

PH1502 - PROPERTIES OF MATTER AND ACOUSTICS

Category : MC
Semester : I

Credits : 6
No. of hrs/wk : 6

Unit 1. ELASTICITY: - Modulus of elasticity- Poisson's ratio- Relation between elastic constants and Poisson's ratio-Energy stored- Twisting couple on a cylinder- Torsional pendulum (with and without weights)- Bending of beams- Bending moment- Cantilever loading- Transverse vibrations of cantilever-Non-uniform and uniform bending of a beam-Koenig's method – Determination of Y and n for the material of the spring.

Unit 2. VISCOSITY AND LOW PRESSURE: - Newton's law- Poiseuille's flow- Stoke's fall- Rotation viscometer- Ostwald viscometer- Meyer's formula for viscosity of gas-Rankine's method- Effect of temperature and pressure on viscosity- Air pump- Rotary oil pump-Mercury diffusion pump- McLeod gauge-Pirani gauge- Knudsen Gauge.

Unit 3. SURFACE TENSION: - Molecular interpretation- surface energy- Pressure difference across a curved surface- Excess pressure in liquid drops and air bubbles-Molecular forces- Shape of liquid meniscus in capillary tube-Angle of contact- Capillary rise and energy consideration- Jaeger's method- Quincke's drop-Vapour pressure over flat and curved surfaces.

Unit 4. WAVES AND OSCILLATIONS: - Transverse and longitudinal waves- Equation of Wave motion- Plane progressive wave- speed of transverse wave on a string- Energy in wave motion- Superposition of waves- Interference, reflection and transmission of wave- Standing waves normal modes of a string- Resonance-Sound Waves in gases- Organ pipes- Beats- Doppler effect.

Unit 5. ULTRASONICS AND ACOUSTICS: - Ultrasonic- Piezo-electric effect-Piezo- electric generator- Magnetostriction effect- Magnetostriction oscillator-Detection and application of ultrasonic-Acoustics- Reverberation time and its measurement- Sabine's formula-Absorption coefficient and its determination- Condition for good acoustical design of an auditorium- Noise and its measurement- Noise reduction- sound insulation

TEXT BOOKS:-

1. D.S MATHUR- ELEMENTS OF PROPERTIES OF MATTER: S.CHAND AND CO
2. BRIJ LAL AND N. SUBRAHMANYAM- PROPERTIES OF MATTER: - S.CHAND AND CO (2003)
3. N.SUBRAHMANYAM AND BRIJ LAL- A TEXT BOOK OF SOUND: VIKAS PUBLISHING HOUSE (SECOND REVISED EDITION- 1995)

BOOKS FOR REFERENCE:-

1. H.R GULATI- FUNDAMENTAL OF GENERAL PROPERTIES OF MATTER- R.CHAND AND CO- FIFTH EDITION (1977)
2. N.K BAJAJ- THE PHYSICS OF WAVES AND OSCILLATIONS- TATA MCGRAW-HILL (1988)
3. A.P FRENCH- VIBRATION AND WAVES- MIT INTRODUCTORY PHYSICS- ARNOLD-HEINMANN INDIA (1973)
4. SATYA PRAKASH AND AKASH SALUJA- OSCILLATIONS AND WAVES- PRAGATI PRAKASHAN (2002)

PH2503 – Mechanics

Category : MC
Semester : II

Credits : 3
No. of hrs/wk : 3

Unit1: RIGID BODY DYNAMICS: Compound pendulum - Centers of oscillation and suspension - determination of g and k - Bifilar pendulum - Parallel and non parallel threads - Torsional pendulum – Centre of mass - Conservation of linear and angular momentum - Variable mass- Rocket propulsion.

Unit2: STATICS AND HYDROSTATICS: Concurrent forces - Parallel forces –couple - static equilibrium of rigid body - Centre of gravity of solid and hollow tetrahedron - centre of pressure of rectangular and triangular lamina - Meta centric height and its determination.

Unit 3: FLUID DYNAMICS: Equation of continuity-Bernoulli's theorem and its applications - Toricelli's theorem - Velocity of efflux – Venturimeter - Pitot's tube-Diffusion - Fick'S law - Relation between the time of diffusion and length of column -Graham's law for diffusion of gases - Tanspiration and transfusion.

Unit 4: LAGRANGIAN DYNAMICS: Mechanics of system of particles - Constraints of motion-Generalized coordinates and the transformation equation-simple illustration for the transformation equation - Configuration space - principle of virtual work - D'Alembert's principle - Lagrange's equations - simple applications.

Unit 5: GRAVITATION: Kepler's law-Newton's law of gravitation - G and measurements - Earth – moon system-weightlessness – earth satellites - parking orbits - Earth density – mass of the sun - gravitational potential - velocity of escape - satellite potential and kinetic energy.

TEXT BOOKS:-

1. M.Narayanamurti and Nagarajan, Dynamics, National Publishing Company, 8th Edition, 2002.
2. D.S. Mathur, Elements of Properties of Matter, S.Chand and Co., 11th Edition,2000.
3. Robert Resnik, Introduction to Special Theory of Relativity, 7th Edition, 1985.
4. S.G.Venkatachalapathy, Mechanics, Margham Publication, 2003.

BOOKS FOR REFERENCE:-

1. H.Goldstein, C.Pole and J.Scifko, Classical Mechanics, Pearson Education Asia, 3rd Edition, 2004.
2. R.P.Feynman, R.B.Leighton and M.Sands, The Feynman Lectures on Physics, Volumes 1 & 1, Narosa Publishing House, 1998.
3. Murray R. Speigal, Theoretical Mechanics, Schaum's Outline Series, McGraw-Hill Book Co, SI(Metric) Edition, 1987.
4. A.P.French, Newtonian Mechanics, MIT Introductory Physics Series, Viva Bools Pvt Ltd, First Indian Edition, 2003.
5. Somnath Data, Introduction to Special Theory of Relativity, Allied Publisher, 1998.

PH2504 - PHYSICS PRACTICAL - I

Category : MC
Semester : I & II

Credits : 6
No. of hrs/wk : 3

Objective :-It is aimed at exposing the under graduate students to the technique of handling simple measuring instruments and also make them measure certain mechanical and thermal properties of matter.

- 1) Cantilever loading-Pin and Microscope- Transverse vibrations – Young's Modulus
- 2) Torsional Pendulum (Without weights) – Rigidity Modulus
- 3) Compound bar pendulum- g and k
- 4) Graduated burette- Viscosity of liquid
- 5) Capillary Rise- Surface Tension of liquid
- 6) Method of Mixtures- Latent Heat of vaporisation of Steam.
- 7) Joly's Bulb- Pressure Coefficient of Air
- 8) Sonometer- Verification of Laws of Transverse vibration in a stretched string
- 9) Deflection magnetometer- Tan C position- Moment of a bar Magnet
- 10) Convex lens- Focal length
- 11) Spectrometer- Solid Prism- A , D and m
- 12) Spectrometer- Grating-Normal incidence
- 13) Carey-Foster Bridge- Specific Resistance
- 14) Table Galvanometer- Figure of Merit
- 15) Logic Gates- OR, AND and NOT
- 16) Transistor Characteristics (Static)
- 17) Unregulated and Zener regulated power supply.
- 18) Potentiometer- Calibration of Ammeter

TEXT BOOKS:-

1. C.C Ouseph, G.Rangarajan- A Text Book of Practical Physics- S. Viswanathan Publisher-Part I (1990)
2. C.C Ouseph, C.Rangarajan, R.Balakrishnan- A Text Book of Practical Physics- S.Viswanathan Publisher-Part II (1996)

BOOKS FOR REFERENCE:-

1. S.L Gupta and V.Kumar- Practical Physics- Pragati Prakashan – 25th Edition (2002)

PH3504 - ELECTRONICS - I

Category : MC
Semester : III

Credits : 5
No. of hrs/wk : 5

Objective : It is aimed at exposing the under graduate students of the Physics department to the fundamentals of analog and digital electronics. The various topics have been selected to augment the electronics experiment they will be doing in their practical sessions.

Unit 1. Circuit Analysis:

DC circuits - Voltage and current sources transformations- Nodal analysis Superposition, Thevenin, Norton's and maximum power transfer theorems - Simple network analysis - Equivalent circuits – h-parameters definition - transistor h parameters – CE mode.

Unit 2. Amplifiers and Oscillators:

Single and multistage amplifier - load line - operating point stability - different methods of biasing - multistage amplifier, RC and direct coupled amplifiers - Power amplifier Class A - Frequency response. Feedback requirements for oscillators - Colpitts oscillator - Phase Shift and Wein Bridge oscillators - Multivibrators - Astable, Monostable, Bistable.

Unit 3. Operational amplifier and special devices:

Ideal operational amplifier parameters - inverting and non inverting - common mode rejection ratio - summing and difference amplifiers - Solving simultaneous equations - FET, MOSFET, UJT, SCR - Equivalent circuit operations, characteristics and parameter - SCR as half and full wave rectifiers.

Unit 4. Digital Electronics:

K-maps - Parallel binary adder - BCD code to 7 segment decoder. Multiplexing and demultiplexing. flip-flop - RS clocked RS - D flip-flop - T flip-flop - JK flip-flop and Master Slave flip-flop - Truth tables.

Unit 5. Counters and Registers:

Counters - Binary ripple counter - modulus counter - decade counter - up counter - down counter - Registers - Shift registers - Shift counter circuits and their working - An introduction to memory devices - ROM, RAM.

BOOKS FOR STUDY:

1. Gupta S.L. and Kumar, Hand book of Electronics, Pragati Prakashan, 1973.
2. Virendra Kumar, Digital technology Principles and practices, New Age Intl. 1996.
3. John D. Ryder- Electronic, fundamentals and applications, Prentice Hall, 1971.
4. Malvino, Electronic principles, Tata McGraw Hill, Ed., 1995.
5. Millman J. and Halkias C.C., Integrated Electronics, Analog & Digital Circuits and systems, McGraw-Hill Kogakashu, 1985.
6. Chattopadhyay D. and Rakshit, Electronics Fundamental and applications, New age publishers, 11 Ed., 1988.
7. Cutler, Electronic Circuit Analysis, 1960.
8. Mehtha VK., Principles of Electronics, S.Chand & Co., VI Ed. (revised), 2000.
9. Malvino A. P & Leach D. R, Digital Electronics, McGraw-Nill , IVEd. 1986
10. B.Grob, Basic electronics, V edition (1986)
11. Boylestad, L.Robert, Introducing circuit analysis.

PH3505 - THERMODYNAMICS

Category : MC
Semester : III

Credits : 4
No. of hrs/wk : 4

Objective: *This course aims to study the response of gases, liquids and solids to heat both at the macroscopic and at the microscope level.*

Unit 1 Kinetic theory:

Expression for pressure – Transport phenomena – expression for mean free path – coefficient of viscosity of gases – Thermal conductivity and diffusion of gases – Distribution of molecular velocities – the energy distribution function – molecular beams – experimental verification of Maxwell's velocity distribution – principle of equipartition of energy – theory of Brownian motion – Perrin's experiment – Langwin's theory

Unit 2 Gases:

Molar heat capacities – Meyer's relation reversible adiabatic and isothermal changes – equations – element and Desormes method of determining C_p/C_v . Andrew's work on CO_2 – regenerative cooling– the Linde process – Liquid air, oxygen, hydrogen and Helium – He I and He II – super fluidity.

Unit 3 Thermodynamics:

Intensive and extensive variables – Partial derivatives – Coefficients of expansion and compressibility – consequences of first law of thermodynamics – Internal energy of gases – enthalpy.

Second law of thermodynamics – reversibility – types of irreversibility – Conditions – Clausius – Clayperon equation – Clausius in equality – Concept of entropy – Unavailable energy.

Unit 4 Phase transition:

Combined 1st and 2nd law of thermodynamics – entropy of an ideal gas – reversible adiabatic process – Temperature – entropy diagrams – Helmholtz and Gibbs functions – Gibbs-Helmholtz equation – Maxwell's equations.

Joule-Kelvin inversion curve – Joule- Kelvin coefficient – phase changes – Ehrenfest's classification of phase transition – equations of state – Heats of transformation – specific heat capacity of saturated vapours – experiment for latent heat of vapourisation.

Unit 5 Statistics:

Introduction – phase-space-microstates and macrostates – Thermodynamic probability and entropy – Maxwell Boltzmann Statistics to a monoatomic ideal gas – specific heat capacity of a diatomic gas – Planck's quantum theory – Black body radiation – Bose – Einstein statistics – Wien's displacement law – Rayleigh Jean's law – Solar constant.

TEXT BOOKS:-

1. Sears.F.W, **Thermodynamics, Kinetic theory of gases and statistical Mechanics**
2. Zemansky.M.W, and Dittman R.H, **Heat and Thermodynamics**, 6th edition (1989)
3. Nelkon Parker, **Advanced level Physics**, 5thedition, (1982), Arnold Pub. Berkely Series Vol. V

BOOKS FOR REFERENCE:-

5. Sears &Salinger, Thermodynamics, kinetic theory and statistical thermodynamics, (1988), 3rd edition
6. Reiff, Statistical physics (1967)
7. C.Kittel and H.Kromer, Thermal Physics, 2nd edition(2000).

**PH4021 - NUMERICAL METHODS AND COMPUTER PROGRAMMING
(C LANGUAGE)**

Category : CL
Semester : IV

Credits : 2
No. of hrs/wk : 3

Objective : To expose the under graduate students of the Physics department to some of the numerical methods of interpolation, integration and differentiation. The student is also expected to pick up the basics for developing computer programs using C language to solve physics related problems.

Unit 1. INTERPOLATION, INTEGRATION AND DIFFERENTIATION:

Linear and Lagrange interpolations - Newton's interpolation. - Trapezoidal rule - Simpson's rule. Solution of first order equation: Euler's and Runge-Kutta method.

Unit 2. DATA TYPES AND OPERATORS:

Variable name - Data types and sizes - Declarations - Arithmetic, Relational and logical operators - Precedence and order of evaluation.

Unit 3. CONTROL FLOW:

Statements and blocks - If-else - Else-if - Switch - While and For - Do While - Break and Continue - Goto and Labels.

Unit 4. FUNCTIONS AND ARRAYS:

Basics of functions - Functions returning non-integers - External variables - Scope rules - Header files Static variables. Arrays - Multi dimensional arrays

Unit 5. INPUT AND OUTPUT:

Standard input and output - Formatted output (printf) - Variable length argument lists - Formatted input (scanf) - File access - Error handling.

TEXT BOOKS:-

1. The C programming language : Brian W. Kernigham and Dennis M. Ritchie - 2nd Ed. Prentice-Hall of India Pvt. Ltd.
2. The spirit of C. Henry Mullish and Herbert L Cooper- 15th Ed. Jaico Publishing house.
3. Numerical methods and Computers: Kuo - Addison - Wesley, London, 1966.
4. Computer Oriented Numerical Methods : Rajaraman - 3rd Ed. Prentice Hall, New Delhi.

PH4504 - MATHEMATICAL PHYSICS

Category : MC
Semester : IV

Credits : 3
No. of hrs/wk : 3

Unit 1. Complex Analytic Functions:

Curves and regions in the complex plane - complex function - Analytic function - Cauchy - Riemann equations - Laplace's equation - rational, exponential, trigonometric and hyperbolic, logarithmic functions. General powers of a complex number.

Unit 2. Complex Integrals:

Line integral and its basic properties - Cauchy's integral theorem - evaluation of line integral by indefinite integration. Cauchy's integral formula.

Unit 3. Partial differential equations:

Basic concepts - vibrating string, one - dimensional wave equation - separation of variables (product method) - D'Alembert's solution of the wave equation - one dimensional heat flow - two dimensional wave equation - potential - Laplace's equation (-2 dimensional) and solutions.

Unit 4. Fourier Transform:

Fourier Transforms and inversion - Definitions - Properties of Fourier transform - Parseva's theorem - convolution - Fourier Sine and Cosine transform - derivatives of Fourier transforms - simple applications.

Unit 5. Numerical Methods:

Forward difference operator - shift operator - Forward Difference table - Newton's forward interpolation formula - Lagrange's interpolation - numerical integration: Trapezoidal and Simpson's 1/3rd rule. Differential equations: First order differential equation - Euler's method.

TEXT BOOKS:-

1. Advanced Engineering Mathematics, Erwin Kreyzig 5th Edition, Wiley Eastern Ltd. (1991). (Units - 1,2,3).
2. Mathematical Physics, Eugene Butkov, Addison Wesley (1968). (Unit- 4)
3. Numerical Methods, (with programs in BASIC, PORTAN and Physical) S. Balachandra Rao, C.K. Shantha, Universities Press. (1992). (Unit - 5)

BOOKS FOR REFERENCE:-

1. M. D. Green berg, Adv. eng. Mat. 2nd Edn (Pearson 2000)
2. Weber and Oscar Mat. Met. For Phy,

PH4505 - PHYSICS PRACTICAL - II

Category : MC
Semester : III & IV

Credits : 6
No. of hrs/wk : 3

Objective :-It is aimed at exposing the under graduate students to the technique of handling simple measuring instruments and also make them measure certain mechanical and thermal properties of matter

- 1) Non-uniform and uniform bending-Pin and microscope- Young's modulus.
- 2) Torsional Pendulum (With weights)- Rigidity modulus.
- 3) Bifilar pendulum- Moment of inertia.
- 4) Searle's viscometer- Viscosity of highly viscous liquids.
- 5) Rankine's tube method- Viscosity of air.
- 6) Newton's law of cooling- Specific heat of liquid.
- 7) Saturated vapour pressure- Jolly's bulb
- 8) Thermal conductivity of bad conductor- Lee's disc
- 9) Thermal conductivity of good conductor- Forbes's method.
- 10) Deflection and Vibration magnetometers- M and B_H .
- 11) Air wedge- Thickness of insulation.
- 12) Liquid lens- Refractive index of glass and liquid.
- 13) Spectrometer- Hollow prism- Refractive index of liquid.
- 14) Spectrometer- Grating- Oblique incidence.
- 15) Carey-Foster bridge- Temperature coefficient of resistance.
- 16) Ballistic galvanometer- Figure of merit.
- 17) Transistor- RC coupled amplifier.
- 18) IC regulated dual power supply.

TEXT BOOKS:-

1. C.C OUSEPH, G.RANGARAJAN- A TEXT BOOK OF PRACTICAL PHYSICS- S. VISWANATHAN PUBLISHER- PART I (1990)
2. C.C OUSEPH, C.RANGARAJAN, R. BALAKRISHNAN- A TEXT BOOK OF PRACTICAL PHYSICS- S. VISWANATHAN PUBLISHER-PART II (1996)

BOOKS FOR REFERENCE:-

1. S.L GUPTA AND V.KUMAR- PRACTICAL PHYSICS- PRAGATI PRAKASHAN- 25TH EDITION (2002).

PH5403 - GEOPHYSICS

Category : ES

Semester : V

Credits : 2

No. of hrs/wk : 3

Unit 1. Introduction and Seismology:

Introduction - Seismology: P waves, S waves, their velocities - Time distance curves and the location of epicenters - Effect of boundaries - Major discontinuities and resulting phase of seismic waves - Derivation of properties from the velocities

Unit 2. Surface Waves and Seismometry:

Surface waves: Rayleigh waves and Love waves - Study of earth by surface waves.

Seismometry: Horizontal seismograph and seismography equation - Strain seismograph.

Unit 3. Earthquakes and Gravity:

Earthquakes: Focus, magnitude, frequency - Detection and prediction - Gravity: The potential (Laplace's equation and Poisson's equation) - Absolute and relative measurements of gravity - Hammond Faller method - Worden gravimeter.

Unit 4. Geomagnetism and Internal structure of the Earth:

Geomagnetism: Fundamental equations - Measurements: method of Gauss, saturation induction magnetometers, proton precession magnetometers, alkali vapour magnetometers - Theories of earth's magnetism - Causes of the main field -Dynamo theories - Internal structure of the earth: The core variation of mechanical properties with depth - Materials and equation of state of the interior of the earth.

Unit 5. Geochronology and Geothermal Physics:

Geochronology: Radioactivity of the earth - Radioactive dating of rocks and minerals Geological time scale - The age of the earth - Geothermal physics: Flow of heat to the surface of the earth - Sources of heat within the earth - Process of heat transport Internal temperature of the earth.

TEXT BOOKS:-

1. Garland, G.D., Introduction to Geophysics 11 Ed., WB Saunder Company, London,1979
2. Cook, A. H., Physics of the Earth and Planets I Ed. , McMillan Press, London, 1973.

PH5404 - ELECTRONICS - II

Category : ES

Semester : V

Credits : 2

No. of hrs/wk : 3

Objective : The first three units are aimed at exposing the under graduate students of the Physics department to the principles and design aspects of non-linear circuits, A/D & D/A conversions and fabrications of Integrated circuits. The fourth and the fifth units are expected to provide the students with a thorough understanding of the functioning of the microprocessor 8085 and also provide them with the basic skills in developing assembly language programs.

Unit 1. Operational amplifiers (non-linear circuits)

Integrator - differentiator - solving differential equations - logarithmic and antilogarithmic amplifiers-II order high pass and low pass filters - astable and monostable multivibrators - instrumentation amplifiers.

Unit 2. Digital to analog and analog to digital conversion:

Weighted resistor D/A converter - R-2R ladder D/A converter - parallel A/D converter - A/D conversion by counter method -A/D conversion using voltage to frequency converter.

Unit 3. Integrated Circuit technology:

Scale of integration - VLSI - monolithic, thick, thin film and hybrid integrated circuits - bipolar and MOS technology comparison - fabrication of monolithic I.C. - fabrication of integrated components like resistors, capacitors, transistors and diodes - linear and nonlinear I.C's.

Unit 4. Architecture of μ P 8085:

Architecture of 8085 - the instruction set - data addressing modes. Simple assembly language programs - addition, subtraction, multiplication, division

Unit 5. Assembly language programming - μ P 8085

Assembly language programs : square, square root, picking largest/smallest of an array-Subroutines - Hand assembling programs.

TEXT BOOKS:-

1. R S. Sedha, A Text Book of Applied Electronics S. Chand & Co., New Delhi, I Ed.1998 (reprint).
2. Allen Mottershead, Electronic Devices and Circuits, Prentice-Hall, 1993.
3. A. Gaykwad, Operational Amplifier and Linear Integrated Circuits Prentice Hall, 11 Ed. 1991.
4. Deboo and Burrows, Integrated Circuits and Semiconductor Devices Theory and Applications Tata McGraw Hill.
5. Ramesh S. Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085 Penram International, IV Ed., 2000.
6. Adithya R Mathur, Microprocessors, Tata McGraw-Hill, III Ed., 1999.

PH5405 - MATERIAL SCIENCE

Category : ES
Semester : V

Credits : 2
No. of hrs/wk : 3

Unit 1. ENGINEERING MATERIALS - CHEMICAL BONDING:

Classification of engineering materials - levels of structure - structure-property relationship in materials stability and metastability - Bond energy - bond type and bond length - Ionic and covalent bonding secondary bonding - variation in bonding character and properties.

Unit 2. ELEMENTARY CRYSTALLOGRAPHY:

Space lattice - basis - unit cell - Bravais lattice - Miller indices - symmetry elements of a crystalline solid - symmetry groups - X-ray diffraction and Bragg's law - powder method. Crystal imperfections - point imperfections - geometry of dislocation - edge and screw dislocation - Burger's vector.

Unit 3. MECHANICAL BEHAVIOUR OF MATERIALS:

Elastic behaviour - atomic model of elastic behaviour -Young's modulus - Poisson's ratio - Shear modulus - bulk modulus -The modulus as a parameter in design - rubber like elasticity. Plastic deformation - the tensile stress-strain curve.

Unit 4. NON DESTRUCTIVE TESTING:

Radiographic methods - Photoelastic method - magnetic methods - electrical methods Ultrasonic methods. Equipments used for NDT - metallurgical microscope - electron microscope - scanning electron microscope (SEM).

Unit 5. MAGNETIC MATERIALS AND DIELECTRIC MATERIALS:

Terminology and classification - magnetic moments due to electron spin - ferro magnetism the domain structure - soft and hard magnetic materials. Polarization electronic, ionic, orientation and space charge polarization - temperature and frequency effects - electric breakdown - ferroelectric materials.

TEXT BOOKS:-

1. Raghavan V- Materials Science and Engineering a first course, III Ed., Prentice Hall of India (pact) ltd , 1990.
2. Structural M., Materials Science, Anuradha agencies & publishers, 1990.

BOOKS FOR REFERENCE:-

1. Kittel C., Introduction to Solid State Physics, V11 Ed, Wiley Eastern
2. Manchandra VK., A text book of Materials Science, New India Publishing House, 1992.

PH5507 - ATOMIC AND NUCLEAR PHYSICS

Category : MC

Credits : 6

Semester : V

No. of hrs/wk : 6

Objectives: *To enable the students to understand and appreciate the fundamental concepts of Atomic and Nuclear Physics*

Unit 1. Ions & Electrons and Atomic Structure & spectra:

Introduction - The detection of charged particles in electric and magnetic fields - Dunnington's method for elm - Positive Ray analysis: Thompson's Parabola method - Angular momenta and magnetic moments - Pauli's exclusion principle - Spin-orbit interaction IS and jj- couplings - Spectroscopic notation: explanation - Zeeman and Anomalous Zeeman effect - Paschen Bach effect - Stark Effect (qualitative study only) - Stern-Gerlach experiment - Compton effect - Experimental verification of Compton effect

Unit 2. Nuclear Structure and General Properties of Nuclei and Radioactivity:

Introduction - Isobars, isotopes, factories and mirror nuclei - Nuclear mass and binding energy Nuclear spin - Parity - Mass defect and packing fraction - B.E/A versus A curve - Nuclear size Nuclear magnetic moment - Determination of nuclear magnetic moment: Rabi's method - Electric quadrupole moment Nuclear energy levels - Range and stopping power of Alpha particles Geiger-Nuttal law - Feature of Alpha decay: Tunnelling - Beta ray spectrum - Energetics of Beta decay -Neutrino hypothesis of Pauli - Inverse Beta decay - Detection of neutrino - Gamma ray spectra - Gamma ray absorption in matter.

Unit 3. Neutron Physics and Nuclear Fission and Fusion:

Neutron: Discovery, mass, half life, magnetic moment, sources and detection - Cross section of reactions - Nuclear fission: Liquid drop theory - Bohr's theory of compound nucleus Classification of neutrons Nuclear chain reaction - Nuclear reactor: Four factor formula Nuclear fusion: Thermonuclear reactions - Lawson's criterion - Controlled fusion.

Unit 4. Nuclear Models, Cosmic Rays and Elementary Particles:

Introduction - Liquid drop model - Semi empirical mass formula - Shell model - Nuclear forces: Yukawa's Meson field theory - Cosmic Rays: Nature of Cosmic rays - Cosmic ray showers Particles discovered Effect of earth's magnetic fields - Van Allen Belts - Elementary particles: Discovery - Classification of elementary particles - Bosons and Fermions - Hadrons and Leptons Particles and antiparticles Fundamental interactions - Conservation laws - Quark contents.

Unit 5. Nuclear Resonance Spectroscopy:

Nuclear magnetic resonance spectroscopy – introduction – interaction of spin and magnetic spin – population of energy levels – Larmor precession – relaxation times – chemical shift and it's measurements – coupling constant – coupling between several nuclei – Mossbauer spectroscopy.

TEXT BOOKS:-

1. A.B. Gupta and Dipak Ghosh, Atomic and Nuclear Physics - Books and Allied, (P) Ltd; Calcutta. (New Central Book Agency)
2. K. Gopala Krishnan, Atomic and Nuclear Physics, MacMillan.

3. Mani H.S. and Mehta (G.K), Introduction to Modern Physics

BOOKS FOR REFERENCE:-

1. Arthur Beiser, Concepts of Modern Physics (5th edition)
2. Irwing Kalan, Nuclear Physics, Narosa Publishing house, New Delhi, 2nd Edition, 1995.
3. Feynmann Lectures, Vol II and III
4. Halliday/Resnik/Krane, Physics - Vol II, 6th edition extended
5. Aonso and Finn, Fundamental of University Physics (Vol III)
6. Robert D. Evans, The Atomic Nucleus JMH edition)
7. Knneth and Krane, Nuclear Physics (Wilely, 1998)
8. Sri Raman and Bagmari, Nuclear Engineering
- 9 Banwell, Fundamentals of Molecular Spectroscopy 4th edition, 1994, Tata McGraw-Hill, New Delhi)

WEBSITES

<http://accept.la.asu.edu/PiN/rdg/photoelectric/photoelectric.shtml>

http://detserv1.dl.ac.uk/Herald/xray_history.htm

<http://www.energyquest.ca.gov/story/chapter13.html>

PH5508 - ELECTRICITY & MAGNETISM

Category : MC

Semester : V

Credits : 6

No. of hrs/wk : 6

Objectives: *To give the students a firm understanding of the basics of Electricity and Magnetism. To introduce to the students the application of Electricity and Magnetism and Electromagnetism*

Unit 1. ELECTROSTATICS: Coulomb's inverse square law - permittivity - electric intensity - Gauss's theorem and its applications - electric potential and potential energy - electric dipole - potential and intensity due to a dipole - torque on the dipole by electric field.

CONDENSERS: Farad - capacitance of a spherical, parallel and cylindrical condenser effect of dielectrics - energy expression - change in energy of parallel plate capacitor - loss of energy on sharing of charges.

Unit 2. CURRENT ELECTRICITY: Kirchoff's laws - EMF and internal resistance of a cell - Carey Foster's bridge potentiometer and its uses.

THERMO ELECTRICITY: Seebeck and Peltier effect - thermo emf- laws of thermoelectricity - Peltier coefficient -determination of thermo emf - Thomson effect and Thomson coefficient - application of thermodynamics - thermo electric power and thermo electric diagrams.

CHEMICAL EFFECT: Faraday's laws - conductivity of an electrolyte - Kohlraush bridge - theories of electrolytic conduction -Daniel and Leclanche cells - Lead- acid accumulator - Gibbs-Helmholtz equation.

Unit 3. MAGNETIC EFFECT OF AN ELECTRIC CURRENT: Biot - Savart's rule application to straight conductor, circular coil and solenoid - tangent galvanometer - Helmholtz galvanometer - Ampere's circuital law.

FORCE ON CURRENT BY MAGNETIC FIELD: Force on a current element by magnetic field - Fleming Left hand rule - force between two infinitely long conductors - Ampere - force on a charge - Lorentz force - theory of moving coil galvanometer damping correction.

ELECTROMAGNETIC INDUCTION: Faraday and Lenz laws - self induction coefficient of self inductance of solenoid -mutual induction - coefficient of mutual inductance of a solenoid inductor - Coefficient of coupling - earth inductor.

Unit 4. TRANSIENT CURRENT: Growth and decay in an inductive circuit - growth and decay in a capacitive circuit -determination of high resistance by leakage - growth, and decay of charge in an LCR circuit.

ALTERNATING CURRENT: EMF induced in coil rotating in a magnetic field - peak, average and rms value of a.c - phasor diagrams - series and parallel resonant circuits power factor - choke coil transformers three phase a.c - dynamos -motors.

Unit 5. MAGNETISM: Deflection magnetometer - vibration magnetometer - its uses. Magnetism: Dia, Para and Ferro - Susceptibility and permeability - Langevin theory for Dia and Para magnetism - Domain theory for Ferro magnetism - hysteresis.

EM WAVES IN FREE SPACE: Maxwell equations - Transverse nature of em waves - Velocity in free space - Poynting vector.

TEXT BOOKS:-

1. Electricity and Magnetism: Brijlal & Subrahmanyam Ratan Prakashan Mandir Publishers -1995.

2. Fundamentals of Electricity and Magnetism: R.G.Mendiratta and B.K.Sawhney East - West Press (1976)

BOOKS FOR REFERENCE:-

1. Advanced level physics, Nelkon and Parker Arnold Publishers (sixth edition)
2. Berkeley Physics Course; Electricity and Magnetism, Vol. 2 Ed. E.M. Purcell – McGraw-Hill (1965)
3. Classical Electricity and Magnetism; Panofsky and Phillips, India Book House (2000)
4. Electricity and Magnetism, A.S. Mahajan and A.A. Rangwala, Tata McGraw-Hill (1989)
5. Feynman lectures on physics, volume 2 Narosa Publishing House (1992)
6. Foundation of Electromagnetic theory, Reitz (Milford) and Christy, Narosa Book Distributors (1992)
7. Fundamental University Physics, Alonso and Finn Addison –Wesley Publishing Company(1977)
8. Fundamentals of Electricity and Magnetism, A F Kip, Fundamentals of Electricity and Magnetism, International Student Edition, McGraw-Hill and Kogakusha, (1969)
9. Introduction to electro dynamics, David J. Griffith Prentice - Hall of India (1984)
10. Physics through Experiments Vol. II, EMF constant and Varying, B Sarat et al, Vikas Publications, New Delhi (1978)
11. Physics volume 11, David Halliday, Robert Resnick John Wiley and Sons (4th edition 1994)

PH5509 - OPTICS

Category : MC

Semester : V

Credits : 6

No. of hrs/wk : 6

Objectives:

1. To expose the students to the fundamentals of optics
2. To provide the student with knowledge of the applications of optics

Unit 1. Geometrical Optics

Matrix method in ray optics - Effect of translation, refraction - Thick and thin lens formulae - Unit planes - Nodal planes - System of two thin lenses

Lens aberrations - Spherical aberrations of a single surface -Astigmatism - Curvature of field - Distortion -Abbe's sine condition - Chromatic aberrations – Huygen's eyepiece – Ramsden's eyepiece

Dispersive power of a prism – Cauchy's formula – Combination of prisms to produce dispersion without deviation – deviation without dispersion

Unit 2. Interference

Fresnel's biprism, Fresnel's mirrors and Lloyd's single mirror experiments Achromatic fringes - Interference in thin films (from reflected and transmitted light) -Fringes in wedge shaped films -Reflective and antireflective coatings - Michelson's interferometer - Determination of wavelength and refractive index -Fabry Perrot etalon (qualitative)

Unit 3. Diffraction

Rectilinear propagation of light - Zone plate - Fresnel diffraction - Diffraction at circular aperture, circular disc and a straight edge - Fraunhofer diffraction - Diffraction at a single and double slit - Missing orders in double slit - Theory of diffraction grating - Determination of wavelength - Dispersive power - Rayleigh's criterion and resolving power of a prism, grating, telescope and microscope

Unit 4. Polarization

Plane of polarization - Polarization by reflection - Brewster's law - Pile of plates- Polarization by refraction - Malu's law -Double refraction - Nicol prism - Huygen's explanation of double refraction - Elliptically and circularly polarized light -Quarter and half wave plates - Production and determination of plane, elliptically and circularly polarized light - Optical activity - Fresnel's theory - Specific rotation - Laurent's half shade polarimeter

Unit 5. Quantum optics

Light quanta and their origin - Resonance radiation - Metastable states Population inversion - Optical pumping -spontaneous and stimulated emission - Einstein's coefficients - Ruby, He-Ne, carbon dioxide lasers Resonant cavities -Elements of non-linear optics (second harmonic generation) - Threshold condition for lasing - Stimulated Raman scattering

TEXT BOOKS:-

1. Optics, Ajoy Ghatak, Tata McGraw Hill Co. (12th edition) (For Matrix methods)
2. Fundamental of Optics, Jenkins and White, McGraw Hill (for Aberrations, Optical Instruments and Quantum Optics)
3. A Text Book of Optics, Subrahmanyam and Brijlal, S. Chand and Co. (22nd edition) (for wave Optics)

4. Optics by Khanna D.R. & Gulati H.R., Chand & Co., Pvt. Ltd., New Delhi.

BOOKS FOR REFERENCE:-

1. Optical Physics, S.G. Lipson, H. Lipson and D. S. Tannhauser (3rd edition) Cambridge University Press
2. Optics, Miles V. Klein and Thomas E. Furtak (2nd edition) John Wiley & Sons
3. Text Book of Optics - Chakraborty, CBS publications.

WEBSITE REFERENCES FOR OPTICS

<http://sky.net.co/physics/optica.html>

<http://www.sparknotes.com/physics/optics/geom/>

<http://en.wikipedia.org/wiki/Diffraction>

PH6609 - QUANTUM MECHANICS AND RELATIVITY

Category : MS

Semester : VI

Credits : 8

No. of hrs/wk : 6

Objectives:

1. To make the students understand the basic concepts of Quantum Mechanics and fundamental postulates of Relativity
2. To expose the students to the applications of Quantum Mechanics and Relativity

Unit I : Dual Nature of Matter and Radiation

Planck's theory of Black body radiation - Photoelectric effect - Failure of Classical Mechanics - De Broglie waves - Compton effect - Experiments of Davisson Gerner and of G.P. Thompson - The electron microscope - Heisenberg's uncertainty principle - Applications of uncertainty relation

Unit II : Quantum Mechanics

Schrödinger equation - Physical interpretation of wave function - Probability current density- Ehrenfest theorem -Free particle - Particle in 1-d well of finite depth - Bound states - 1 -d harmonic oscillator - Potential barrier - Alpha decay - Particle in 3-d box - Degeneracy

Unit III : Operators

Eigen values and Eigen functions - Operator formalism - Commutation relations - Hermitian operators - Orbital angular momentum operator in Cartesian and Spherical polar coordinates - Eigen values and Eigen functions of L^2 & L_z - Rigid Rotator problem - Hydrogen atom.

Unit IV : Special Theory of Relativity

Frames of reference - Inertial frames and non-inertial frames - Galilean transformation -Michelson Morely experiment - Interpretation of result - Postulates of special theory -Lorentz transformation equations - Length contraction -Time dilation -Transformation of velocities - Redefining momentum - Variation of mass with velocity - Mass-energy equation

Unit V : General Theory of Relativity

The conflict between Newtonian gravitation and special theory - General theory of relativity - Mach's principle -Definable features of a gravitation theory - Two approaches to general theory - Einstein's equations - A heuristic derivation - Principle of equivalence - Experimental test of GTR - Gravitational Red Shift - Planetary motion - Bending of light.

TEXT BOOKS:-

1. Mathews and Venkatesan, 1976, A Text book of Quantum Mechanics, Tata McGraw-Hill, New Delhi. (Units I, II, III)
2. Robert Resnick, 1968, Introduction to Special Relativity, 1st Edition, Wiley Eastern, New Delhi. (Unit IV)
3. Narliker, Lectures on General Theory of Relativity, Macmillan. (Unit V)
4. Beiser, Concepts of Modern Physics.
5. Powell and Craseman, Quantum Mechanics.
6. Gupta and Dipak Ghosh, Atomic and Nuclear Physics, (Books & Allied (P) Ltd).

WEBSITES

Quantum Mechanics

<http://www.hi.is/~hj/QuantumMechanics/quantum.html>

<http://newton.ex.ac.uk/research/qsystems/people/jenkins/mbody/mbody2.html>

http://en.wikipedia.org/wiki/Quantum_mechanics

Theory of Relativity

<http://www.bartleby.com/173>

<http://www2.slac.stanford.edu/vvc/theory/relativity.html>

<http://archive.ncsa.uiuc.edu/Cyberia/NumRel/GenRelativity.html>

PH6610 - SOLID STATE PHYSICS

Category : MS
Semester : VI

Credits : 4
No. of hrs/wk : 3

Objectives:

To give the students a firm understanding of the basics of Solid State Physics. To introduce the students the application of Solid State Physics and the various physical properties of solids.

Unit 1. Crystal Structure: Introduction – Periodic array of atoms – Crystal lattice – Unit cell – Basis – Symmetry considerations – Classification of crystals – Bravais lattices in three dimensions – Crystal Planes and Miller indices – Single crystal Structure.

Unit 2. Crystal diffraction: Bragg's law – Laue equations - Experimental X-ray diffraction methods – Laue method – Rotating crystal method – Powder method – Neutron diffraction.

Unit 3. Thermal properties: Heat capacity – Classical theory – Einstein model – Debye model – Density of modes (3d) – Debye model – Anharmonicity and thermal expansion of crystals – Principal coefficients – Gruneisen relation – Thermal conductivity.

Unit 4. Free electron theory of metals: Introduction – Free electron model – Free electron gas in 3-dimensions – Density of states – Thermal capacity of free electron system – Paramagnetism of free electrons – Sommerfeld theory of electrical conductivity – Thermal conductivity – Wiedemann Franz law – Hall effect – Failure of free electron theory.

Unit 5. Superconductivity: Introduction – Meissner effect – Levitation – Type I and Type II superconductivity – Vortex states – BCS theory (qualitative treatment only) – Josephson's effect – Cooper pair tunneling.

TEXT BOOKS:-

1. An Introduction to Solid State Physics (5th edition), Kittel. C
2. Solid State Physics Hall H. E, E.L.B.S Manchester Physics series.

BOOKS FOR REFERENCE:-

1. Solid State Physics Kakani, Hemarajani, Sultan Chand & Co.,)
2. Solid State Physics, Dekker A.N. MacMillan
3. Fundamentals of Electricity and Magnetism, Mandiratta, Sawhey
4. R. Asokamani, Solid state physics, principles and applications, I edition (2006), Anamaya publishers

PH6501 - PHYSICS PRACTICAL - III

Category : MC
Semester : V & VI

Credits : 6
No. of hrs/wk : 3

Objective : It is aimed at exposing the under graduate students of the Physics department to the techniques of handling equipments, making error free measurements and error analysis.

1. Spectrometer- Small angled prism- Refractive index.
2. Spectrometer- i-d curve-Refractive index.
3. Spectrometer- i-i' curve- Refractive index.
4. Spectrometer- Dispersive power of a prism.
5. Newton's Rings- Radius of curvature of lens.
6. EMF of a thermocouple- Potentiometer.
7. EMF of a thermocouple- Moving Coil galvanometer.
8. Field along the axis of a circular coil- Determination of B_H .
9. Field along the axis of a circular coil- Moment of a bar magnet.
10. Field along the axis of a circular coil- Searle's Vibration magnetometer- B_H .
11. Searle's vibration magnetometer- Magnetic moment.
12. Potentiometer- Calibration of Voltmeter.
13. Absolute determination of capacitance- BG.
14. Mutual Inductance- BG.
15. High resistance by leakage- BG.
16. C_1/C_2 and M_1/M_2 - BG.
17. Hysteresis curve –Deflection magnetometer.
18. Poteniometer- Calibration of High range voltmeter.
19. Wavelength of light- Biprism.

TEXT BOOKS:-

1. C.C Ouseph, G.Rangarajan- A Text Book of Practical Physics- S. Viswanathan Publisher-Part I (1990)
2. C.C Ouseph, C.Rangarajan, R.Balakrishnan- A Text Book of Practical Physics- S.Viswanathan Publisher-Part II (1996)

BOOKS FOR REFERENCE:-

1. S.L Gupta and V.Kumar- Practical Physics- Pragati Prakashan – 25th Edition (2002)

PH6608 - PHYSICS PRACTICAL - IV

Category : MS
Semester : V & VI

Credits : 8
No. of hrs/wk : 3

Objective : It is aimed at exposing the under graduate students of the Physics department to the techniques of handling equipments, making error free measurements and error analysis.

1. Inverting and Non-inverting amplifier – Op-amp.
2. Summing and Difference amplifier – Op-amp
3. Solving simultaneous equations – Op-amp.
4. Low and High pass filters (2nd order) – Op-amp.
5. Band-pass and band-reject filters (2nd order)– Op-amp.
6. Astable multivibrator – Op-amp.
7. Wein's bridge oscillator – Op-amp.
8. R-2R D/A converter – Op-amp.
9. Temperature to voltage converter – Op-amp.
10. Locking range and application - Phase Locked Loop
11. Colpit's oscillator – transistor
12. Mod n counter using 7493
13. Light to frequency converter – 555 timer
14. Double digit seconds counter – 7 segment
15. Flasher using relay – 555 timer
16. Power amplifier (Power Gain) – TBA810
17. ASM programs – Add & subtract (all modes of addressing) - μ P 8085
18. ASM programs – multiply & divide (all modes of addressing) - μ P 8085
19. ASM programs – factorial & square root (all modes of addressing) - μ P 8085

TEXT BOOKS:-

1. C.C Ouseph, G.Rangarajan- A Text Book of Practical Physics- S. Viswanathan Publisher-Part I (1990)
2. C.C Ouseph, C.Rangarajan, R.Balakrishnan- A Text Book of Practical Physics- S.Viswanathan Publisher-Part II (1996)
3. R S. Sedha, A Text Book of Applied Electronics S. Chand & Co., New Delhi, I Ed.1998 (reprint).
4. A. Gaykwad, Operational Amplifier and Linear Integrated Circuits Prentice Hall, 11 Ed. 1991.
5. Ramesh S. Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085, Penram International, IV Ed., 2000.

BOOKS FOR REFERENCE:-

1. S.L Gupta and V.Kumar- Practical Physics- Pragati Prakashan – 25th Edition (2002)
2. Adithya R Mathur, Microprocessors, Tata McGraw-Hill, III Ed., 1999.

PH6652 – ELECTRICALS, ELECTRONICS & COMPUTER HARDWARE

Category : SK

Credits : 15

Semester : VI

No. of hrs/wk : 15

ELECTRICALS AND ELECTRONICS

Unit 1. ELECTRICAL MACHINES:

D.C. Machines - constructional details - D.C. Generators - principle of working - types - emf equation D.C. motor - principle of working - types - back emf, torque equation - starting of motors using 3 pt. and 4 pt. Starters - speed control of D.C. motors - applications. Transformer - Ideal transformer - principle of working, Construction details - emf equation, transformation ratio - core loss - copper loss - losses and efficiency - regulation - OC and SC tests on transformer -application. Synchronous machines - principles of working and constructional details - induction motors - principle of working of 3 phase induction motor (Simple problems)

Unit 2. POWER SUPPLIES AND REGULATORS:

Half wave, full wave and bridge rectifiers - efficiency and ripple factor for the above circuits - filters capacitors, inductors, L-section and Pi-section and RC filters Voltage multipliers - Half wave – Full d wave - quadruple multipliers - Voltage regulators -zener regulator - Emitter follower regulators - Series regulators Switched mode power supplier - Uninterrupted power supplier [Mock diagrams only)

Unit 3. INSTRUMENTATION:

Bio-medical instrumentation - Transducers - electrodes and Bio amplifiers physiological transducer pressure transducer -temperature transducers - pulse sensors - respiration sensors - Bio-chemical transducers. Micro controllers - Intel 8031/8051 - Internal architecture - Addressing modes - Instruction set - Software examples.

COMPUTER HARDWARE

Unit 4. PC HARDWARE - OVERVIEW, MEMORY DEVICES

Personal computer system - Block diagram - PG system unit - layout - lower model - mother board daughter boards - SMPS -front panel controls - display unit - Keyboard - rear side connectors and their uses.

PC Mother board layouts - PC/XT/PCAT 286/386/486/ Pentium - Functional blocks - Processor - Motherboard Memory - I/O Expansion Slots - RTC Integrated motherboard layout - Important blocks.

Basics - ROM BIOS - Organization -Services - Hardware - BIOS - DOSDiskette Basics - Tracks Sectors - Types - 3-5 "Capacity - disk parts - disk formatting - data recording floppy disk drive -capacity - installation and configuration - adding and removing disk drives

Hard disk basics - tracks, cylinders, sectors, heads- hard disk capacity - data storage and retrieval mechanism - hard disk types - IDE - SCSI, Installation of hard disk configuring, formatting and partitioning

CDROM Types - Audio, Video, DVD, Data CDs, Reading and writing mechanism Storage capacity - CD Drive Mechanisms Installation

Unit 5. KEY BOARD, MONITOR., PORT AND SMPS

PC Keyboard operation, the Scan code concept - Keyboard signals - Interface logic Advanced KBD functions - Ctrl-Alt-Del, pause, print screen, Alt+numeric Pad.

The display, video basics - the CRT scanning methods- colour CRT - Block diagram, of VGA monitor-, display adaptors -power management signaling - creating the screw image - video attributes.

The serial port - parallel port - game port - signals and connector specifications block diagram
SMPS - operation, output voltage levels.

INPUT/OUTPUT DEVICES

The mouse - signals, connection, operation Installation - scanner types.

The print" controller block diagram and description - ports

INSTALLATION AND SERVICING

Configuring the mother board - all in one motherboards - jumper sets - identifying the connectors & cables - adding memory modules - upgrading the CPU - BIOS setup program - various setup options - configuring the IDE card. Power-On Self Test -POST test sequence - POST error messages, The DOS diagnostic commands MSD - Microsoft Diagnostics.

PRACTICALS

For units I to III - (Any Eight to be selected by the course teacher)

1. Shift Registers - to shift left, right and parallel load. Using JK flip-flop.
2. Counters - to design modern counters (or of any -sequence) using JK flip-flop.
3. Astable Multivibrators - using 555 timer, to study the Frequency response for different values of resistances and capacitances and to find the unknown resistance and capacitance.
4. Astable multivibrators - optocoupler, current to frequency converter
5. Regulators - to study the regulation characteristics with and without filters.
6. Transformer - to find the efficiency of a single-phase transformer by conducting o.c. and s.c. tests.
7. Induction motor - to find the power input to a 3-phase induction motor using two wattmeter method at no load and any other load.
8. DC motors - speed control.
9. Microcontroller Intel 8051 - software programs - I
10. Microcontroller Intel 8051 - software programs - 19
11. Microcontroller Intel 8051 - interfacing - 1
12. Microcontroller Intel 8051 - interfacing - 11.

For units IV and V - (Any Four to be selected by the course teacher)

1. Assembling a Personal Computer.
2. Installing an Operating System
3. Adding/ removing devices in windows.
4. Simple interface experiment - I (Using the parallel port and 'C' Language)
5. Simple interface experiment - II (Using the parallel port and 'C' Language)
6. Using BIOS Interrupts.
7. Using DOS Interrupts.

TEXT BOOKS:-**FOR UNITS 1 TO 3:**

1. Electrical Technology - B. L. Theraja
2. Electronic Devices and circuits - G.K. Mittal, Khanna Publishers
3. Biomedical instrumentation Manual and student work book - 8051, Arumugam

FOR UNITS 4 & 5:

1. Introduction to Microprocessors, Software, Hardware and Programming- lance A *Leventhal*, *Prentice* -Hall. of India
2. Microprocessors and interfacing, Programming mid Hardware- Second Edition. Douglas. V. Hall
Tata Me Graw Hill (1999)

BOOKS FOR REFERENCE:-

1. Electrical Machines S.K. Bhattacharaya, (TTTI Chandigarh) - TMH 1998.
2. Power Supplies, M. Sasikumar
3. Handbook of Bio-Medical instrumentation, R.S. Khanpur

PH6653 – ELECTRICALS, ELECTRONICS & MACHINE SHOP TECHNOLOGY

Category : SK

Semester : VI

Credits : 15

No. of hrs/wk : 15

ELECTRICALS AND ELECTRONICS

Unit 1. ELECTRICAL MACHINES:

D.C Machines - constructional details - D.C- Generators - principle of working, types emf equation - D.C. motor - principle of working - types - back emf, torque equation - starting of motors using 3 pt. and 4 pt Starters - speed control of D.C. motors - applications. Transformer - ideal transformer - principle of working, construction details - emf equation, transformation ratio -core loss - copper loss - losses and efficiency regulation - OC and SC tests on transformer - application- Synchronous machines principle of working and constructional Mails - induction motors - principle of working of 3 phase induction motor (simple problems).

Unit 2. POWER SUPPLIES AND REGULATORS:

Half wave, full wave and *bridge rectifiers* - *efficiency*. and ripple factor for the above circuits - filters capacitors, inductors, L-section and Pi-section and RC filters - Voltage multipliers - Half wave - Full wave quadruple multipliers - Voltage regulators -zener regulator - Emitter follower regulators - Series regulators - Switched mode power supplier - Uninterrupted power supplier (block diagram only).

Unit 3. INSTRUMENTATION:

Bio-medical instrumentation - Transducers - electrodes and *Bio* amplifiers - physiological transducers pressure transducers - temperature transducers - pulse sensors - respiration sensors - *Bio-chemical* transducers. Micro-controllers - Intel 8031/8051- Internal architecture - Addressing modes - Instruction set - Software examples.

MACHINE SHOP TECHNOLOGY

Unit 4. PLANER

Types of planers (Description only) - specifications - Principles of operation - Drives Quick return mechanism - feed mechanism - Types, work holding devices and special fixtures - Types of tools - various operations.

SHAPER

Types of shapers - specifications - standard plain - universal - draw cut - principles of operation - drives quick return mechanism - crank and slotted ink - feed mechanism work holding devices - tools and Fixtures.

DRILLING MACHINES

Drills - Flat drills - Twist drills - Nomenclature - Types of Drilling Machines - Bench *type* - Floor *type* -

Radial Type - Gang Drill - Multispindle type - Principle of operation in drilling - speeds and feeds for various material -drilling holes - methods of holding drill bit - drill chucks - Regrinding of Drill bits and Drill jigs.

MILLING MACHINES

Types - Column and knee type - plain - universal milling machine - vertical milling machine - plano miller - specification of milling_machines - Principles of operation work and too] holding devices.

Unit 5. GRINDING MACHINES

Types and classification - specifications - Rough Grinders - Floor mounted band grinders - portable grinders

BROACHING

Types of broaching machine - Horizontal, vertical and continuous broaching - principles of operation.

PRACTICALS

For units I to III - (Any Eight to be selected by the course teacher)

1. Shift Registers - to shift left, right and parallel load. Using JK flip-flop.
2. Counters - to design modern counters (or of any -sequence) using JK flip-flop.
3. Astable Multivibrators - using 555 timer, to study the Frequency response for different values of resistances and capacitances and to find the unknown resistance and capacitance.
4. Astable multivibrators - optocoupler, current to frequency converter
5. Regulators - to study the regulation characteristics with and without filters.
6. Transformer - to find the efficiency of a single-phase transformer by conducting o.c. and s.c. tests.
7. Induction motor - to find the power input to a 3-phase induction motor using two wattmeter method at no load and any other load.
8. DC motors - speed control.
9. Microcontroller Intel 8051 - software programs - I
10. Microcontroller Intel 8051 - software programs - 19
11. Microcontroller Intel 8051 - interfacing - 1
12. Microcontroller Intel 8051 - interfacing - 11

For units IV and V - (Any Four to be selected by the course teacher)

1. Shapping to the planned dimension.
2. Cutting and bending.
3. Using drilling machines for various requirements.
4. Different types of welding.
5. Boxes of different sizes.
6. Wood work.
7. Experiments using lathe.

TEXT BOOKS:-

FOR UNITS 1 TO 3:

1. Electrical Technology, B. L. Theraja
2. Electronic Devices and circuits, G.K. Mittal Khanna Publishers
3. Biomedical instrumentation Arumugam Manuel and student workbook - 8051

FOR UNITS 4 & 5:

1. Element of workshop technology, vol.I, f. Hajra choudry and Bhathacharya
2. Manufacturing process, Myro L. Bezema
3. Workshop technology, vol. I,II,III, Chapman
4. Production technology, Jain and Gupta

BOOKS FOR REFERENCE:-

1. Electrical Machines, S.K. Bhattacharaya, (TTTI Chandigarh) - TMH 1998.
2. Power Supplies, M. Sasikumar
3. Handbook of Bio-Medical instrumentation, R.S. Khandpur

PH2103 - PHYSICS FOR CHEMISTRY - I

Category : AR

Credits : 3

Semester : II

No. of hrs/wk : 4

Objective: This paper is offered to the students of chemistry as allied required. While the chemical properties are learnt in the major, the study of physical properties will compliment their studies.

Unit – 1: Classical mechanics

- a) **Particle dynamics:** Displacement, velocity and acceleration- distance –time graph-velocity – time graph – projectile motion – uniform circular motion – tangential acceleration in circular motion – relative velocity and acceleration
- b) **Lagrangian formulation :** Generalised coordinates – holonomic and non-holonomic constraints – Lagrange’s equations – simple applications- Atwood’s machine – simple pendulum

Unit 2: Gravitation

- a) **Classical theory of gravitation :** Kepler’s laws, Newton’s law of gravitation – G and measurement – Earth –moon system – weightlessness – earth satellites – parking orbit – earth density – mass of the Sun – gravitational potential – velocity of escape – satellite potential and kinetic energy.
- b) **Einstein’s theory of gravitation :** Introduction – the principle of equivalence – experimental tests of general theory of relativity – gravitational red shift – bending of light – preihelion of mercury.

Unit –3: Properties of matter

- a) **Elastic properties :** Elastic limit – Hooke’s law – moduli of elasticity – poisson ratio –relation between q, n, k – force in a bar due to contraction or expansion – energy stored in a wire – rigidity modulus – torsion in a wire – static torsion and torsional oscillations method.
- b) **Viscosity and surface tension :** Newton’s formula – Stoke’s formula – Poiseuille’s flow – molecular theory of surface tension – excess pressure over curved surface – spherical and cylindrical drops – surface energy – capillary rise – Quincke’s method for mercury.

Unit – 4: Optics

- a) **Diffraction:** Fresnel and Fraunhofer diffractions – Fraunhofer diffraction at a single slit- diffraction at multiple slits- plane diffraction grating – determination of wavelength of a special line.
- b) **Polarisation:** Double refraction of crystals– geometry of Nicol prism – Huygen’s theory – Polaroid – circular and elliptical polarization – quarter and half wave plates – production and analysis of polarized beams – optical activity.

Unit – 5 : Crystal Physics

- a) **Crystal structures:** Introduction – periodic array of atoms – crystal lattice – unit cell – basis – symmetry considerations – classification of crystals – Bravais lattices in three dimensions – crystal planes and Miller indices – simple crystal structures.
- b) **Crystal diffraction:** Bragg’s law – experimental X-ray diffraction methods: - Laue method – rotating crystal method – powder method – neutron diffraction.

TEXT BOOKS:-

1. Nelkon and Parker Advanced level physics — Arnold Publishers – 7th edition.
2. M.Narayanamurthy and N.Nagarathnam Dynamics – (The national publishers)

3. D.S.Mathur, properties of matter, S.Chand and Co., New Delhi
4. S.Subrahmanyam and S.Brijlal, A text book of optics, S.Chand and Co (22nd edition.
5. C.Kittel , Introduction to solid state physics – Wiley eastern 5thedition.

BOOKS FOR REFERENCE:-

1. D.Halliday and R.Resnick , Physics, Part 1 (Wiley eastern)

PH2104 - PHYSICS FOR CHEMISTRY - PRACTICAL - I

Category : AR

Semester : II

Credits : 1

No. of hrs/wk : 2

LIST OF EXPERIMENTS

1. Young's modulus by stretching -vernier microscope
2. Rigidity modulus -torsional pendulum
3. Surface tension and interfacial tension - method of drops
4. Surface tension - capillary rise
5. Viscosity - capillary flow
6. Specific heat of liquid - method of mixtures (approximate radiation correction)
7. Specific heat of liquid - electrical heating
8. Sonometer -verification of laws
9. Compound bar pendulum - determination of 'g'and radius of gyration

PH3104 - PHYSICS FOR MATHEMATICS - I

Category : AR

Semester : III

Credits : 3

No. of hrs/wk : 4

Objective:

This paper is offered to the students of mathematics as allied required. Most of the mathematics learnt by the students has immediate application to many physical problems. The logical reasoning behind the description of the physics problem and obtaining the solution to such problems are taught in this paper.

Unit – 1: Classical mechanics

- a) **Particle dynamics:** Displacement, velocity and acceleration- distance –time graph-velocity – time graph – projectile motion – uniform circular motion – tangential acceleration in circular motion – relative velocity and acceleration
- b) **Lagrangian formulation :** Generalised coordinates – holonomic and non-holonomic constraints – Lagrange's equations – simple applications- Atwood's machine – simple pendulum

Unit 2: Gravitation

- a) **Classical theory of gravitation :** Kepler's laws, Newton's law of gravitation – G and measurement – Earth –moon system – weightlessness – earth satellites – parking orbit – earth density – mass of the Sun – gravitational potential – velocity of escape – satellite potential and kinetic energy.
- b) **Einstein's theory of gravitation :** Introduction – the principle of equivalence – experimental tests of general theory of relativity – gravitational red shift – bending of light – perihelion of mercury.

Unit –3: Properties of matter

- a) **Elastic properties :** Elastic limit – Hooke's law – moduli of elasticity – poisson ratio –relation between q, n, k – force in a bar due to contraction or expansion – energy stored in a wire – rigidity modulus – torsion in a wire – static torsion and torsional oscillations method.
- b) **Viscosity and surface tension :** Newton's formula – Stoke's formula – Poiseuille's flow – molecular theory of surface tension – excess pressure over curved surface – spherical and cylindrical drops – surface energy – capillary rise – Quincke's method for mercury.

Unit – 4: Electronics

- a) Operational amplifier: ideal operational amplifier – inverting and non- inverting amplifiers – summing amplifier – differential amplifier – integrator – differentiator – CMRR – solving simultaneous equations.
- b) Digital circuits: J-K-Flip-Flop – combinational circuits – application of Karnaugh map- Full and half binary adders - counters

Unit – 5 : Special theory of relativity

Frames of reference – inertial frames and non- inertial frames -Galilean transformations – Michelson- Morley experiment – interpretation of results – postulates of special theory of relativity – Lorentz transformation equations – length contraction – time dilation – transformation of velocities– variation mass with velocity – Mass –energy equation

TEXT BOOKS:-

1. Nelkon and Parker Advanced level physics — Arnold Publishers – 7th edition.

2. M.Narayanamurthy and N.Nagarathnam Dynamics – (The national publishers)
3. D.S.Mathur, properties of matter, S.Chand and Co., New Delhi
4. R.S.Sedha, A text book of applied electronics, S.Chand and Co., New Delhi, I edition, 1998
5. Robert Resnick , Introduction to special relativity, Wiley Eastern.

BOOKS FOR REFERENCE:-

1. D.Halliday and R.Resnick , Physics, Part 1 (Wiley eastern)
2. Richard p. Feynman, robert b. Leighton & Mathew Sands, Feynman lectures on physics series, vol. 1, 2 & 3, narosa publishing, New Delhi, 8th reprint, 1995

PH3105 - PHYSICS FOR MATHEMATICS - PRACTICALS - I

Category : AR

Semester : III

Credits : 1

No. of hrs/wk : 2

LIST OF EXPERIMENTS

1. Young's modulus by stretching -vernier microscope
2. Rigidity modulus -torsional pendulum
3. Surface tension and interfacial tension - method of drops
4. Surface tension - capillary rise
5. Viscosity - capillary flow
6. Specific heat of liquid - method of mixtures (approximate radiation correction)
7. Specific heat of liquid - electrical heating
8. Sonometer -verification of laws
9. Compound bar pendulum - determination of g' and radius of gyration

PH 3106 - APPLIED ELECTRONICS

Category : AR

Semester : III

To Whom : Computer Science

Credits : 4

No. of hrs/wk : 6

Unit – I : Semiconductor Devices : semiconductors - intrinsic and extrinsic semiconductors - Fermi level (No Derivation) - Mechanism of Current Conduction - PN Junction Diode - Zener diode - LED - Solar Cell. Transistor: Construction - Mechanism of Amplification - Current components - Modes of operation - Transistor amplifier.

Unit - II : Operational Amplifier: Ideal op-amp - Inverting and non-inverting amplifiers - summing amplifier - differential amplifier - integrator - differentiator - CMRR. A/D & D/A converters Introduction - weighted resistor D/A converter - ladder network D/A converter - BCD D/A converter. A/D converters: flash A/D converter - successive approximation converter - dual Slope A/D converter.

Unit - III Boolean Algebra & Combinational Logic Circuit Design: Basic logic gates - NAND, NOR, XOR and XNOR gates and their truth tables - Boolean postulates - Boolean laws - Simplification of Boolean algebraic expressions - Universal Building Blocks – NAND / NOR logic: Minterms and Maxterms - 2,3,4 variable Karnaugh map design - SOP and POS reduction - don't care states.; Design of decoder, encoder, multiplexer, demultiplexer circuits using gates - half adder, full adder, half subtractor and full subtractor using gates.

Unit – IV: Flip Flops, Registers & Counters: Flip-flops: RS,D,JK & T flip flops - clocked flip-flops - race around condition - JK Master-Slave Flip-flop - Converting JK flip-flop to RS, D & T flip-flops. Registers: Types - shift right and shift left registers using D & JK flip-flops. Counters: types - binary ripple counter - mod 3 counter - ring counter - Johnson counter - wave forms for counters.

UNIT – V: Design of a Digital Computer: Instruction Code - Computer registers - Computer Instructions - Timing and Control - Memory hierarchy - main memory - RAM, ROM, EPROM, EEPROM, UVEEPROM - Cache memory - virtual memory.

TEXT BOOKS:-

For Unit I:

1. R.S.Sedha, Textbook of Applied Electronics - 3rd ed., S.Chand & Co.

For Units – II to IV

1. John D.Ryder, Electronic Fundamentals & Applications - (5th ed., PHI)
2. Virendri Kumar, Digital Technology — Principles & Practice (1 st ed.. New Age International Pvt. Ltd.)

For Unit- V

1. M.Morris Mano Computer System Architecture (3rd ed.,PHI)

PH 2300 – PHOTOGRAPHY

(PH2300-Photography is offered to 08 Batch of students only)

Category : EG

Semester : II

To Whom : Other Than Physics Students

Credits : 1

No. of hrs/wk : 3

Theory Component (30%)

Unit 1. Introduction : the pin hole camera - image quality of the pin hole camera - types of camera - lenses - depth of field - types of films - light and exposure - filters - filter factor - flash - exposure meter - cable release.

Unit 2. Composition : outdoor photography - aperture and shutter speed combination - lenses and perspective types of lenses - normal, telephoto, zoom, wide angle, fish eye and close up lenses - types of shutter safe shutter speeds - portrait photography - basic lighting for portraiture - nature photography - night photography photography as an art.

Unit 3. Darkroom and chemicals : halides -sensitivity - emulsion illumination - darkroom accessories - chemicals used in the darkroom. photosensitive materials - silver - physical properties -darkroom constituents of the developer - other

Unit 4. Negatives and prints : light reaction with silver halides - chemical mechanism involved in exposing, developing and fixing a film/paper - types of films - the positive and negative systems - developing the film - defects in negatives - printing paper - choice of paper grade - contact printing.

Unit 5. Print enlargement and after work on the print : the enlarger - enlarging - different types of paper developer - the fixer -finer points of enlarging - drying the prints - print quality - touching the print - toning of prints.

Laboratory Component (70%)

1. Handling and using cameras.
2. Handling and exposing films.
3. Handling, developing and fixing exposed films.
4. Exposing, developing and fixing contact prints.
5. Exposing, developing and fixing enlargements.
6. Possible manipulations at the time of printing.

TEXT BOOKS:-

1. How to Use Your 35mm Camera - Minolta .
2. Basic Photography - Michael J. Langford, Focal Press, London, 4th edition.

BOOKS FOR REFERENCE:-

1. Photographic Tricks Simplified, AMPHOTO, Garden City, New York.
2. Night Photography Simplified, AMPHOTO, Garden City, New York.

PH 2302 WORKSHOP PRACTICE

Category : EG

Semester : II

To Whom : Other Than Physics Students

Credits : 1

No. of hrs/wk : 3

THEORY

1. Safety and General precautions - its importance - Metals: production, manufacture.
2. Steel Scale, Scribes, Punches, Hammers, calipers, Dividers, Try square, V block, Surface plate, Angle plate, Marking block, Height gauge, Marking, Vices.
3. Cutting Tools - Hacksaw, Chisels, Files, Dies, Taps, Screw thread.
4. Cutting speed, Feed-lubricants.
5. Drills. Drill chuck - Reamers - Drilling machines – Types - Drilling.
6. Measuring Instruments, Vernier calipers - Vernier depth gauge Micrometer - Types - Dial indicator Bevel protractor, Gauges.
7. Steel- Properties - Heat treatment - Types of steel.
8. Lathe - Types, Different parts - Types of work done - Accessories - Lathe work.
9. Lathe Cutting Tools, Tool angles, Grinding - Types of tools - Shapes, Setting tools in tool posts - P tool materials.
10. Rivets - Riveting - Sheet metal works - Tools used - Locking devices.
11. Grinding - grinding wheels.
12. Welding - soldering.

PRACTICALS

1. Marking out and filing plane surfaces. Use of surface plates, Angle plate, Marking block, Height gauge, Marking the centre of a round bar.
2. Hacksawing, Chiseling.
3. Marking for drilling holes.
4. Threading - External, Internal. Filing - Cham.
5. Filing right angles and open fitting. Use of vernier calipers.
6. Filing. Use of micrometer - fitting.
7. Grinding Lathe tools. Facing, plane turning, step turning, taper turning. Other machines used in workshop.
8. Engineering Drawing, workshop calculations.
9. Soldering. Sheet metal work.
10. Welding - Fabrication.

PH 4303 - PHYSICS FOR ALL

Category : EG

Semester : IV

To Whom : Other Than Physics Students

Credits : 1

No. of hrs/wk : 3

Unit 1. MATTER:

Atomic constituents - Duality - Particles and waves - Uncertainty principle Phases of matter - Internal energy and temperature - If Law of Thermodynamics - Conductors, Insulators & Semi-conductors Superconductivity and super fluidity.

Unit 2. FUNDAMENTAL INTERACTIONS:

Law of Gravitation (general theory) - Electromagnetism - Maxwell's equations Nuclear force - Radioactivity - Strong and Weak interactions - Elementary particles (Classification) - Unification of forces.

Unit 3. ENERGY:

Conservation of energy - Planck's hypothesis - Mass-energy equivalence - Nuclear energy - Solar energy - Non-conventional sources of energy.

Unit 4. THE EARTH:

Internal structure of the Earth - Plate Tectonics - Earthquakes - Magnetism of the Earth - Atmosphere - Global climatic changes.

Unit 5. COSMOS:

Visible universe - Galaxies - Milky way - Solar system - Birth and death of stars - Neutron Star, Pulsars, Black holes - Big Bang theory.

TEXT BOOKS:-

1. Physics of particles, Matter and the Universe: Roger J Binstoyle - Institute of Physics Publishing, Bristol (1997)
2. Science Matters, Robert' M. Hazen & James Trefil - Universities Press (India) Ltd., (1991)
3. Almost Everyone's guide to science, John Gribin - Universities Press (1998)
4. Inside Science, Edited by John Allen - BBC Books, (1988).
5. Physical Science Fundamentals, John J Merrill, W Kenneth Hamblin, James M Thorne -Macmillan, NY (1982)

PH3202 - PHYSICS FOR CHEMISTRY - II

Category : AO
Semester : III

Credits : 3
No. of hrs/wk : 4

Objective:

This paper is offered to the students of chemistry and mathematics as allied optional. This paper aims to give some fundamental physics required for their higher studies.

Unit – 1: Digital Electronics :

Number Systems – Binary – Octal – Hexadecimal – Digital Gates – Boolean Algebra – K-map – RS Flip Flop – JK Flip Flop – Shift registers – full and half binary adder- Binary counter – Mod n Counter - Decade counter.

Unit 2: Atomic physics

- Atomic physics: Bohr's atom model – hydrogen spectrum – fine structure splitting : sodium doublet – quantum numbers- Pauli's exclusion principle- periodic table
- X- rays and photo electric effect: Production of X-rays- continuous and characteristic X- ray spectra – industrial and medical applications of X- rays. Laws of photo electric emission – Einstein's photoelectric equation- Millikan's experiment – Photo electric cells (emissive, electric and voltaic) – photo multiplier tubes.

Unit –3: Nuclear physics

- General properties of nuclei: Nuclear mass and binding energy- B.E/A versus A curve - nuclear spin and magnetic moment- mass, half life and spin of neutron - semi empirical mass formula
- Nuclear models and elementary particles: nuclear reactions: cross section – nuclear fission – liquid drop model –nuclear forces- elementary particles: classification- Quarks and leptons.

Unit – 4: Mechanical waves:

- Waves in strings and pipes: Velocity of a transverse wave along a stretched- velocity of sound in gases- Newton's formula for velocity of sound – effect of temperature, pressure, humidity and density of medium on sound
- Ultrasonics and acoustics: Ultrasonics – piezo-electric effect – detection of ultrasonics – applications – reverberation time and Sabine's law – absorption coefficient – conditions for good acoustical design of rooms – noise – measurement of noise – reduction and sound insulation

Unit – 5 : Quantum mechanics

Failure of classical mechanics: Black body radiation spectra – Planck's theory – matter waves – DeBroglie wavelength- Davisson and Germer experiment- Heisenberg's uncertainty principle – applications: binding energy of the hydrogen atom and radius of the Bohr's orbit – proving the non- existence of electron in the nucleus- Schroedinger equation – wave function and its interpretation- box normalization – admissibility conditions.

TEXT BOOKS:-

- Brijlal and Subramanyam, Electricity and magnetism , Ratan Prakashan Mandir publisher – 1995
- A.B.Gupta and Dipak Ghosh, Atomic and nuclear physics – Books and allied (sp) Ltd, Calcutta
- H.S.Mani and Mehta. G.K., Introduction to modern physics
- Nelson and Parker Advanced level physics — Arnold Publishers – 7th edition.
- R.Khanna and R.S. Bedi , A text book of sound (Atma Ram and sons)
- Powell and Crasemen, Quantum mechanics

BOOKS FOR REFERENCE:-

- Richard p. Feynman, Robert b. Leighton & Matthew Sands, Feynman lectures on physics series, vol. 1, 2 & 3, Narosa publishing, New Delhi, 8th reprint, 1995

PH 3203 - PHYSICS FOR CHEMISTRY - PRACTICAL II

Category : AO

Semester : III

Credits : 1

No. of hrs/wk : 2

1. Determination of Young's Modulus (Non-uniform bending) - Pin and Microscope.
2. Determination of Rigidity Modulus (Pointer method) - Static Torsion.
3. Determination of focal length - concave and convex lenses.
4. Determination of thickness of wire - Air wedge.
5. Determination of velocity of sound waves - Melde's string.
6. Determination of wavelengths (Grating) - Hg spectrum.
7. LCR Parallel resonant circuit.
8. Universal building block - NAND gates.
9. Construction of Half and Full adders - digital gates.

PH3204 - PHYSICS FOR BIOLOGY

Category : AO
Semester : III
To Whom : PB & Bio Tech / Adv. Zoo

Credits : 3
No. of hrs/wk : 4

Objective:

This paper is offered to the students of biology. Some fundamental physics required for study of the measurements of physical properties related to biological systems.

Unit – 1: Properties of matter:

- a) **Viscosity and surface tension:** Newton's formula- coefficient of viscosity- steady flow of a liquid through a pipe- Poiseuille's formula- Oswald viscometer-molecular theory of surface tension-capillarity- surface energy and formation of drops.
- b) **Diffusion and osmosis:** Laws of diffusion- Fick's law - laws of osmosis – depression of freezing point and elevation of boiling point – calculation of molecular weight and degrees of dissociation.

Unit 2: Physics of Photosynthesis :

Introduction- free energy – coupled reactions- group transfer potential- role of pyridine nucleotides – photosynthesis- photo system I and photo system II – photophosphorylation and carbon fixation – energy conversion pathways: oxidation – Glycolysis –The Krebs cycle – the respiratory chain.

Unit –3: Wave physics:

- a) **Microscopes:** laws of refraction – magnification – simple and compound microscope – microscope objectives- resolving power – matter waves - principles of focussing electron beams – electron microscope – advantages and uses.

Ultrasonics: –Piezo-electric effect – generators of ultrasound and detection- imaging techniques – applications and uses- noise – measurement of noise – reduction and sound insulation

Unit – 4: Nuclear physics:

- a) **Radioactivity 1:** Nuclear size – binding energy – mass defect - α - decay – range and stopping power- β - decay - energetics of beta decay - γ - ray spectra – gamma ray absorption in matter –
- b) **Radioactivity 2:** Half life and mean life – induced radioactivity – radio isotopes – radiation levels – unit – uses of radio isotopes: diagnostic and therapeutic – archeological dating by C^{14} method.

Unit – 5 : Biosensors and biological transducers:

- a) **Biosensors:** Eye –vision – linear and lateral magnification – defects of images –ear – sound – hearing – intensity – unit of intensity – intensity levels.
- b) **Transducers:** Bio-medical instrumentation – transducers – electrodes and bio amplifiers – physiological transducer – pressure transducer – temperature transducer – pulse sensors – respiration sensors- bio-chemical transducers.

TEXT BOOKS:-

1. D.S.Mathur, Properties of matter, S.Chand and Co.

2. M.W.Zeemansky, Heat and thermodynamics, Narosa Pub.
3. N.Subrahmanyam and Brijlal, A text book of sound, Vikas pub.
4. N.Subrahmanyam and Brijlal, A text book of optics, S.Chand and Co.
5. S.Armugam, Biomedical instrumentation

PH3205 - PHYSICS FOR BIOLOGY PRACTICAL

Category : AO

Semester : III

To Whom : PB & Bio Tech / Adv. Zoo

Credits : 1

No. of hrs/wk : 2

1. Surface tension- capillary rise
2. Surface tension by method of drops
3. Viscosity by graduated burette
4. Focal length of a convex and concave lens
5. Melde's string – longitudinal and transverse vibrations.
6. Temperature transducer.
7. Light Transducer.

PH4204 - PHYSICS FOR BIOLOGY

Category : AO

Semester : IV

To Whom : PB & Bio Tech / Adv. Zoo

Credits : 3

No. of hrs/wk : 4

Objective:

This paper is offered to the students of biology. Some fundamental physics required for study of the measurements of physical properties related to biological systems.

Unit – 1: Properties of matter:

- a) **Viscosity and surface tension:** Newton's formula- coefficient of viscosity- steady flow of a liquid through a pipe- Poiseuille's formula- Oswald viscometer-molecular theory of surface tension-capillarity- surface energy and formation of drops.
- b) **Diffusion and osmosis:** Laws of diffusion- Fick's law - laws of osmosis – depression of freezing point and elevation of boiling point – calculation of molecular weight and degrees of dissociation.

Unit 2: Physics of Photosynthesis :

Introduction- free energy – coupled reactions- group transfer potential- role of pyridine nucleotides – photosynthesis- photo system I and photo system II – photophosphorylation and carbon fixation – energy conversion pathways: oxidation – Glycolysis – The Krebs cycle – the respiratory chain.

Unit –3: Wave physics:

- a) **Microscopes:** laws of refraction – magnification – simple and compound microscope – microscope objectives- resolving power – matter waves - principles of focussing electron beams – electron microscope – advantages and uses.

Ultrasonics: –Piezo-electric effect – generators of ultrasound and detection- imaging techniques – applications and uses- noise – measurement of noise – reduction and sound insulation

Unit – 4: Nuclear physics:

- a) **Radioactivity 1:** Nuclear size – binding energy – mass defect - α - decay – range and stopping power- β - decay - energetics of beta decay - γ - ray spectra – gamma ray absorption in matter –
- b) **Radioactivity 2:** Half life and mean life – induced radioactivity – radio isotopes – radiation levels – unit – uses of radio isotopes: diagnostic and therapeutic – archeological dating by C^{14} method.

Unit – 5 : Biosensors and biological transducers:

- a) **Biosensors:** Eye –vision – linear and lateral magnification – defects of images –ear – sound – hearing – intensity – unit of intensity – intensity levels.
- b) **Transducers:** Bio-medical instrumentation – transducers – electrodes and bio amplifiers – physiological transducer – pressure transducer – temperature transducer – pulse sensors – respiration sensors- bio-chemical transducers.

TEXT BOOKS:-

1. D.S.Mathur, Properties of matter, S.Chand and Co.

2. M.W.Zeemansky, Heat and thermodynamics, Narosa Pub.
3. N.Subrahmanyam and Brijlal, A text book of sound, Vikas pub.
4. N.Subrahmanyam and Brijlal, A text book of optics, S.Chand and Co.
5. S.Armugam, Biomedical instrumentation

PH4205 - PHYSICS FOR BIOLOGY PRACTICAL

Category : AO

Semester : IV

To Whom : PB & Bio Tech / Adv. Zoo

Credits : 1

No. of hrs/wk : 2

1. Surface tension- capillary rise
2. Surface tension by method of drops
3. Viscosity by graduated burette
4. Focal length of a convex and concave lens
5. Melde's string – longitudinal and transverse vibrations.
6. Temperature transducer.
7. Light Transducer.

PH4206 - PHYSICS FOR MATHEMATICS - II

Category : AO
Semester : IV

Credits : 3
No. of hrs/wk : 4

Objective:

This paper is offered to the students of chemistry and mathematics as allied optional. This paper aims to give some fundamental physics required for their higher studies.

Unit – 1: Digital Electronics :

Number Systems – Binary – Octal – Hexadecimal – Digital Gates – Boolean Algebra – K-map – RS Flip Flop – JK Flip Flop – Shift registers – full and half binary adder- Binary counter – Mod n Counter - Decade counter.

Unit 2: Atomic physics

- Atomic physics: Bohr's atom model – hydrogen spectrum – fine structure splitting : sodium doublet – quantum numbers- Pauli's exclusion principle- periodic table
- X- rays and photo electric effect: Production of X-rays- continuous and characteristic X- ray spectra – industrial and medical applications of X- rays. Laws of photo electric emission – Einstein's photoelectric equation- Millikan's experiment – Photo electric cells (emissive, electric and voltaic) – photo multiplier tubes.

Unit –3: Nuclear physics

- General properties of nuclei: Nuclear mass and binding energy- B.E/A versus A curve - nuclear spin and magnetic moment- mass, half life and spin of neutron - semi empirical mass formula
- Nuclear models and elementary particles: nuclear reactions: cross section – nuclear fission – liquid drop model –nuclear forces- elementary particles: classification- Quarks and leptons.

Unit – 4: Mechanical waves:

- Waves in strings and pipes: Velocity of a transverse wave along a stretched- velocity of sound in gases- Newton's formula for velocity of sound – effect of temperature, pressure, humidity and density of medium on sound
- Ultrasonics and acoustics: Ultrasonics – piezo-electric effect – detection of ultrasonics – applications – reverberation time and sabine's law – absorption coefficient – conditions for good acoustical design of rooms – noise – measurement of noise – reduction and sound insulation

Unit – 5 : Quantum mechanics

Failure of classical mechanics: Black body radiation spectra – Planck's theory – matter waves – Debroglie wavelength- Davission and Germer experiment- Heisenberg's uncertainty principle – applications: binding energy of the hydrogen atom and radius of the Bohr's orbit – proving the non- existence of electron in the nucleus- Schroedinger equation – wave function and its interpretation- box normalization – admissibility conditions.

TEXT BOOKS:-

- Brijlal and Subramanyam, Electricity and magnetism , Ratan Prakashan Mandir publisher – 1995
- A.B.Gupta and Dipak Ghosh, Atomic and nuclear physics – Books and allied (sp) Ltd, Calcutta
- H.S.Mani and Mehta. G.K., Introduction to modern physics
- Nelkon and Parker Advanced level physics — Arnold Publishers – 7th edition.

5. R.Khanna and R.S. Bedi , A text book of sound (Atma Ram and sons)

6. Powell and Crasemen, Quantum mechanics

BOOKS FOR REFERENCE:-

1. Richard p. Feynman, robert b. Leighton & mathew sands, feynman lectures on physics series, vol. 1, 2 & 3, narosa publishing, new delhi, 8th reprint, 1995

PH 4207 - PHYSICS FOR MATHEMATICS - PRACTICAL II

Category : AO

Semester : IV

Credits : 1

No. of hrs/wk : 2

1. Determination of Young's Modulus (Non-uniform bending) - Pin and Microscope.
2. Determination of Rigidity Modulus (Pointer method) - Static Torsion.
3. Determination of focal length - concave and convex lenses.
4. Determination of thickness of wire - Air wedge.
5. Determination of velocity of sound waves - Melde's string.
6. Determination of wavelengths (Grating) - Hg spectrum.
7. LCR Parallel resonant circuit.
8. Universal building block - NAND gates.
9. Construction of Half and Full adders - digital gates.