## Syllabi for Physics Theory & Practical

**Academic year 2013 – 14**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Physics theory</th>
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<th>Physics theory</th>
<th>Physics Subject Elective</th>
<th>Physics Practical</th>
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<tbody>
<tr>
<td></td>
<td>4 credit</td>
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<td>2 Credit</td>
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<td>Total 100 Marks</td>
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<td>Internal 30 Marks</td>
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<td>12 hrs/Week</td>
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</table>

### 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.
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:

Article Nos.: Chapter 2: 2.1, 2.2(A – E), 2.3, A.3 (3, 4)
Article Nos.: Chapter 3: 3.1 to 3.7 including examples.
Reference Book:

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.

Motion of a rigid body:
Introduction, Euler’s theorem, Angular momentum and kinetic energy, The inertia tensor, Euler’s equations of motion, Torque free motion, Euler’s Angles, Motion of a symmetric top, Nutational motion.

Article Nos.: Chapter 8: 8.1 to 8.9; Chapter 10: 10.1 to 10.7
Reference Book:
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
Introduction, the simple harmonic oscillator, the Schrödinger equation and energy eigenvalues, the energy eigenfunctions, properties of stationary states, the abstract operator method, Coherent states, 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. Angular momentum in stationary states of systems with spherical symmetry

Article Nos.: Chapter 4: 4.1 to 4.12
Reference Book:
2. Quantum Mechanics by F. Schwabl, Narosa Publishing House
3. Quantum Mechanics by G. Aruldhas, PHI
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, tuneable 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:

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:

Unit – IV: Solid State Physics


Article Nos.: Chapters 3 & 6
Reference book:
Elements of Solid State Physics by J. P. Srivastava, Prentie-Hall of India Private Limited, New Delhi
Unit – I:
**Electromagnetic induction:** Hysterisis, 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, Lienaed-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.

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
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 to2.4, 2.6, 2.8 )
Reference Books: Network Analysis by M. S. Van Valkenburg
               Network Analysis by G K Mithal
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:

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

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 – II: 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.
5. Basic Physical Chemistry for Atmospheric Sciences by P.V. Hobbs
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:
   \[ \sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots \]
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.
3. C++ : Effective Object Oriented Software Construction - Kayshav Dattari.
5. Object Oriented Programming in C++ - Bala Guruswamy.
College authority / Concern department will assign a project guide and student has to work under allotted project supervisor for the project. Student has to submit project report and give a project presentation and project viva-voce. Project supervisor has to take care such that the subject of the project falls under the category of PHYSICS.
Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – V
Academic year 2013 - 14

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 10 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**  
**Academic year 2013 - 14**

**Physics Practical: PHY – 306**  
*(5 credit : 12 hrs/week)*

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

<table>
<thead>
<tr>
<th>No</th>
<th>GROUP- A</th>
<th>Description</th>
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<tbody>
<tr>
<td>01</td>
<td>Acceleration due to gravity by Kater’s pendulum (fixed knife edges).</td>
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<tr>
<td>02</td>
<td>To determine melting point of a substance by platinum resistance thermometer using Callender- Griffiths bridge.</td>
<td></td>
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<tr>
<td>03</td>
<td>Characteristics of G.M. Tube.</td>
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<tr>
<td>04</td>
<td>Viscosity by Log decrement</td>
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<tr>
<td>05</td>
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<tr>
<td>01</td>
<td>Refractive index by total internal reflection using Gauss eye piece.</td>
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<tr>
<td>02</td>
<td>Fabry-Perot etalon. Determination of the thickness of air film and wavelength of light using spectrometer.</td>
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<tr>
<td>03</td>
<td>Michelson interferometer. To determine the wavelength of monochromatic light.</td>
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<tr>
<td>04</td>
<td>Absorption spectrum of Iodine molecule.</td>
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<tr>
<td>05</td>
<td>An optical method of determining dielectric constant, dipole moment and polarizability of a polar liquid using Hollow prism</td>
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<tr>
<th>No</th>
<th>GROUP- C</th>
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<tr>
<td>01</td>
<td>Mutual Inductance by Ballistic Galvanometer</td>
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<tr>
<td>02</td>
<td>Determination of capacity of Scherreing Bridge</td>
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<tr>
<td>03</td>
<td>Determination of Curie temperature of ferroelectric ceramic</td>
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<tr>
<td>04</td>
<td>I-V Characteristics of Solar Cell and to determine fill-factor, voltage-factor and efficiency</td>
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<tr>
<td>05</td>
<td>Determination of unknown frequency using Wein Bridge</td>
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<th>GROUP- D</th>
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<tr>
<td>02</td>
<td>Series and parallel resonance. To find the band width and Q value of a coil.</td>
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<tr>
<td>03</td>
<td>Frequency response of CE amplifier</td>
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<tr>
<td>04</td>
<td>Half adder, Full adder and substractor using IC 7483.</td>
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</tr>
<tr>
<td>05</td>
<td>A.C. Circuit analysis by C.R.O. Measurement of frequency and phase difference</td>
<td></td>
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</tbody>
</table>

**Reference Books:**
1. Practical Physics by S.L.Gupta & V kumar  
3. B.Sc. Practical Physics by C.L.Arora, S Chand.  
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.
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.

Article Nos.: Chapter 5: 5.1 – 5.9 including examples.
Reference Book:

Unit – II: Variational principle : Lagrange's and Hamilton's equations :

Article Nos.: Chapter 11: 11.1 - 11.13
Reference Book:
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, normal modes of coupled systems of particles, a charged particle in a uniform magnetic field.

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. The algebra of Rotation generators, transformation of dynamical variables, Symmetries and conservation laws, the space inversion, time reversal.

Article Nos.: Chapter 4: 4.13 - 4.21
Article Nos.: Chapter 7: 7.1 – 7.14
Reference Book:
2. Quantum Mechanics by F. Schwabl, Narosa Publishing House
3. Quantum Mechanics by G. Aruldhas, PHI
(4 Credit : 4 hrs/week)

Unit – I: Electronic Spectra:

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:

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 diamagnetism, Quantum theory of paramagnetism, application to magnetic ions in solids: effect of the crystal field, van Vleck paramagnetism, Pauli paramagnetism, Nuclear paramagnetism, Cooling by adiabatic 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:
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: 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

Article Nos.: 2.1 – 2.12, 3.1 – 3.8, 4.3 – 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.

Unit – IV: Elementary particles:
The four basic forces, Particles and antiparticles, Families of particles, conservation laws, particle interactions and decays, energetics of particle reactions, the quark model, the standard model, Numerical Examples.

Article Nos.: 6.1 to 6.9, 9.5 to 9.7
Modern Physics by Kenneth Krane, John Wiley and sons.
Article Nos.: 14.1 – 14.9
Reference Books:
Introduction to Nuclear Physics by H.Engle, Addison Wesley
Nuclear Physics by D. C. Tayal, Himalaya Publisher
Nuclear Physics by Irving Kaplan
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, Colpit and Hearley oscillators with analysis.

Text Book: Electronic Devices and circuits – An introduction by Allen Mottershead
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 V_{DS} 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 Mottershead
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 - subtructactor, binary multiplication and division, Digital comparator, decoder, demultiplexer, data selector, encoder.

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. Mottershead
Article Nos.: 28.2 to 28.4
Electronic Instruments: Cathode ray oscilloscope: CRO, CRT, electrongun, 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.

Article Nos.: 36.1 to 36.11, 36.17, 36.18, 36.20.
Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – VI
Academic year 2013 - 14

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

Unit – I:
Numerical analysis in physical measurement:

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.

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

Reference Books:
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.


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
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:
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
Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – VI
Academic year 2013 - 14

PHY – 311: SEC_D: PHYSICS PROJECT
(2 Credit)

College authority / Concern department will assign a project guide and student has to work under allotted project supervisor for the project. Student has to submit project report and give a project presentation and project viva-voce. Project supervisor has to take care such that the subject of the project falls under the category of PHYSICS.
Gujarat University
Ahmedabad

B. Sc. (PHYSICS) Semester – VI
Academic year 2013 - 14

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 10 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.
<table>
<thead>
<tr>
<th>No.</th>
<th>GROUP - A</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Acceleration due to gravity by Kater's pendulum (variable knife edge)</td>
</tr>
<tr>
<td>02</td>
<td>e/k by power transistor.</td>
</tr>
<tr>
<td>03</td>
<td>Hall effect.</td>
</tr>
<tr>
<td>04</td>
<td>Study of thermocouple.</td>
</tr>
<tr>
<td>05</td>
<td>To find the value of permeability of free space</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>GROUP - B</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Michelson interferometer - To determination of “d” of</td>
</tr>
<tr>
<td>02</td>
<td>To calibrate the spectrometer using Edser-Butler plate.</td>
</tr>
<tr>
<td>03</td>
<td>To analyse elliptically polarized light using Babinates compensator.</td>
</tr>
<tr>
<td>04</td>
<td>To determine the charge on electron by Millikan’s experiment.</td>
</tr>
<tr>
<td>05</td>
<td>Determination of dead time of G.M. tube.</td>
</tr>
<tr>
<td></td>
<td>Comparison of relative intensities of different sources using G.M. Tube.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>GROUP - C</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Heaviside mutual inductance bridge.</td>
</tr>
<tr>
<td>02</td>
<td>Self inductance of a coil by Rayleigh’s method.</td>
</tr>
<tr>
<td>03</td>
<td>Use of Excell for data analysis and graph plotting.</td>
</tr>
<tr>
<td>04</td>
<td>Susceptibility of ferromagnetic substance by Quink’s method (Magnetic fluid).</td>
</tr>
<tr>
<td>05</td>
<td>Study of Hysterisis using C.R.O.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>GROUP - D</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Frequency response of a common source FET amplifier.</td>
</tr>
<tr>
<td>02</td>
<td>Colpitts oscillator.</td>
</tr>
<tr>
<td>03</td>
<td>Negative feedback amplifier using transistor.</td>
</tr>
<tr>
<td>04</td>
<td>Study of voltage regulated circuit using IC7805</td>
</tr>
<tr>
<td>05</td>
<td>To measure a threshold current of a LASER diode at room temperature.</td>
</tr>
</tbody>
</table>

**Reference Books:**
1. Practical Physics by S.L.Gupta & V kumar
3. B.Sc. Practical Physics by C.L.Arora, S Chand.