit Total 100 Marks Internal : 30 Marks External : 70 Marks**
Unit – I	Solid State Physics	Sound & Optics	A, B & C three groups : Each group consists of 06 experiments. Total 18 experiments. External Examination: 70 Marks Group A : 23 Marks Group B : 23 Marks Group C : 24 Marks Practical batch size: Maximum 15 students.
Unit - II	Heat & Thermodynamics	Statistical Mechanics	
Unit - III	Electronics	Special Theory of Relativity & Quantum Mechanics	
Unit - IV	Atomic Spectroscopy	Quantum Mechanics	

In order to give exposure of industry, research institute and higher learning in the field of Physics,
Industrial / Institutional visit may be arrange. It is expected that students of SEM-III & IV with Physics as one of the subject must visit the Industry / Research Institute / Institute of higher learning during either III or IV semester.

GUJARAT UNIVERSITY
B. Sc. (PHYSICS) Semester – IV
PHYSICS : PHY – 204
(4 Credit)

UNIT – I: Solid State Physics

A. Lattice Vibrations : Harmonic crystals : the "Ball & strings" model; Normal modes of one dimensional monoatomic lattice, periodic boundary condition, concept of the first Brioullin zone, salient features of the dispersion curve; Normal modes of one dimensional diatomic lattice, salient features of the dispersion curves, optical and acoustical mode; Quantization of lattice vibrations-phonons; Measurement of phonon dispersion by inelestic neutron scattering.

B. Thermal properties : Classical lattice heat capacity Quantum theory of lattice heat capacity, Einstein model, phonon density of states; Debye continuum model; Anharmonic effects, Thermal expansion, Gruneisen parameter; Phonon collision processes, Phonon thermal conductivity.

Text book: Elements of Solid State Physics (2nd Edition) by J. P. Srivastava, PHI Learning
For A - Chapter 4: Article Nos. : 4.1, 4.2, 4.2.1, 4.2.2, 4.3, 4.3.1, 4.7, 4.8
For B - Chapter 5: Article. Nos. : 5.1, 5.2, 5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.3, 5.3.1, 5.3.2, 5.3.3

Reference Books:
1. Solid State Physics (6th Edition) by S.O. Pillai, New Age International Publishers
2. Solid State Physics (4th Edition) by S.L Kakani & C. Hemrajani, S. Chand & Sons
3. Introduction to Solid State Physics (7th Edition) by C. Kittle, Wiley (India)

UNIT - II: Heat and Thermodynamics

Entropy: Reversible part of the second law (Clausius theorem), Entropy, Principle of increase of entropy, TS diagram, Application of the Entropy principle.

Pure substances: Volume expansitivity: Cubic Expansion coefficient, Compressibility.

Mathematical methods in thermodynamics: Characteristics functions, Enthalpy, Helmholtz & Gibb's functions, two mathematical theorems, Maxwell's relations, Tds equations, Internal energy equations, Heat Energy equations, Heat capacity equations.

Open Systems: Joule-Thomson expansion, Liquefication of gases by the Joule-Thomson expansion

Text book: Heat & Thermodynamics by Mark W. Zemansky and R.H. Dittman, McGraw Hill, Int. Edition (7th edition)

Article Nos. : 8.1, 8.2, 8.5, 8.11 and 8.12, 9.6, 9.7, 10.1 to 10.8, 11.1, 11.2

Reference books: Thermal Physics by A. B. Gupta, H. P. Roy (New central Publication)

UNIT - III: Transistor Circuits

Transistor Biasing: Factors contributing to thermal stability, effect of temperature increase, stability factor S, common base stability, collector to base bias, disadvantage of collector to base bias, emitter bias, voltage divider bias with emitter bias, emitter bypass capacitor, summary of stabilization circuit, additional stability factors, bias compensation

Hybrid equivalent circuit for a transistor: conversion of a transistor to a standard form, general Black box theory, Hybrid 'h' parameters, obtaining the hybrid h parameters, typical h parameter value, Amplifier equation, voltage and current gains taking into account Rg of source, dependence of amplifier characteristics on R_L and R_g, comparison of CB, CC and CE

Text book: Electronics Devices and Circuits By Allen Mottershed, PHI
Article no. 12.1 to 12.12, 14.1 to 14.10

Number system: Binary number system, Binary to decimal conversion, decimal to binary conversion, Hexadecimal numbers, ASCII codes, The Excess 3 code, Gray code

Text Book: Digital principle and Application By Malvino, Leach and Saha (6^{th} edition)
Article no. 5.1 to 5.3, 5.5 to 5.8

Reference Books: Electronic Principles (7th Edition) by A. Malvino & D.J. Bates, TMcGHill Pub.
Electronic Devices and Circuit Theory (8th Edition) by Robert Boylestad and L. Nashelsky, PHI
Fundamentals of Digital Circuits by A. Anandkumar, PHI (2^{nd} Edition)

UNIT – IV: Atomic Spectroscopy

Hydrogen atom spectrum, Orbital magnetic moment of hydrogen, Larmor precession, Stern-Garlach experiment, Electron spin, The vector atom model, Spin-orbit interaction and fine structure, Pauli's exclusion principle and electronic configuration, Total angular momentum in many electron atoms, L-S coupling, j-j coupling, Hund rules, Energy levels and transitions of Helium, Alkali spectra, Shielding of core electrons, Spectral terms of equivalent electrons, Normal Zeeman effect, experimental arrangement and theory, Anomalous Zeeman effect, Paschen-Bach effect, Stark effect, Characteristics X-ray spectrum, Moseley's law, Width of spectral lines.

Text Book: Modern Physics by G. Aruldhas and P. Rajagopal, PHI Learning Pvt. Ltd.
Article Nos. : 7.1 to 7.19

Reference books:
1. Principles of Modern Physics by A. K. Saxena, Narosa Publishing House
2. Modern Physics (2^{nd} Edition) by Kenneth Krane, John Wiley & Sons
3. Atomic & molecular spectra by Rajkumar, Kedarnath Ramnath Prakashan Meerut

GUJARAT UNIVERSITY
B. Sc. (PHYSICS) Semester – IV
PHYSICS : PHY - 205

UNIT – I: Sound and Optics

Sound: Architectural Acoustics, Sabine's formula, Reverberation time-theoretical treatment, Reverberation time of a live room, Reverberation time of a dead room, optimum reverberation time.

Text book: A textbook on oscillations, waves & acoustics by M. Ghosh, D. Bhattacharya, S. Chand Publishers
Article Nos. : 24.1 to 24.5

A. Polarization of light & double refraction : Plane polarized light, pictorial representation of light vibrations, method to produce plane polarized light (only names), double refraction or birefringence, geometry of calcite crystal, Optical axis principal section & principal plane, Nicol prism, Parallel & Crossed Nicol prism, Huygen's theory of double refraction in uniaxial crystals, refractive indices for o-rays & e-rays, Polaroids.

B. Production & Analysis of Polarized light : Introduction, superposition of two plane polarized waves having perpendicular vibrations, The elliptically & circularly polarized light, quarter wave plate, half wave plate, production of plane elliptically & circularly polarized light, detection of plane elliptically & circularly polarized light, systematic analysis of polarized light

Text Book: Optics & atomic physics by Singh, Agrawal (Pragati Prakashan, Meerat)
For A: Article Nos. : 10.2 to 10.4, 10.9 to 10.12, 10.14 to 10.16, 10.18, 10.21
For B: Article Nos. : 11.1 to 11.17

Reference book:
1. Optics by Ajoy Ghatak, Tata McGraw Hill Ltd.
2. A Textbook of Optics by N. Subrahmanyam & Brij Lal (S. Chand & Company Ltd.)

UNIT - II: Statistical Mechanics

Macroscopic and microscopic states: Macroscopic states, Microscopic states, Phase spaces, μ-space, Γ-space, Postulate of equal a priori probabilities, Ergodic hypothesis, Density distribution in phase space, Liouville's theorem, Principle of conservation of density in phase and principle of conservation of extension in phase, Condition for statistical equilibrium,

Statistical ensemble: Microcanonical ensemble, Canonical ensemble, Mean value and fluctuations, Grand canonical ensemble, Fluctuations in the number of particles of a system in a grand canonical ensemble.

Some applications of Statistical mechanics: Thermodynamics, Statistical interpretation of basic thermodynamic variables, Ideal gas, Gibbs paradox, the equipartition theorem

Text books: Fundamentals of Statistical Mechanics by B.B. Laud, New Age International Publishers
Article Nos.: 4.1 to 4.11, 5.1, 5.2, 5.4, 5.5, 5.7, 6.3, 6.4, 6.8 to 6.10

Reference books:
1. Statistical Mechanics An Introduction by Evelyn Guha, Narosa Publications

2. Introduction to Statistical Mechanics by S. K. Sinha, Narosa Publication
3. Fundamentals of Statistical and Thermal Physics by F. Reif, McGraw Hill Book Co.

UNIT – III: Relativity

Relativity: Postulates of Special Relativity, Time Dilation, Doppler Effect, Length Contraction, Twin Paradox, Electricity and Magnetism, Relativity of mass, Mass and Energy, Massless Particles, Lorentz Transformation, Velocity addition, Michelson-Morley Experiment.

Text Book: Concepts of Modern Physics by Arthur Beiser, 4th edition, McGraw Hill Pub. Co.
Chapter 1: Articles Nos.: 1.1 to 1.11, Appendix – I

Reference books:
1. Modern Physics by R. Murugeshan and K. Sivaprasath, (S. Chand & Company Ltd.)

UNIT – IV: Quantum Mechanics

Expectation values: Ehrenfest's Theorem, Admissibility conditions on the wave functions, stationary states : The time dependent Schrodinger equation, A particle in a square well potential, bound states in a square well ($\varepsilon < 0$) (a,b,c,d), The square well : Nonlocalized states ($E > 0$), square potential Barrier

Text Book: A Textbook of Quantum mechanics by PM Mathews & K. Venkatesan, Tata McGrew Hill
Chapter 2: Article Nos.: 2.7 to 2.14

General Formalism of wave mechanics: The Schrodinger equation & the probability interpretation for an N- particle system, the fundamental postulates of wave mechanics. The adjoint of an operator & self adjointness. The Eigen value problem, Degeneracy, Eigen values & Eigen functions of self- adjoint operators, The Dirac delta function, observables: Completeness & normalization of Eigen functions, closure, physical interpretation of Eigen values, Eigen functions & Expansion coefficients.

Text Book: A Textbook of Quantum mechanics by PM Mathews & K. Venkatesan, Tata McGrew Hill
Article Nos.: 3.1 to 3.9

Reference Books:
1. Quantum Mechanics by G. Aruldhas, PHI Limited
2. Quantum Mechanics by H. C. Verma, Surya Publications
3. Quantum Mechanics- A text book for Undergraduates by Mahesh C. Jain, PHI Ltd.

GUJARAT UNIVERSITY
B. Sc. (PHYSICS) Semester – IV

PHYSICS PRACTICAL: PHY – 206
(2.5 Credit)

Group A:

1. Searl's goniometer.
2. To study double refraction in calcite prism.
3. Resolving power of grating.
4. Diffraction by single slit.
5. Wavelength of light by Biprism.
6. Phonon dispersion relation of monoatomic lattice.

Group B:

1. FET Characteristics.
2. C by ballistic galvanometer.
3. Gray to binary code conversion.
4. High Resistance by leakage method.
5. To study the variation of Ic & Vce with temperature in fixed bias circuit & collector to base bias circuit for CE configuration
6. To study the variation of Ic & Vce with temperature in fixed bias circuit & potential divider circuit for CE configuration

Group C:

1. Identification of elements in line spectra.
2. Thevenin's maximum power theorem.
3. Analysis of elliptical polarized light using photocell.
4. Wavelength of light by Adser's A pattern.
5. L by Anderson's bridge.
6. Least Square Method.

A, B & C three groups: (Total 100 Marks: Internal 30 marks, External 70 Marks)

Each group consists of 06 experiments.

Total 18 experiments.

External Examination: 70 Marks

Group A: 23 Marks
Group B: 23 Marks
Group C: 24 Marks

Practical batch size: Maximum 15 students.

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – V
Syllabi for Physics Theory & Practical

From Academic year 2019 – 2020

Unit	Physics theory PHY – 301 4 credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Physics theory PHY – 302 4 credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Physics theory PHY – 303 4 credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Physics theory PHY – 304 4 credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Physics Subject Elective PHY – 305 2 Credit Total Marks 100 Internal 30 Marks External 70 Marks 3 hrs/Week	Physics Practical PHY – 306 5 Credit Total 200 Marks Internal 60 Marks External 140Marks 12 hrs/Week
I	Mathematical Physics	Molecular Spectra	Electromagnetism	Electronics	Student has to select one subject elective course from the University approved subject elective courses	There are A, B, C & D Four groups. Each group consists of 5 experiments. Total 20 experiments.
II	Mathematical Physics	Molecular Spectra	Electromagnetism	Electronics		
III	Classical Mechanics	Statistical Mechanics	Nuclear Physics	Electronics		
IV	Quantum Mechanics	Solid State Physics	Nuclear Physics	Electronics		

In order to give exposure of industry, research institute and higher learning in the field of physics, industrial visit may be arranged. It is expected that students of B.Sc. (PHYSICS) Semester – V & VI must visit industry / research institute / institute of higher learning.

College can also offer (Student can also select) subject elective course from the subject electives of Electronics Science Semester – V & VI.

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – V
From Academic year 2019 - 2020

PHY – 301: MATHEMATICAL PHYSICS, CLASSICAL MECHANICS & QUANTUM MECHANICS
(4 Credit: 4 hrs/week)

Unit – I: Differential equations:
Some partial differential equations in physics, the method of Separation of variables, separation of Helmholtz equation in Cartesian coordinates, in spherical polar and cylindrical Coordinates, Laplace's equation in various coordinates, Choice of coordinate system and separability of a partial differential equation, Parabolic coordinates system, Prolate Spheroidal coordinates system, various examples based on the separation of variables.

Unit – II: 2nd order differential equations:
Ordinary and Singular points, Series solution around an ordinary point, Series solution around a regular singular point: the method of Frobenius, Getting a second solution, Alternative method of getting the second solution, System of linear first order differential equations, Non-linear differential equations, related examples.

Text Book: Mathematical Physics by P.K. Chattopadhyay, New Age International Publishers (2006)
Article Nos.: Chapter 2: 2.1, 2.2 (A – E), 2.3, A.3 (3, 4) Chapter 3: 3.1 to 3.7 including examples.
Reference Book: 1. Mathematical Methods for Physicists by G. Arfken, Academic Press
2. Mathematical Methods in the Physical Sciences by Mary L. Boas, Wiley India Pvt. Ltd.

Unit – III: Classical Mechanics:
Lagrangian Formulation:
Introduction, Constraints, holonomic and non-holonomic constraints, scleronomous and rheonomous constraints, generalized coordinates, D'alembert's principle, Lagrange's equations, a general expression for kinetic energy, Symmetries and the laws of conservation, Cyclic or ignorable coordinates (including illustrations), Velocity dependent potential of electromagnetic field, Rayleigh's dissipation function.

Moving Co-ordinate System: Rotating co-ordinate system, The Coriolis force, Motion on the earth, Effect of Coriolis force on freely falling particles.

Text Book: Introduction to Classical Mechanics by R. G. Takawale and P. S. Puranik, Tata McGraw-Hill Publishing Co. Ltd.
Article Nos.: Chapter 8: 8.1 to 8.9; Chapter 9: 9.2 to 9.5;
Reference Book: 1. Classical Mechanics by A. B. Bhatia, Narosa Publication.
2. Classical Mechanics by H. Goldstein, Addison Wesley.
3. Classical Mechanics by J. C. Upadhyaya, Himalaya publications

Unit – IV: Quantum Mechanics: Exactly soluble Eigenvalue problems
General Formalism of wave mechanics:

The uncertainty principle, states with minimum value for uncertainty product, Commuting observables, Removal of Degeneracy, Evolution of system with time, constants of the motion, Non- interacting & interacting systems, systems of identical particles.

Introduction, the simple harmonic oscillator, the Schrödinger equation and energy eigenvalues, the energy eigenfunctions, properties of stationary states, the abstract operator method, the angular momentum operators, the eigenvalue equation for L^2, separation of variables, admissibility conditions on solutions, eigenvalues, the eigenfunctions, Spherical harmonics, Physical interpretation, Parity.

Text Book: A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata McGraw-Hill Publishing Co. Ltd.
Article Nos.: Article Nos.: Chapter 3: 3.11 to 3.16, Chapter 4: 4.1 to 4.4, 4.6 to 4.11
Reference Book: 1. Quantum Mechanics: Theory and Applications by A. Ghatak and S. Lokanathan, Macmillan India Limited.
2. Quantum Mechanics by F. Schwabl, Narosa Publishing House
3. Quantum Mechanics by G. Aruldhas, PHI

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – V
From Academic year 2019 - 2020

PHY – 302: MOLECULAR SPECTRA, STATISTICAL MECHANICS & SOLID STATE PHYSICS
(4 Credit: 4 hrs/week)

Unit – I:

Types of Molecular Spectra and Molecular Energy States: Separation of electronic and nuclear motion - The Born Oppenheimer approximation, types of molecular spectra.

Pure Rotational Spectra: Salient features of Rotational spectra, Molecular requirement for rotation spectra, experimental arrangement, Molecule as a rigid rotator, explanation of rotational spectra (without the process of solving Schrodinger equation to get energy formula), the non-rigid rotator, Isotope effect on rotational spectrum, tunable laser and pulse laser - introduction

Vibrational - Rotational Spectra: salient features of vibrational - Rotational spectra, Molecule as a harmonic oscillator, Molecule as anharmonic oscillator, Vibrational frequency and force constant for anharmonic oscillator, Fine structure of Infrared bands: Molecule as vibrating rotator, Diatomic molecule as symmetric top, Thermal distribution of vibrational and rotational levels.

Unit – II:

Raman Spectra: Nature of the Raman spectra, experimental arrangement for Raman spectra, Classical theory of Raman effect, Quantum theory of Raman effect, Raman spectra and Molecular structure, Infrared spectra versus Raman spectra, Laser as intense source.

Classification of Molecular Electronic States: Molecular electronic states, Symmetry properties of electronic eigenfunctions (symmetry classification of electronic states)

Fluorescence and Phosphorescence: Luminescence, Mechanism of fluorescent emission, Mechanism of phosphorescent emission, Fluorescence spectrum compared with Raman spectrum.

Text Book: Atomic and Molecular Spectra: Laser by Rajkumar, Kedar Nath & Ram Nath

Article Nos: Chapter 17: 1, 2, Chapter 18: 1 – 6, Chapter 19: 1 – 4, 6 – 8, Chapter 20: 1 – 6, Chapter 23: 1 – 4, Chapter 24: 1,2

Unit – III:

Formulation of Quantum Statistics: Density matrix, Liovilles theorem in Quantum Statistical Mechanics, Condition for Statistical equilibrium, Ensemble in Quantum Mechanics, Problems

Bose Einstein and Fermi Dirac Distributions: Symmetry of wave functions, the Quantum Distribution functions, the Boltzmann limit of Boson and Fermions Gases, Evaluation of the Partition function, Partition function for Diatomic Molecules (a) translation partition function (b) rotational partition function (c) vibration partition function (d)electronic partition function Equation of state for an Ideal gas, The quantum mechanical Para magnetic susceptibility, problems

Text Book: Fundamentals of Statistical Mechanics by B. B. Laud, New Age International Publishers

Article Nos.: 7.1 – 7.4, 8.1 – 8.7

Reference Book:

1. Statistical Mechanics - Theory and Application by S K Sinha, TMH Publishing Company Limited New Delhi:
2. Statistical Mechanics - An introduction by Evelyn Guha, Narosa publication.
3. Statistical Mechanics by R.K. Patharia, Pergamon Press
4. Statistical Mechanics by B.K. Agarwal & Melvin Eisner, Wiley Eastern

Unit – IV: Solid State Physics

Elastic constants and elastic waves: Analysis of elastic strains, Dilation, stress components, Elastic compliance and stiffness constants, Elastic energy density, elastic stiffness constants of cubic crystals, Bulk modulus and compressibility. Elastic waves in cubic crystals, waves in the [100] direction, waves in the [110] direction and waves in the [111] direction.

Free electron Fermi gas: Introduction, Energy levels in one dimension, Effect of temperature on the Fermi-Dirac distribution, Free electron gas in three dimensions and density of states, Heat capacity of the electron gas and experimental heat capacity of metals, Electrical conductivity and ohm's law, Experimental electrical resistivity of metals, Thermal conductivity of metals, ratio of thermal to electrical conductivity.

Text Book: Introduction to Solid State Physics by C. Kittel, (Eight Edition) John Wiley and Sons.

Article Nos.: Chapters 3 & 6

Reference book:

Elements of Solid State Physics by J. P. Srivastava, Prentice-Hall of India Private Limited, New Delhi

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – V
From Academic year 2019 - 2020

PHY- 303: Electromagnetism and Nuclear Physics
(4 Credit: 4 hrs/week)

Unit – I:

Electromagnetic induction: Hysteresis, Maxwell's equations, Decay of free charge, Potentials of electromagnetic fields, More about the Lorentz gauge condition, Field energy and Field momentum.

Electromagnetic waves: Plane waves in non-conducting media, Polarizations, Energy flux in a plane wave, Radiation pressure and Momentum, Plane waves in conducting medium, Skin effect.

Unit – II:

Electromagnetic Radiation: Retarded Potential, Radiation from an oscillating dipole, Linear Antenna, Lienard-Wiechert Potentials, Potentials for a charge in uniform motion – Lorentz formula, Fields of an accelerated charge, Radiation from an acceleration charged particle at low velocity, Radiation when the velocity and acceleration of the particles are collinear, Radiation from a charged particle moving in a circular orbit, Elective quadrupole radiation.

Text Book: Electromagnetics by B. B. Laud, 2nd Edition, Wiley Eastern Ltd.
Article Nos.: 5.7 - 5.12, 6.1 - 6.6
Article Nos.: 9.1 – 9.10

Unit – III: Alpha and Beta Rays:

Alpha Rays: Range of alpha particles, Disintegration energy of the spontaneous alpha decay, Alpha decay paradox - barrier penetration.

Beta Rays: Introduction, Continuous Beta ray spectrum - difficulties encountered to understand it, Pauli's Neutrino Hypothesis, Fermi's theory of Beta decay, the detection of neutrino, Parity non-conservation in Beta decay.

Unit – IV: Gamma Rays and The liquid drop model of the nucleus:
Gamma Rays: Introduction, Gamma-ray emission – selection rules, Internal conversion, Nuclear isomerism.

The liquid drop model of the nucleus: Introduction, Binding energies of nuclei: plot of B/A against A., Weizsacher's semi empirical mass formula Mass parabolas: prediction of stability against Beta decay for members of an isobaric family, Stability limits against spontaneous fission, Barrier penetration - decay probabilities for spontaneous fission, Nucleon emission.

Text Book: Nuclear Physics - An Introduction by S.B. Patel, New Age International. Article Nos.: 4 – II - 1 to 4 – II - 3, 4 – III - 1 to 4 – III - 6, 4 – IV - 1 to 4 – IV - 4, 5.1 to 5.7

Reference books:

1. Introduction to Nuclear Physics by H.Enge, Addison Wesley
2. Nuclear Physics by D. C. Tayal, Himalaya Publisher
3. Nuclear Physics by Irvin Kaplan
4. Modern Physics by Kenneth Krane, John Wiley and sons.

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – V
From Academic year 2019 - 2020

PHY – 304: Linear & Non-Linear Electronics circuits
(4 Credit: 4 hrs/week)

UNIT – I: General amplifier characteristics:

Introduction, concept of amplification, amplifier notations, current gain, voltage gain, power gain, amplifier input resistance, amplifier output resistance, maximum power transfer, conversion efficiency, classes of amplifier operation, harmonic distortion, three point method of calculating harmonic distortion, five point method of calculating harmonic distortion, oscilloscope display of an amplifier dynamic transfer curve, measurement of harmonic distortion, other types of amplifier distortion, decibels, other equations for decibel computation, zero dB reference level, use of voltmeter as dB indicator, voltmeter range correction factor, impedance correction factor, frequency response curves, amplifier bandwidth, phase relationship in amplifier square wave testing.

Text Book: Electronic Devices and circuits – An Introduction by Allen Mottershead, Printice-Hall of India Private Limited
Article Nos. 7.1 - 7.16, 8.1 - 8.8, 8.10, 8.11

UNIT – II: Frequency response of a transistor amplifier:

Low frequency response of a transistor amplifier:
Effect of an emitter by pass capacitor on low frequency response, effect of coupling capacitor on low frequency response, cascading of CE stages, mid frequency gains, low frequency response of cascaded stages amplifier, low frequency response to a square wave, transformer coupled transistor amplifier, low frequency response of TC amplifier, step response of a TC amplifier.

High frequency response of a transistor amplifier:
High frequency model for a CE amplifier, approximate CE high frequency model with a resistive load, CE short circuit current gain, high frequency current gain with a resistive load, high frequency response of cascaded CE stages, amplifier high frequency response to a square wave high frequency response of a transformer coupled amplifier.

Text Book: Electronic Devices and circuits – An Introduction by Allen Mottershead, Printice-Hall of India Private Limited
Article Nos.: 15.1 – 15.8, 16.1 – 16.7

UNIT – III: Circuit analysis, design and Flip-Flop:
Circuit analysis and design:
Boolean laws and theorems, sum of products method, truth table to Karnaugh map, pairs, quads and octets, Karnaugh simplification, don't care conditions, product of sums method, product of sums simplification, Exclusive OR gate.

FLIP- FLOP:
RS flip flop, clocked RS flip flop, D flip flop, Edged triggered D flip flop, JK flip flop, JK master slave flip flop
Book recommended: Digital Principles and Applications by Malvino and Leach Article Nos.: 2.1 - 2.8, 3.7

UNIT – IV: Network Transformations:
Reduction of complicated network, conversion between T and π sections, bridge T network, the lattice network, superposition theorem, the reciprocity theorem, thevenin's theorem, Norton theorem, maximum power transfer theorem, compensation theorem.

Resonance: Definition of Q, the figure of merit, series resonance, Bandwidth of the series resonant circuit, parallel resonance or antiresonance, current in antiresonant circuits, Bandwidth of antiresonant circuits.

Text Book: Network Lines and Field by J D Ryder. (1.4 to 1.13, 2.1 to 2.4, 2.6, 2.8)
Reference Books: 1. Network Analysis by M. S. Van Valkenburg,
2. Network Analysis by G K Mithal

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – V
From Academic year 2019 - 2020

PHY – 305: SEC_A: Nanoscience and nanotechnology
(2 Credit: 3 hrs/week)

Unit – I: Introduction to Nanomaterials:

Introduction to nano-sized materials and structures, Definitions of nanomaterials, Brief history of Nanomaterials and challenges in Nanotechnology, Properties of Nanomaterials: Effect of reduction of dimensions, quantum size effects, Mechanical, Thermal, Optical and Magnetic properties of nanomaterials

Unit – II: Methods of Synthesis of Nanomaterials:

Bottom-up and Top-down approaches - Mechanical method: High Energy Ball Milling, Methods based on evaporation (Physical Vapour Deposition), Chemical Vapour Deposition, Chemical Methods: Colloidal Method and Sol-gel Method

Special Nanomaterials:

Carbon Nanotubes (CNT), Types –Single walled, multiwalled CNT, Structures and properties of CNTs, Synthesis of carbon nanotubes

Unit – III: Analytical (Characterization) Technique:

Microscopes: Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), X-ray diffraction

Applications: Electronics, Biotechnology and Medical, Automobiles, Space, Defense, Sports, Cosmetics, Cloth Industry.

Text Book:
Nanotechnology: Principles and Practices by Sulbha K Kulkarni, Capital Publishing Co. New Delhi.

Reference:

1. Introduction to Nanotechnology, C.P. Poole Jr. and F.J. Ownes, Wiley Publication.

2. Nanoscience and Technology eds. R. W. Kelsall, I.W. Hemley & M. Geoghehan, John Wiley and sons

3. Introduction to Nanoscience and nanotechnology by K.K. Chattopadhyay and A.N. Banerjee, PHI Learning Pvt. Ltd. 2012

4. Origin and Development of Nanotechnology, P. K. Sharma, Vista International Publishing House

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – V
From Academic year 2019 - 2020

PHY – 305: SEC_B: Atmospheric Science
(2 Credit: 3 hrs/week)

Unit – I: Introduction and Chemistry of Earth's atmosphere:

Evolution of earth's atmosphere, Nitrogen, hydrogen halogen, sulfur, carbon-containing compounds in the atmosphere, ozone and neutral chemistry, chemical and photochemical processes, Chemical and dynamical life time of atmospheric constituent. Eddy diffusion and Turbulence.

Unit – II: Ozone in the Atmosphere:

Evolution of the ozone layer, sources and sinks of tropospheric and stratospheric ozone, chlorofluorocarbons, ozone and UV-radiations, supersonic transport.

Unit – III: Atmospheric aerosols:

Concentration and size, sources, and transformation, Chemical composition, transport and sinks, residence times of aerosols, geographical distribution and atmospheric effects, Air Pollution: Sources of anthropogenic pollution, Emission Inventory, Atmospheric effects- smog, visibility. Measurements of Particulate matters, SOx, NOx and CO

Reference Books:

1. Introduction to Atmospheric Chemistry by P.V. Hobbs

2. Atmospheric Chemistry and Physics: From Air Pollution to Climate Change by John H. Seinfeld, Spyros N. Pandis

3. Chemistry of the Upper and Lower Atmosphere by Barbara J. Finlayson-Pitts, Jr., James N. Pitts.

4. Chemistry of Atmospheres by Richard P. Wayne.

5. Basic Physical Chemistry for Atmospheric Sciences by P.V. Hobbs

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – V
From Academic year 2019 - 2020

PHY – 305: SEC_C: Object Oriented Programming: C++
(2 Credit: 3 hrs/week)

Unit – I: Introduction to Object Oriented Programming:

C++ fundamentals, Classes and Objects, Constructors and destructors, Inline functions, Friend functions and classes, Static class members: Static data members and member functions

Unit – II: Arrays, Pointers, References, Overloading Function and Operator

Array of objects, References, Pointers to objects, Function overloading, copy constructors and Default arguments, Creating a member Operator Function, Overloading new and delete

Unit – III: Exception handling and I/O system

Exception handling Fundamentals, Handling derived class exceptions, Streams and stream classes, Formatted I/O, Opening and closing files, Reading and writing text files

In addition to above content, student has to learn following exercise

1. Write a program to find average of two numbers.
2. Write a program to convert and display temperature in Fahrenheit to Celsius and vice versa.
3. Write a program to evaluate the following equation/series: Sin x= x-x^3/3!+x^5/5!-x^7/7!+…..
4. Write a program to input data and display with Class and Objects.
5. Write a program to add time data in hours and minutes format.
6. Write a program for arithmetic operator overloading.
7. Write a program for function overloading.
8. Write a program to display string:

Recommended Reference Books:

1. The complete reference C++: Herbert Schildt, TMH.
2. Object Oriented Programming in C++: Robert Lafore - Galgotia Publication.
3. C++: Effective Object Oriented Software Construction - Kayshav Dattari.
4. Object Oriented Programming using C++ - Addition Wesley.
5. Object Oriented Programming in C++ - Bala Guruswamy.

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – V
From Academic year 2019 - 2020

Physics Practical: PHY – 306

(5 credit: 12 hrs/week)

Total: 200 Marks
Internal: 60 Marks
External: 140 Marks

There are A, B, C & D four groups.
Each group consists of 5 experiments.
Total 20 experiments.

External examination 140 Marks

Group A: One Practical: 35 Marks: 3 Hrs

Group B: One Practical: 35 Marks: 3 Hrs

Group C: One Practical: 35 Marks: 3 Hrs

Group D: One Practical: 35 Marks: 3 Hrs

Practical batch size: Maximum 16 students

In order to give exposure of industry, research institute and higher learning in the field of physics, industrial visit may be arranged. It is expected that students of B.Sc. (PHYSICS) Semester – V & VI must visit industry/research institute / institute of higher learning.

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – V
From Academic year 2019 - 2020

Physics Practical: PHY – 306

(5 credit : 12 hrs/week)

Total: 200 Marks
Internal: 60 Marks
External: 140 Marks

No	GROUP- A
01	Acceleration due to gravity by Kater's pendulum (fixed knife edges).
02	To determine melting point of a substance by platinum resistance thermometer using Callender-Griffiths bridge.
03	Characteristics of G.M. Tube.
04	Viscosity by Log decrement
05	Hall effect

No	GROUP- B
01	Refractive index by total internal reflection using Gauss eye piece.
02	Fabry-Perot etalon. Determination of the thickness of air film and wavelength of light using spectrometer.
03	Michelson interferometer. To determine the wavelength of monochromatic light.
04	To measure a threshold current of a LASER diode at room temperature.
05	An optical method of determining dielectric constant, dipole moment and polarizability of a polar liquid using Hollow prism

No	GROUP- C
01	Mutual Inductance by Ballistic Galvanometer
02	Determination of capacity of Schering Bridge
03	Determination of Curie temperature of ferroelectric ceramic
04	I -V Characteristics of Solar Cell and to determine fill-factor, voltage-factor and efficiency
05	Determination of unknown frequency using Wein Bridge

No	GROUP- D
01	Hartley Oscillator. Measurement of frequency by C.R.O. (Transistorized).
02	Series and parallel resonance. To find the band width and Q value of a coil.
03	Frequency response of CE amplifier
04	RS Flip flop using gates (IC 7400, 7402) and D Flip flop using IC 7474.
05	A.C. Circuit analysis by C.R.O. Measurement of frequency and phase difference

Reference Books:

1. Practical Physics by S.L.Gupta & V kumar
2. Advanced Practical Physics I & II by S.P.Singh, Pragati prakashan vol. 1 & 2.
3. B.Sc. Practical Physics by C.L.Arora, S Chand.
4. An advanced course in Practical Physics by D. Chattopadhyay & P. C. Rakshit, New central Book Agency (P), Kolkata.

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – VI
Syllabi for Physics Theory & Practical

From Academic year 2019 – 2020

Unit	Physics theory PHY – 307 4 credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Physics theory PHY – 308 4 credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Physics theory PHY – 309 4 credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Physics theory PHY – 310 4 credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Physics Subject Elective PHY – 311 2 Credit Total Marks 100 Internal 30 Marks External 70 Marks 3 hrs/Week	Physics Practical PHY – 312 5 Credit Total 200 Marks Internal 60 Marks External 140Marks 12 hrs/Week
I	Mathematical Physics	Molecular Spectra	Plasma Physics	Electronics	Student has to select one subject elective course from the University approved subject elective courses	There are A, B, C & D Four groups. Each group consists of 5 experiments. Total 20 experiments.
II	Classical Mechanics	Statistical Mechanics	Plasma Physics	Electronics		
III	Quantum Mechanics	Solid State Physics	Nuclear Physics	Electronics		
IV	Quantum Mechanics	Solid State Physics	Nuclear Physics	Electronics		

In order to give exposure of industry, research institute and higher learning in the field of physics, industrial visit may be arranged. It is expected that students of B.Sc. (PHYSICS) Semester – V & VI must visit industry/research institute / institute of higher learning.

College can also offer (Student can also select) subject elective course from the subject electives of Electronics Science Semester – V & VI.

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – VI
From Academic year 2019 - 2020

PHY – 307: MATHEMATICAL PHYSICS, CLASSICAL MECHANICS & QUANTUM MECHANICS

(4 Credit : 4 hrs/week)

Unit – I: Some special functions in Physics:
Bessel functions, Bessel functions of the second kind, Henkel functions, Spherical Bessel functions, Legendre polynomials, Associated Legendre polynomials and spherical harmonics, Hermite polynomials, Laguerre polynomials, The gamma function, the Dirac delta function, examples.

Text Book: Mathematical Physics by P.K. Chattopadhyay, New Age International Publishers (2006)
Article Nos.: Chapter 5: 5.1 – 5.9 including examples.
Reference Book: 1. Mathematical Methods for Physicists by G. Arfken, Academic Press
2. Mathematical Methods in the Physical Sciences by Mary L. Boas, Wiley India Pvt. Ltd.

Unit – II: Variational principle: Lagrange's and Hamiltons equations:
Introduction, Configuration space, Some techniques of calculus of variation, the delta-notation, Applications of the variational principle, Hamilton's principle, Equivalence of Lagrange's and Newton's equations, Advantages of the Lagrangian formulation - Electromechanical analogies, Lagrange's undetermined multipliers, Lagrange's equation for non-holonomic systems, Applications of the Lagrangian method of undetermined multipliers, Hamilton's equations of motion, some applications of the Hamiltonian formulation, Phase space, Comments on the Hamiltonian formulation.

Text Book: Introduction to Classical Mechanics by R. G. Takawale and P. S. Puranik, Tata McGraw-Hill Publishing Co. Ltd.
Article Nos.: Chapter 11: 11.1 - 11.13
Reference Book: 1. Classical Mechanics by A. B. Bhatia, Narosa Publication.
2. Classical Mechanics by H. Goldstein, Addison Wesley.
3. Classical Mechanics by J. C. Upadhyaya, Himalaya publications

Unit – III: Three dimensional square well potential:
Solutions in interior region, Solutions in the exterior Region and Matching, Solution of the radial Equation: energy levels, Stationary state wave functions, Discussion of bound states, Solution of confluent hypergeometric functions, non localized states, solution in parabolic coordinates, the anisotropic oscillator, the isotropic oscillator.

Text Book: A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata McGraw-Hill Publishing Co. Ltd.
Article Nos.: Chapter 4: 4.13 - 4.21

Unit – IV: Representations, Transformations and Symmetries:
Quantum states, state vectors and wave function, The Hilbert space of state vectors, Dirac notation, Dynamical variables and linear operators, Representations, Continuous basis - The Schrödinger representation, Degeneracy, Labeling by commuting observable, change of basis, Unitary transformations, Unitary transformation induced by change of coordinate system: translation, Unitary transformation induced by Rotation of coordinate system.

Text Book: A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata McGraw-Hill Publishing Co. Ltd.
Article Nos.: Chapter 7: 7.1 – 7.9
Reference Book:
1. Quantum Mechanics: Theory and Applications by A. Ghatak and S. Lokanathan, Macmillan India Limited.
2. Quantum Mechanics by F. Schwabl, Narosa Publishing House
3. Quantum Mechanics by G. Aruldhas, PHI

Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – VI
From Academic year 2019 - 2020

PHY – 308: Electronic Spectra, Statistical Mechanics & Solid State Physics
(4 Credit: 4 hrs/week)

Unit – I: Electronic Spectra:

Electronic Spectra, salient features, formation of electronic spectra, Vibrational (Gross) structure of electronic band system in emission, electronic band spectra in absorption, Rotational structure of electronic bands; Rotational structure of three branch bands; observed intensity distribution (vibrational) in band systems: Franck-Condon principle; explanation of intensity distribution in absorption bands from Franck-Condon principle. Explanation of intensity distribution in emission bands: Condon parabola. Line intensities in a band: Rotational intensity distribution. Quantum mechanical Exploting Franck-Condon principle.

Text Book: Atomic and Molecular Spectra: Laser by Rajkumar, Kedar Nath & Ram Nath
Article Nos: Chapter 21: 1 – 11

Unit – II: Transport Phenomena:
Introduction, Mean collision time, Scattering cross-section, viscosity, electrical conductivity, thermal conductivity, thermionic emission, photoelectric effect, molecular collision, effusion, diffusion, Brownian motion, Einstein's relation for mobility

Text Book: Fundamentals of Statistical Mechanics by B. B. Laud, New Age International Publishers
Article Nos.: 12.1 – 12.12
Reference Book:

1. Statistical Mechanics - Theory and Application by S K Sinha, Tata McGraw- Hill Publishing Company Limited New Delhi:
2. Statistical Mechanics - An introduction by Evelyn Guha, Narosa publication.
3. Statistical Mechanics by R.K. Patharia, Pergamon Press
4. Statistical Mechanics by B.K. Agarwal & Melvin Eisner, Wiley Eastern

UNIT - III: Theory of Dielectrics:

Polarization, Dielectric constant, Local Electric field, Dielectric polarizability, Sources of polarizability, theory of electric polarizability and optical absorption, ionic polarization, polarization from dipole orientation, dielectric losses, Applications to optical phonon modes in ionic crystals, the longitudinal optical mode, the transverse optical mode, the interaction of electromagnetic waves with optical modes, application to the motion of electrons in polar crystals.

Unit – IV: Diamagnetism and paramagnetism:

Langevin's theory of diamagnetism, Langevin's theory of paramagnetism, theory of atomic magnetic moment, Hund's Rule, Quantum theory of magnetic susceptibility: A quantum mechanical formulation, Dimagnetism, Paramegnetism, application to magnetic ions in solids: effect of the crystal field, van Vleck paramagnetism, Pauli paramagnetism, Nuclear paramagnetism, Cooling by adiabetic demagnetization, magnetic resonance, ESR, NMR, Spin relaxation, line width and line shape

Text Book: Elements of Solid State Physics by J. P. Srivastava, Prentice-Hall of India Private Limited, New Delhi
Article Nos.: 10.1 – 10.10
Article Nos.: 13.1 – 13.9
Reference book:
Introduction to Solid State Physics by C. Kittel, (Eight Edition) John Wiley and Sons.

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B. Sc. (PHYSICS) Semester – VI
From Academic year 2019 - 2020

PHY – 309: Nuclear Physics
(4 Credit: 4 hrs/week)

Unit – I:
Motion of charged particles in Magnetic & Electric field:

Microscopic & Macroscopic description, Maxwell's equation & charge conservation, Motion of a charged particle in electric & Magnetic fields, Uniform magnetic field & Oscillating electric field, Drift velocity in a gravitational field, Magnetic field varying in space & time : adiabatic variance of the magnetic moment, Inhomogeneous magnetic field : gradient drift & curvature drift, peculiarity of drift motions, Converging magnetic field : magnetic mirror, Longitudinal adiabatic invariant, Periodic magnetic field : Gyro relaxation effect, Motion of magnetic lines of force.

Unit – II:
Characteristics of plasma in magnetic field:
Description of plasma as gas mixture, Properties of plasma in a magnetic field, Force on plasma in magnetic field, Current in magnetized plasma, Diffusion in a magnetic field, Collisions in fully ionized magnetoplasma, Pinch effect, Oscillations and waves in the Plasma.

Application of Boltzmann-Vlasov equation on plasma:
Distribution function, Homogeneous, Inhomogeneous, Isotropic and Anisotropic distribution functions, Boltzmann equation, Fokker-Planck equation, Debye screening, Equilibrium distribution function and Boltzmann's H-theorem, Application of B-V equation to longitudinal waves: Dispersion relations, Initial value problem: Landau damping, Cyclotron damping, Excitation, two-stream instability: Beam plasma instability, Pinch instability, Plasma sheath, Non-linear effects

Text book: Elements of Plasma Physics by S. N. Goswami, New Central Book Agency (P) Ltd.
Article Nos.: 2.1 – 2.12, 3.1 – 3.8, 4.1 – 4.12
Reference Book:
Introduction to Plasma Physics by F.F. Chen, Plenum Press, 2nd ed

Unit – III:
Nuclear Energy: Introduction, Neutron induced fission, Asymmetrical fission - mass yield, Emission of delayed neutrons by fission fragments, Energy released in the fission of U235, Fission of lighter nuclei, Fission chain reaction, neutron cycle in a thermal nuclear reactor, Nuclear reactors.

Nuclear Physics in other areas of Physics: The Mossbaur effect, some experiments using Mossbaur effect, Natural Fusion - energy production in stars, Possibility of controlled fusion.

Text Book: Nuclear Physics - An Introduction by S. B. Patel, New Age International.
Article Nos.: 6.1 to 6.9, 9.5 to 9.7
Reference Books: Introduction to Nuclear Physics by H. Enge, Addison Wesley Nuclear Physics by D. C. Tayal, Himalaya Publisher Nuclear Physics by Irving Kaplan

Unit – IV: Elementary particles:
Interactions and Particles, Leptons, Hadrons, Elementary Particle Quantum Numbers, Quarks, Field Bosons, The Standard Model and Beyond, History of Universe.
Text Book: Concept of Modern Physics by A. Beiser, McGraw Hill International Edition, 6th Ed
Articles Nos.: 13.1 – 13.8

Reference Books: Modern Physics by Kenneth Krane, John Wiley and sons.

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B. Sc. (PHYSICS) Semester – VI
From Academic year 2019 - 2020

PHY – 310: Linear & Non-Linear Electronics circuits
(4 Credit: 4 hrs/week)

UNIT – I:
Negative Feedback in transistor amplifier: General theory of feedback, reasons for negative feedback, loop gain, types of negative feedback in transistor circuits,

Transistor Oscillators: Introduction, Effect of positive feedback, requirements for oscillations, the phase shift oscillator, Wien bridge oscillator, LC oscillators, Colpitt and Hartley oscillators with analysis.

Text Book: Electronic Devices and circuits – An introduction by Allen Mottershed
Article Nos.: 17.1 to 17.4, 18.1 to 18.7

Hand Book of Electronics by Gupta and Kumar
Article Nos.: 22.4, 22.5

UNIT – II:
Field effect transistor amplifier: Advantages and disadvantages of the FET, Basic construction of the JFET, Characteristics curve of the JFET, Principle of operation of the JFET, Effect of the VDS on channel conductivity, Channel ohmic region and pinch off region. Characteristics parameters of the FET, Common source AC amplifier

Operational Amplifier: The basic operational amplifier, the differential amplifier, offset error voltages and currents, the basic operational amplifier application,

Text Book: Electronic Devices and circuits – An introduction by Allen Mottershed
Article Nos.: 21.1 to 21.7, 21.9
Integrated Electronics by Millman Halkias
Article Nos.: 15.1, 15.2, 15.6, 16.1

UNIT – III:
Arithmetic circuits: Binary addition binary subtraction, unsigned binary number, sign magnitude numbers, 2 S compliment representation, 2' S compliment arithmetic building blocks the adder - substractor, binary multiplication and division, Digital comparator, decoder, demultiplexer, data selector, encorder.

Text Book: Digital Principles and Applications by Malvino and Leach
Article Nos.: 5.1 to 5.9

UNIT – IV:
Regulated Power Supply: Introduction, stabilization, limitations of Zener diode regulator, Transistor series voltage regulator, transistor shunt voltage regulator, a series regular with two transistors, current regulator
Text Book: Electronic Devices & Circuits by A. Mottershed
Article Nos.: 28.2 to 28.4

Electronic Instruments: Cathode ray oscilloscope: CRO, CRT, electron gun, deflecting plates, screen, methods of focusing, deflection systems, mathematical expression for electrostatic deflection sensitivity, electromagnetic deflection system, magnetic deflection in CRT, Time base (without circuits), CRO Parts, operation of a typical oscilloscope control, uses of CRO.

Text Book: Electronic & Radio Engineering by M. L. Gupta, Dhanpat Rai & Sons.
Article Nos.: 36.1 to 36.11, 36.17, 36.18, 36.20.

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B. Sc. (PHYSICS) Semester – VI
From Academic year 2019 - 2020

PHY – 311: SEC_A: Experimental and Measurement Techniques
(2 Credit : 3 hrs/week)

Unit – I:
Numerical analysis in physical measurement:

Measurement, The result of a measurement, Sources of uncertainty and experimental error, Systematic error, Random error, Definition of uncertainty, The analysis of repeated measurements, Mathematical description of data distribution functions.

Unit – II:
Temperature and Optical Measurement Techniques
Transducer definition, Transducer characteristics, Temperature measurements, Definition of temperature, Temperature transducers: Resistance thermometers, Thermistors, Thermocouples, Thermal radiation temperature measurements: Infra-red pyrometers, Low temperature thermometry, Optical measurements: Bolometers, Photoconductive detectors, Photoemissive detectors.

Unit – III:

Units of pressure measurement, Characteristics of vacuum, Applications of vacuum, Vacuum systems, Vacuum pumps: mechanical rotary pump, multistage diffusion pump, Vacuum gauges: Pirani gauge, penning cold cathode gauge, capacitance gauge, pumping speed for a vacuum system, leak testing.

Text Book: Measurement, Instrumentation and Experiment Design in Physics and Engineering by Michael Syer and Abhai Mansingh, PHI Learning Pvt. Ltd.

Article No: 1.1 to 1.8,. 2.2., 2.3, 3.1 to 3.6, 6.1 to 6.7)

Reference Books:
5. Experimental Methods for Engineers by J.P. Holman, 7th Edition, Tata McGraw Hill
6. Advanced Experimental Techniques in Modern Physics by K. Muraleedhara Varier, Anthony Jodrph, P.P Pradyumanan, Pragati Prakashan

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B. Sc. (PHYSICS) Semester – VI
From Academic year 2019 - 2020

PHY – 311: SEC_B: Instrumentation
(2 Credit: 3 hrs/week)

Unit – I: Transducers:

What is a transducer? Classification of transducers, classification based on electrical principle involved, resistive position transducer, resistance pressure transducer, Inductive pressure transducer, capacitive pressure transducer, self inductive transducer, linear variable differential transformer (LVDT), piezoelectric transducer, strain gauge, temperature transducers, resistance temperature detectors, thermistors, thermocouples, ultrasonic temperature transducers, photoelectric transducers.

Unit – II: Electronic Instruments:

Introduction, analog and digital instruments, functions of instruments, electronic versus electric instruments, essentials of an electronic instrument, measurement standards, the basic meter movement, characteristics of moving coil meter measurement, variations of basic meter movement, converting basic meter to dc ammeter, multirange multimeter, measurement of current, converting basic meter to dc voltmeter, multirange dc voltmeter, loading effect of a voltmeter, ohmmeter multimeter, rectifier type of ac meter, electronic voltmeter, direct current VTVM, comparison of VOM and VTVM, direct current FETVM, digital voltmeter.

Text book: Basic electronics Solid State by B. L. Tharaja (1st multicolour illustrative edition)

Unit – III: Signal Generators:

Introduction, fixed frequency AF oscillator, variable oscillator, basic standard signal generator (sine wave), standard signal generator, modern laboratory signal generator, AF sine and square wave generator, function generator, square and pulse generator, random noise generator, sweep generator.

Text book: Electronic instrumentation by H. S. Kalsi

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B. Sc. (PHYSICS) Semester – VI
From Academic year 2019 - 2020

PHY – 311: SEC_C: Visual Basics
(2 Credit: 3 hrs/week)

Unit – I:
Introduction to the VB Environment
Visual Basic 6.0, Overview & Terminology, Event driven programming, VB Programming

Creating the User Interface
Building the User Interface Creating an Application Building Menus

Unit – II:
VB Programming Language

Event Handling Using Properties Methods Naming Conventions Variables Variable Scope Constants Arrays User Defined Types Comments Continuation Statements Assignment Statements Operators Loops & Decision structures

Unit – III:
Error handling and debugging

Error Handling, Avoid Variable Name Errors, Setting Your Own Error Codes, Simulating A Visual Basic Error, Catering for Unexpected Errors, Delayed Error Handling, Turning Off Error Handling, Function Specific Error, Procedures, Debugging your code, Using the Debug, Window Passively, Using the Debug Window Actively,

In addition to above content, student has to learn following exercise:

1. Prepare a Simple Calculator in VB.
2. Write a VB script to input any number N and Calculate its Factorial.
3. Write a VB script to print first 25 terms of Fibonacci Sequence.
4. Write a VB script to print prime number from 1 to 100.
5. Write a VB script to print Automorphic number from 1 to 100.

Reference Books:

1. Visual Basics. Net (Version 2012)
2. Mastering in Visual Basic 6.0 BPB publications Evangelos Petroutsos
3. SAMS Teach Yourself Visual Basic 6.0 in 21 Days Techmedia By Greg Perry
4. The Complete Reference Visual Basic 6.0, Tata Mcgraw-Hill Publishing Pvt.Ltd. by Noel Jerke

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B. Sc. (PHYSICS) Semester – VI
From Academic year 2019 - 2020

Physics Practical: PHY – 312
(5 credits: 12 hrs/week)

Total: 200 Marks
Internal: 60 Marks
External: 140 Marks

There are A, B, C & D four groups.
Each group consists of 5 experiments.
Total 20 experiments.

External examination 140 Marks

Group A: One Practical: 35 Marks: 3 Hrs

Group B: One Practical: 35 Marks: 3 Hrs

Group C: One Practical: 35 Marks: 3 Hrs

Group D: One Practical: 35 Marks: 3 Hrs

Practical batch size: Maximum 16 students

In order to give exposure of industry, research institute and higher learning in the field of physics, industrial visit may be arranged. It is expected that students of B.Sc. (PHYSICS) Semester – V & VI must visit industry/research institute / institute of higher learning.

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B. Sc. (PHYSICS) Semester – VI
From Academic year 2019 - 2020

Physics Practical: PHY – 312
(5 Credit: 12 hrs/week)

No	GROUP- A
01	Acceleration due to gravity by Kater's pendulum (variable knife edge)
02	e/k by power transistor.
03	Rubber tubing.
04	Susceptibility of ferromagnetic substance by Quink's method (Magnetic fluid).
05	To find the value of permeability of free space

No	GROUP- B
01	Michelson interferometer - To determine "d"
02	To calibrate the spectrometer using Edser-Butler plate.
03	Absorption spectrum of Iodine molecule
04	To determine the charge on electron by Millikan's experiment.
05	Determination of dead time of G.M. tube. Comparison of relative intensities of different sources using G.M. Tube.

No	GROUP- C
01	Heaviside mutual inductance bridge.
02	Self-inductance of a coil by Rayleigh's method.
03	Use of Excel for data analysis and graph plotting.
04	Study of voltage regulated circuit using IC7805
05	Half adder, Full adder and subtracter using IC 7483.

No	GROUP- D
01	Frequency response of a common source FET amplifier.
02	Colpitts oscillator.
03	Negative feedback amplifier using transistor.
04	Nibble Multiplexer and 8:1 Multiplexer
05	OPAMP Applications: Adder and Subtracter.