PH1503 - PROPERTIES OF MATTER AND ACOUSTICS

(Proposed syllabus – from 12PH batch onwards)

Category : MC **Credits : 6**

Semester : I **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- Poiseuilles 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-Magneostriction 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)

PH2505 - MECHANICS AND STATISTICAL PHYSICS

(Proposed syllabus – from 12PH batch onwards)

Category : MC **Credits : 6**

Semester : II **No. of hrs/wk : 6**

Unit1: RIGID BODY AND FLUID DYNAMICS:

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

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

Unit 2: LAGRANGIAN AND HAMILTONIAN MECHANICS:

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 – Applications: Atwood's machine – Bead sliding on a uniformly rotating wire

Phase space- Hamilton's equations of motion- Physical significance of the Hamiltonian function- Applications : Motion of a particle in a central force field- Motion of a charged particle in an electromagnetic field

Unit 3 : TRANSPORT PHENOMENA

Molecular collisions – mean free path – sphere of influence – collision cross section – expression for mean free path – variation of mean free path with temperature and pressure– viscosity - effect of temperature and pressure on viscosity – thermal conductivity – effect of temperature and pressure on thermal conductivity – relation between viscosity and thermal conductivity – largest thermal conductivity in Hydrogen – Transport of mass and diffusion – effect of temperature and pressure – relation between viscosity and diffusion

Unit 4: THERMODYNAMIC RELATIONS:

Extensive and intensive variables- Thermodynamic potentials and Maxwell's relations- Applications of Maxwell's relations: Specific heat equation and Joule- Thomson cooling- T-ds equations- Clapeyron's latent heat equations – Internal energy of ideal and real gases- Clausius inequality- Entropy and second law of thermodynamics – First and second order phase transitions- Gibbs- Helmholtz equation of a reversible cell

Unit 5 : MAXWELL- BOLTZMANN STATISTICS :

Macro and microstates-Thermodynamic probability-Equilibrium state-Momentum and phase space-Entropy and probability- Maxwell-Boltzmann energy and momentum distribution law- Application of M-B distribution law :Total internal energy and specific heat at constant volume of an ideal gas-M-B distribution of speed-Mean, rms and most probable speeds- Doppler broadening of spectral lines- Limitations of M-B statistics.

TEXT BOOKS:-

1) M.Narayanamurti and Nagarajan, Dynamics, National Publishing Company, 8th Edition, 2002.(For Chapter 1 (partly) and Chapter 2)
2) D.S. Mathur, Elements of Properties of Matter, S.Chand and Co., 11th Edition,2000. (For Chapter 1 (partly))
3) Brij Lal, N.Subrahmanyam and P.S Hemne- Heat Thermodynamics and Statistical Mechanics, S.Chand and C Ltd- Revised Edition 2007 (For Chapter 3,4 and 5)

REFERENCE BOOKS

1) H.Goldstein, C.Pole and J.Scifko, Classical Mechanics, Pearson Education Asia, 3rd Edition, 2004.

2) Sears.F.W, Thermodynamics, Kinetic theory of gases and statistical Mechanics.
3) Zemansky.M.W, and Dittman R.H, **Heat and Thermodynamics**, 6th edition (1989)
4) R.P.Feynman, R.B.Leighton and M.Sands, The Feynman Lectures on Physics, Volumes 1 & 1, Narosa Publishing House, 1998.
5) Murray R. Speigal, Theoretical Mechanics, Schaum's Outline Series, McGraw-Hill Book Co, SI(Metric) Edition, 1987.

PH2504 - PHYSICS PRACTICAL - I

Category : MC **Credits : 6**

Semesters : I & II **No. of hrs/wk : 6**

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 μ.
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)

PH2105 - PHYSICS FOR CHEMISTRY – I

(Proposed syllabus – from 12CH batch onwards)

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 – poission 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)

PH2106 - PHYSICS FOR CHEMISTRY - PRACTICAL – I

(Proposed syllabus – from 12CH batch onwards)

Category : AR **Credits : 1**

Semester : II **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

PH1101 - PHYSICS FOR MATHEMATICS – I

(Proposed syllabus – from 12MT batch onwards)

Category : AR **Credits : 3**

Semester : I **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 ofequivalence – 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 – poission 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 – 7^{th} 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*

PH1102 - PHYSICS FOR MATHEMATICS - PRACTICALS – I

(Proposed syllabus – from 12MT batch onwards)

Category : AR **Credits : 1**

Semester : I **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. Viscosity - capillary flow
5. Specific heat of liquid - electrical heating
6. Sonometer -verification of laws
7. Compound bar pendulum - determination of'g'and radius of gyration
8. Basic Gates – AND, OR, NOT, NAND, NOR
9. NAND, NOR as Universal Building Blocks

PH2107 - MICROPROCESSOR

(Proposed syllabus – from 12CS batch onwards)

Category : AR **Credits : 3**

Semester : I or II **No. of hrs/wk : 4**

Objective : This paper aims at providing the students with an in depth exposure to the sixteen bit microprocessor Intel 8086.

UNIT I : Intel 8086 Architecture and Instruction set

CPU architecture-addressing modes-instruction formats-instruction set-execution timing.

UNIT II : Introduction to Macro Assembler (MASM)

Assembler directives-assembler operators-assembly process-translation of assembler instructions-simple programs.

UNIT III : Modular Programming and Multiprogramming

Linking and relocation-access to external identifiers-procedures-interrupts and their routines-macros-process management and IRMX86-semaphore operations-common procedure sharing.

UNIT IV : I/O consideration and System bus structure

Programmed I/O-Interrupt I/O-block transfer and DMA-basic 8086 bus configuration-minimum and maximum modes-system bus timings.

UNIT V : Interrupt system

Software Interrupts – hardware interrupts – vectored and non-vectored interrupts – hardware Interrupt priority management Daisy chain - single and multiple interrupt controllers 8259

BOOKS FOR STUDY:

1. Yu-cheng Liu, Glen A. Gibson, “Microcomputer Systems : 8086/8088 Family”, Prentice-Hall of India, 2006.
2. Douglas V. Hall, “Microprocessor interfacing, Programming and Hardware”, Tata McGraw-Hill, 2005.
3. Vijayendran V., “Fundamentals of Microprocessor-8086”, S.Visvanathan PVT.,LTD., 3rd Edition 2005.
4. Muhammad Ali Mazidi, Janice Gillipsie Mazidi, “The 8051 Microcontroller and Embedded Systems”, Pearson Prentice Hall, First Impression, 2006.

BOOKS FOR REFERENCES :

1. Barry B. Brey, “The Intel Microprocessors 8086/8088, 80186, 80286, 80386 and 80486, Prentice-Hall of India, New Delhi, 3rd Edition,1995.
2. Uffrenbeck J., “The 8086/8088 Family-Design, Programming and Interfacing, Software, Hardware and Applications”, Prentice-Hall of India, New Delhi.
3. Tribel W.A., Avtar Singh, “The 8086/8088 Microprocessors: Programming, Interfacing, Software, Hardware and Applications”, Prentice-Hall of India, New Delhi.

PH2108 - MICROPROCESSOR PRACTICAL

(Proposed syllabus – from 12CS batch onwards)

Category : AR **Credits : 1**

Semester : I or II **No. of hrs/wk : 2**

Objective : This paper aims at providing the students with hands on experience of developing assembly language programs for the 16 bit microprocessor 8086.

1. Microprocessor 8086 - Introduction I (arithmetic - immediate mode)
2. Microprocessor 8086 - Introduction II (arithmetic and logical - all modes)
3. Microprocessor 8086 - Code conversions and arrays manipulation
4. Microprocessor 8086 - Solving equations
5. Microprocessor 8086 - Subroutines
6. Microprocessor 8086 - Interface I (LEDs & switches)
7. Microprocessor 8086 - Interface II (Freq. generation)
8. Microprocessor 8086 - Interface III (Waveform generation)
9. Microprocessor 8086 - Interface IV (Traffic lights simulation)