PONDICHERRY UNIVERSITY

SYLLABUS FOR B.Sc (PHYSICS)

For the student admitted from the academic year 2008-2009 onwards

SYLLABUS FOR B.Sc (PHYSICS)

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PAPER DETAILS

SL NO	PAPER NO	PAPER TITLE	SEMESTER
1	PHYS 111	MECHANICS OF PARTICLES, RIGID BODIES AND CONTINUOUS MEDIA	I
2	PHYS 112	KINETIC THEORY AND THERMODYNAMICS	I
3	PHYS 121	OSCILLATIONS, WAVES AND ACOUSTICS	II
4	PHYS 122	QUANTUM MECHANICS	II
5	PHYS 120	PHYSICS PRACTICAL -I	II
6	PHYS 231	OPTICS	III
7	PHYS 232	ELECTRICITY	III
8	PHYS 241	MAGNATISM AND ELECTRO DYNAMICS	IV
9	PHYS 242	ELECTRONICS	IV
10	PHYS 240	PHYSICS PRACTICAL - II	IV
11	PHYS 351	STATISTICAL MECHANICS	V
12	PHYS 352	SOLID STATE PHYSICS	V
13	PHYS 353	LASER AND MOLECULAR SPECTROSCOP	V
14	PHYS 354	DIGITAL ELECTRONICS	V
15	PHYS 355	ASTROPHYSICS (OPTIONAL)	V
16	PHYS 361	ELECTROMAGNETIC WAVES AND RELATIVITY	VI
17	PHYS 362	ATOMIC PHYSICS	VI
18	PHYS 363	NUCLEAR PHYSICS	VI
19	PHYS 364	COMMUNICATION ELECTRONICS - II	VI
20	PHYS 365	NUMERICAL METHODS AND COMPUTER APPLICATIONS	VI
21	PHYS 350	PHYSICS PRACTICAL – III	VI
22	PHYS 360	PHYSICS PRACTICAL – IV	VI

SYLLABUS FOR B.Sc (PHYSICS)

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I-SEMESTER

PHYS 111: MECHANICS OF PARTICLES, RIGID BODIES AND CONTINUOUS MEDIA

UNIT-1

Laws of motion: Laws of motion, Conservative forces and potential energy- Law of conservation of momentum and energy for a single particle- Angular velocity, angular momentum, and torque- Law of conservation of angular momentum for single particle- Rotating frame of reference- Centrifugal and Coriolis forces- Foucault pendulum.

System of particles. Equation of motion- Centre of mass- Conservation of momentum and angular momentum of system of particles- Rigid body- Degrees of freedom- Euler's theorem.

UNIT-II

Motion under central force: Motion under central force and conservation of angular momentum- Kepler's laws- Fields and potentials- Gravitational potential and field and potential due to spherical shell and uniform solid sphere of mass- Gravitational self energy- Self energy of a uniform solid sphere of mass- Elastic and inelastic collisions between two smooth spheres and between a smooth sphere and a solid surface (direct and oblique)- Determination of final velocities, impulse, and loss of KE- Two body problem- Reduced mass- Scattering and scattering cross sections- Rutherford scattering by hard sphere.

UNIT-III

Rigid body dynamics: Angular momentum of a rigid body- Moment of inertia tensor- Principal axes of inertia- Various types of tops- Euler's equation of motion for rotation- Precessional motion (qualitative) - Gyroscope.

Rotation of a rigid body about a fixed axis- Component of angular momentum and moment of inertia about a fixed axis- Parallel and perpendicular axes theorems- Moments of inertia (about various axes) of thin rod, circular disc, solid sphere, spherical shell, diatomic and triatomic molecules.

UNIT-IV

Continuous media: Elastic constants for an isotropic solid- Their inter-relation- Torsion of a cylinder- Bending of a beam- Cantilever.

Kinematics of moving fluids- Equation of continuity- Euler's equation- Bernoulli's theorem- Velocity of efflux- Venturimeter- Viscous fluids- Streamline and turbulent flow- Flow though a capillary tube- Reynold's number- Stokes law.

Surface tension and surface energy- Molecular interpretation- Pressure on a curved liquid surface.

TEXTBOOKS

1. D S Mathur, Mechanics, (S. Chand & Co.)
2. D S Mathur, Elements of properties of matter, (S.Chand & Co.)
3. M.Narayanamurthy et. al., Mechanics, (National Publishing House.)
4. P P Gupta, Hydrodynamics, (S. Chand & Co)

REFERENCE BOOKS

1. R G Takwale & PS Puranik, Introduction to Classical Mechanics, (Tata McGraw-Hill)
2. S L Gupta,V Kumar & H V Sharma, Classical Mechanics, (Pragati Prakashan, Meerut.)
3. N C Rana & P S Joag, Classical Mechanics, (Tata McGraw-Hill.)
4. F. Chorlton, Textbook of fluid dynamics, (CBS Publishers and Distributors.)

SYLLABUS FOR B.Sc (PHYSICS)

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I-SEMESTER

PHYS 112: KINETIC THEORY AND THERMODYNAMICS

UNIT-I

Ideal gas: Review of the kinetic model of an ideal gas- interpretation of temperature- Equipartition of energy; specific heats of gases, Real gas: Van der Waal's model; equation of state, nature of Van der Waal's forces, critical constants- Transport Phenomena: mean free path, transport of momentum (viscosity), of energy (thermal conduction) and matter (diffusion)-

UNIT-II

Joule Thomson and adiabatic cooling: Joule Thomson expansion- constancy of U + PV- cooling in J-T expansion- adiabatic expansion of an ideal gas- principles of regenerative and cascade cooling- liquefaction of gases- Linde's method- Low temperatures: Production and measurement of very low temperatures.

UNIT-III

The laws of thermodynamics, Black body radiation: The zeroth law- indicator diagrams- work done- the first law- internal energy- Carnot cycle and its efficiency- Carnot's theorem- the second law. Entropy as a thermodynamic variable; reversible and irreversible processes. Principle of increase of entropy. Thermodynamic scale of temperature: its identity with perfect gas scale- impossibility of attaining the absolute zero (third law).

UNIT-IV

Thermodynamic relationships: Maxwell's equations- application to Clausius-Clapeyron equation and Joule-Thomson effect- Thermodynamic potentials- Relation to thermodynamic variables- equilibrium in thermodynamic systems- simple applications.

Temperature & radiation- Stephen-Boltzmann law- spectral distribution- Wien's displacement law. Rayleigh-Jeans law and the ultraviolet catastrophe- Planck's hypothesis- mean energy of an oscillator and Planck's law.

TEXT BOOKS

1. Brijlal and Subramanian, Heat and thermodynamics, (S.Chand & Co)
2. Mathur, Heat and thermodynamics, (S.Chand & Co).
3. J B.Rajam and CL.Arrora, A Textbook of Heat and thermodynamics, (S.Chand & Co)
4. A.B.Gupta and H.Roy, Thermal Physics, (Allied Books, New Delhi)

REFERENCE BOOKS

1. D P Khandelwal and A K Pande, Thermodynamics and Statistical Physics (Himalaya Publication House, Bombay)
2. C Kittel and H Kroemer, Thermal Physics, (CBS Publishers, Delhi)
3. M W Zemanasky, Heat and Thermodynamics, (McGraw-Hill)

SYLLABUS FOR B.Sc (PHYSICS)

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II-SEMESTER

PHYS 121: OSCILLATIONS, WAVES AND ACOUSTICS

UNIT- I

Free, damped and forced oscillations: Equilibrium- concept of potential well- small oscillations about stable equilibrium- differential equation of SHM- solutions- simple pendulum- compound pendulum- loaded spring- loaded cantilever- linear and transverse oscillations of a mass between two springs- diatomic molecule.

Damped oscillations- critical damping- Q of an oscillator- Forced oscillator with one degree of freedom- transient and steady state oscillations- resonance energy absorption- and low and high frequency responses.

UNIT-II

Free oscillations of system with two degrees of freedom, Fourier analysis: Two dimensional oscillator - normal modes- Fourier series and Fourier coefficients- simple examples- expression for Fourier coefficients.

UNIT- III

Waves in continuous media: Speed of transverse waves on a uniform string- characteristic impedance to transverse waves by a string- boundary conditions and normal modes in a string- speed of longitudinal waves in a fluid- velocity of sound in air- dependence on pressure and temperature- normal mode vibrations of air columns.

Energy density and energy transmission in waves- dispersion in waves- group velocity and phase velocity.

Linear homogeneous equations and the superposition principle: interference- beat combination-tones.

UNIT-IV

Applied acoustics: Transducer and their characteristics- acoustics of halls- reverberation period- Sabines formula**.**

Ultrasonics: generation of ultrasonic waves- piezoelectric and magnetostriction methods- detection- medicinal and industrial applications of ultrasonic waves.

TEXT BOOKS

1. Bajaj, Waves and oscillations (Tata McGraw Hill)
2. D P Khandelwal, Oscillations and Waves (Himalaya Publishing House, Bombay)
3. R.Murugeshan, Sound, (S.Chand & Co).
4. M.Ghosh, A Text Book- of Sound (S.Chand & Co).

REFERENCE BOOKS

1. I G Main, Vibrations and Waves (Cambridge University Press)
2. H J Pain, The Physics of Vibration and Waves (Wiley ELBS, 1976)
3. R K Ghosh, The Mathematics of waves and vibrations (Macmillan, 1975)
4. A P French, Oscillations and waves (MIT Introductory Physics Series).
5. S.P. Puri, Vibrations and Waves (Tata McGraw - Hill).

SYLLABUS FOR B.Sc (PHYSICS)

(*For the student admitted from the academic year 2008-2009 onwards*)

II-SEMESTER

PHYS 122: QUANTUM MECHANICS

UNIT-I

Wave Mechanical Concepts: Rise and fall of Planck-Bohr quantum theory, Duality of radiation and matter, de Broglie's hypothesis, justification for the relation $\lambda = h/p$, experimental confirmation. Phase and group velocities of a wave; formation of a wave packet, illustrations. Uncertainty principle relating to position and momentum, relating to energy and time. Double slit experiment.

UNIT-II

Schrodinger equation : Einstein de-Broglie relations as a link between particle and wave properties, general equation of wave propagation, propagation of matter waves, time dependent and time independent Schrodinger equations, physical meaning of ψ, conditions to be satisfied by ψ. Postulatory approach to wave mechanics, operators, observables and measurements.

UNIT-III

Simple one-dimensional problems: Particle in a box with rigid walls, concept of a potential well, wave functions and, energies for the ground and excited states; quantization of energy. One dimensional harmonic oscillator, zero-point energy.

Other one-dimensional problems; step potentials, penetration through rectangular barrier, transmission coefficients, quantum mechanical tunneling.

UNIT -IV

Operator method: Operators, Eigenvalues and Eigenfunctions; linear operators, product of two operators, commuting and non commuting operators, simultaneous eigenfunctions, orthogonal functions. Hermitian operators, their eigenvalues and eigenfunctions, expectation values of an operator.

Application of operator methods; simple harmonic oscillator, step-up and step-down operators, eigen functions and eigen values of the ground state and excited states; Probability density and its variation with degree of excitation(qualitative).

TEXTBOOKS

1. V. Devanathan, Quantum Mechanics (Narosa Publishing House).
2. R.K.Srivastava, Quantum Mechanics (Prentice Hall of India, 2007)
3. S.P.Khare, Modem Physics (Rastogi Publications)
4. G.S.Chaddha, Quantum Mechanics (New Age Int. Pub.)
5. P.M. Mathews and K.Venkatesan, A Text Book of Quantum Mechanics (Tata McGraw Hill).
6. Aruldhas, Quantum Mechanics (Prentice Hall of India, 2006)

REFERENCE BOOKS

1. Leonard I Schiff, Quantum Mechanics (McGraw Hill Int. Edition)
2. Ghatak & Lokanathan, Quantum Mechanics: theory and application (Macmillan)
3. J.J.Sakurai, Modern Quantum Theory Rev.ed. (Addision Wesley Pub. Co.)
4. P.T.Mathews, Quantum Mechanics (McGraw Hill).
5. W. Greiner, Quantum Mechanics (Springer Verlag).

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II-SEMESTER

PHYS 120: PHYSICS PRACTICAL -I

Choose any 16 experiments from the list given below

LIST OF EXPERIMENTS

1. Compound pendulum - determination of g, radius of gyration and moment of inertia
2. Young's modulus - non-uniform bending - pin & microscope.
3. Young's modulus - cantilever - pin & microscope.
4. Surface tension of a liquid and interfacial surface tension between water and kerosene by the method of drops.
5. Rigidity modulus - torsional oscillations without masses.
6. Specific heat capacity of a liquid and emissivity of a surface - method of cooling.
7. Thermal conductivity of a bad conductor- Lee's disc method.
8. Sonometer - determination of frequency and verification of laws of transverse vibrations.
9. Melde's apparatus - determination of frequency.
10. Spectrometer- refractive index of a liquid - hollow prism.
11. Spectrometer - calibration of a grating - minimum deviation method.
12. P.O. box - resistivity and verification of laws of resistance.
13. P.O. box - temperature coefficient of the material of a coil of wire.
14. Potentiometer - calibration of low range voltmeter (0 - 1.5 V).
15. Potentiometer - calibration of ammeter (0-1.5 amps).
16. Oscillations on a bifilar suspension
17. Y - Searle's method for determining Y, n and η of a material.
18. Variation of period of oscillations of a spring (or rubber band) with mass and spring constant
19. Jolly's constant volume air thermometer - determination of melting point of wax
20. Study of characteristics of a thermistor
21. Emf of thermocouple using digital thermometer
22. Kater's pendulum - determination of acceleration due to gravity at a place
23. Stoke's method of viscosity determination
24. Terminal velocity for bodies falling through a fluid
25. Study of laws of parallel and perpendicular axes fir estimation of moment of inertia
26. Computer simulation of spherical body falling in a viscous liquid.
27. Computer simulation of damped oscillator.
28. Computer simulation of analyzing a square wave-form for its harmonic components.
29. Computer simulation of Generation of phase space plots of simple harmonic oscillator
30. Computer simulation of motion of a single pulse.
31. Computer simulation of motion of equation of motion for a system of particles
32. Computer simulation of motion of molecular rotations as rigid bodies.
33. Computer simulation of motion of Study of coupled oscillators.

TEXTBOOKS

1. D P Khandelwal, Laboratory Manual of Physics for UG classes (Vani Pub. House, New Delhi)
2. B Saraf et al, Physics through Experiments, Vol. 1, Mechanical Systems, (Vikas Publication House. New Delhi)
3. Verma, Ahluwalia, Sharma, Computational Physics, an Introduction (New Age Int. (P) Ltd.)

REFERENCE BOOK

1. V Y Rajopadhye and V L Purohit, Text book of experimental Physics

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III-SEMESTER

PHYS 231: OPTICS

UNIT-I

Ray optics: Fermat's principle and its applications: Principle of extremum path, proof of laws of reflection and refraction, paraxial approximation, matrix method in paraxial optic, ABCD law, ray equation and its solutions

UNIT-II

Reflection and refraction*:* Snell's law of reflection and refraction, Fresnel's law of reflection and refraction (amplitude and phase), reflection and refraction at spherical surfaces: formula for refraction at single spherical surface, sign convention. Thick lenses: matrix methods in paraxial optics, basic ideas of unit planes and nodal planes, cardinal points of an optical system; general relationships, combination of thin lenses.

Aberration in images: chromatic aberrations; achromatic combination of lenses in contact and separated lenses; Monochromatic aberrations and their reduction.

UNIT-III

Electromagnetic optics: Representation of electromagnetic waves, wave vector and direction of propagation, concept of plane polarized wave and its equation.

UNIT-IV

Interference and diffraction: Interference of light, two beam interference by division of wave front. Haidinger fringes, Newton's rings. Michelson interferometer; its uses for determination of wavelength, concept of coherence using Michelson interferometer; temporal and spatial coherence. Multiple beam interference, interference due to two plane parallel system. Fabry-Perot interferometer, concept of finesse.

Fresnel diffraction: Half-period zones, zone plate, Fresnel diffraction at straight edge, explanation of rectilinear propagation, Fresnel diffraction at a circular aperture, Fresnel diffraction at a circular disc.

Fraunhofer diffraction: Diffraction at a single slit, a circular aperture and a circular disc; Resolution of images; Rayleigh criterion, resolving power of a telescope and a microscope, outline (no derivations) of phase contrast microscopy. Diffraction grating: Diffraction at double and N parallel slits; plane diffraction grating, resolving power of gratings and prisms.

Double refraction, interference of polarized light, phase retardation plates (quarter and half wave plates).

TEXTBOOKS

1. Ajoy Ghatak, Optics, (Tata McGraw Hill)
2. Ajoy Ghatak, Introduction to Modern Optics (Tata McGraw Hill)
3. Brijilal and Subramanian, Optics ((S.Chand & Co).
4. S.L. Kakani and H.C. Bhandrai, Optics (S.Chand & Co)
5. Jenkins and White, "Fundamentals of Optics" (McGraw-Hill)

REFERENCE BOOKS

1. F G Smith and J H Thomson, "Manchester Physics Series: Optics" (English Language Book Society and John Wiley and Sons Ltd. London, 1977)
2. K D Meller, "Optics" (Oxford University Press)
3. Smith and Thomson, "Optics" (John Wiley and Sons, 1980)
4. R S Longhurst, "Geometrical and Physical Optics" (Longmans, 1966)
5. A.N.Matveev, "Optics" (Mir Publishers 1988)
6. Jurger R. Meyer -Arednt " Introduction to Classical and Modern Optics" (Prentice Hall)

SYLLABUS FOR B.Sc (PHYSICS)

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III-SEMESTER

PHYS 232: ELECTRICITY

(Note: *Vector language is to be used all through)*

UNIT-I

Electric field: Coulomb's law, Unit of charge (SI and other systems of unit). Conservation and quantization of charge. Field due to different charge distributions. Monopole, dipole, quadrupole, line charge, sheet charge. Torque on dipole in uniform field and non-uniform fields.
Flux of an electric field. Gauss's theorem. Application to deduce E fields. Force per unit area on the surface of a charged conductor.

UNIT-II

Potential: Line integral of electric field and electric potential. Field as the gradient of potential. Potential and field due to spherical shell charge distribution and uniform spherical volume charge distribution. Potential energy (self energy) of a system of charges. Self energy of a spherical volume charge distribution. Energy associated with E field. Differential form of Gauss's law. Poisson's equation. Laplace's equation. Boundary conditions, and Uniqueness theorem.

Electric field around conductors. Induced charges. Field and potential inside a conductor. Field near the surface of a conductor. Method of images.

UNIT-III

Electric fields in matter*:* Atomic and molecular dipoles. Induced dipoles. Polarizability tensor. Electronic and molecular contributions. Electrical field caused by polarized matter. E and D fields. Permittivity, dielectric constant. Capacitor filled with dielectric. Field equations in presence of dielectric. The field of a polarized sphere. Dielectric sphere in a uniform field. Energy in dielectric systems. Polarizability and susceptibility. Frequency dependence of polarizability. Claussius-Massotti equation.

UNIT-IV

Electric current: Current density and current. Non-steady currents and continuity equation. Kirchoffs laws. Network theorems and their applications. Non-Ohmic circuitry, thermistor.

Varying current: Rise and decay of currents in LR, CR circuits and LCR circuits - resonance. Time constant. Integrating and differentiating circuits.

TEXTBOOKS

1. K K Tewari, Electricity and Magnetism (S Chand and Co.)
2. Brijlal and Subramaniam, Electricity and Magnetism (S Chand and Co.)
3. D N Vasudeva, Electricity and Magnetism (S Chand and Co.)
4. S. Mahajan and A. A. Rangawala, Electricity and Magnetism, (Tata Me Graw - Hill)
5. Khare and Srivastava, Electricity and Magnetism, (Atmaram and sons, New Delhi.)

REFERENCE BOOKS

1. S Mahajan & A A Ranganwala, Electricity and Magnetism, (Tata McGraw-Hill)
2. Reitz & Millford, Electricity and Magnetism (Addison - Wesley)
3. Nelkon and Parker, Advanced level physics (Heinemann Educational, London)
4. Halliday, Resnick, Walker: Fundamentals of Physics, 7th Edition (John Wiley & Sons Inc.)
5. Pugh and Pugh, Principles of Electricity and Magnetism, (Addison - Wesley)

SYLLABUS FOR B.Sc (PHYSICS)

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IV-SEMESTER

PHYS 241: MAGNATISM AND ELECTRO DYNAMICS

(Note: *Vector language is to be used all through*)

UNIT-I

Magnetic field: Magnetic field B seen through Lorentz force on a moving charge, unit for B defined through force on a straight current, torque on a current loop in B field, magnetic dipoles in atoms and molecules.

Magnetic field due to currents, Biot and Savart's law. Field equations in magnetostatics. Ampere's law. Fields due to a straight wire, magnetic dipole, circular current and solenoid. Magnetic fields in matter: Magnetizing current, magnetization vector, Hand B fields, magnetic permeability, susceptibility. Comparison of magnetostatics and electrostatics. Relation connecting (E, D) and relation connecting (B, H).

UNIT-II

Electromagnetic Induction, vector and scalar potentials: Faraday's law for electromagnetic induction: Faraday's law in integral and differential forms; self-inductance of a solenoid and of a straight conductor, energy stored in an inductor and in the magnetic field. Displacement current; modified Ampere's law.

Electromagnetic potentials: Magnetic vector potential A and scalar potential <D. Gauge transformations and gauge invariance of potentials, Poisson's equation for A in terms of current density.

UNIT-III

Alternating currents: Skin effect for resistance at high frequencies', complex impedance, reactance, impedances of LCR series and parallel circuits, resonance, Q-factor, power dissipation and power factor. AC bridges; Anderson's and Owens bridges.

Generators: Three-phase electrical power supply, delta and star connections

UNIT-IV

Motion of charged particles in E and B fields: Case of cathode ray oscillograph, positive ray parabola, velocity selector, magnetic focusing, principle of mass spectrograph.

TEXTBOOKS

1. K.K.Tewari, Electricity and Magnetism (S.Chand & Co).
2. Murugeshan, Electricity and Magnetism (S.Chand & Co).
3. S.L.Guptha, S.P. Singh, V. Kumar Electrodynamics (Pragati Prakasan).
4. A S Mahajan and A A Rangawala, Electricity and Magnetism (Tata McGraw-Hill
5. D.J. Griffiths; Introduction to Electrodynamics (Prentice-Hall of India 1989)

REFERENCE BOOKS

1. Pugh and Pugh, Principles of Electricity and Magnetism (Addison-Wesley)
2. Panofsky and Phillips, Classical Electricity and Magnetism (India Book Co.)
3. S S Atwood, Electricity and Magnetism (Dover publication)
4. Reitz and Milford, Introduction to Electrodynamics (Addison-Wesley)
5. J.B. Marion, Classical electromagnetic radiation, (Academic Press)

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IV-SEMESTER

PHYS 242: ELECTRONICS

UNIT-I

Junction diode, special diodes, and their general uses*:* Classification of Conductors, insulators and semi-conductors on the basis of energy band diagram - Intrinsic and extrinsic semiconductors. P- type and N-type semi-conductors. Formation of PN junction diode - Forward and reverse characteristics - Diode resistance - Effect of temperature on extrinsic semiconductors, Half wave, Centre tap and Bridge rectifiers, Expression for average dc voltages, qualitative ideas of filters, clipping and clamping circuits - their general applications.

Zener diode - Volt- ampere characteristics - Avalanche and Zener breakdown mechanisms - Zener voltage. Simple voltage regulator circuit using zener diode. LED, Photodiode.

UNIT-II

Bipolar junction transistors, biasing and hybrid parameters: Construction of NPN and PNP transistors - their operation modes - operation of NPN and PNP transistors - CB, CE and CC configurations and their biasing, Input, Output and transfer characteristics of BJTs in CB and CE modes - Active, saturation and cut-off regions - Bias stability - Load line analysis - operating point.

The need of transistor biasing for faithful amplifications. Variations of transistor parameters - stability factor and stabilization - Thermal runaway - Methods of transistor biasing - Base bias - Base bias with emitter feedback - Base bias with collector feed-back - Voltage divider bias, h-parameters of a transistor and their notations - hybrid equivalent circuits for CE, CB and CC mode transistors. Single stage RC coupled amplifier, calculation of mid frequency gain using h-parameters, frequency response curve (qualitative).

UNIT-III

JFETS and MOSFETS: Construction of n-channel and p-channel JFETs - operation of n-channel JFET - Drain characteristics of n-channel JFET - Transfer characteristics - parameters of JFET - comparison between BJT and JFET. JFET biasing circuits. MOSFETS, characteristics and parameters.

UNIT-IV

Operational amplifiers and oscillators: Principles of operational amplifiers, offset parameters, differential gain, CMRR, applications of op-amp: as inverting and non-inverting amplifiers, summing amplifier, difference amplifier, differentiator, integrator, and comparator.

Concept of feedback mechanism, oscillators, Barkhausen criterion, RC oscillators (Wein bridge & Phase shift), Multivibrators.

TEXTBOOKS

1. R.S. Sedha, A textbook of applied electronics, 2005 (S. Chand & Co.,)
2. V.K. Metha, Principles of electronics, 2005 (S. Chand & Co.,)
3. Millmann & Halkias, Integrated Electronics (Tata Me Graw Hill.)
4. M.K.Bagde, S.P. Singh, Element of Electronics (S.Chand & Co.)
5. D.Chathopadhyay & Rakshit, Electronic Fundamental and Applications (New Age International)
6. S. Salivahanan and N. Suresh Kumar, Electronic devices and electronic circuits, 2004 (TMH)
7. Malvino, Electronic principles, 6th Edition (TMH).

REFERENCE BOOKS

1. B.L. Theraja, Basic Electronics, 2005 (S. Chand & Co.,)
2. G. Nagarajan, Electronic devices, 2005 (Lakshmi Publications)
3. U.A. Bakshi and A.P. Godso, Electron devices, 2005 (Technical Publications, Pune).
4. Millman and Halkias,Electronic devices and Circuits, (Mc Graw Hill)
5. Horowitz and Hill, Art of Electronics (Cambridge University Press).

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IV-SEMESTER

PHYS 240: PHYSICS PRACTICAL - II

Choose any 18 experiments from the list given below

LIST OF EXPERIMENTS.

1. Young's modulus - Uniform bending - scale & telescope
2. Young's modulus - Koenig's method.
3. Rigidity modulus - Torsional pendulum with masses.
4. Rigidity modulus - Static torsion.
5. Specific latent heat of fusion of ice.
6. Specific Heat capacity of a liquid - Joule's calorimeter.
7. Spectrometer- determination of wavelength - Minimum deviation method.
8. Spectrometer calibration of grating- Normal incidence method.
9. Spectrometer - i-d curve.
10. M and B_H using deflection and vibration magnetometer.
11. Field along the axis of the circular coil carrying current and determination of B.
12. Carry-Foster's bridge - Resistivity of the material of the coil of wire.
13. Carry-Foster's bridge-'Temperature co-efficient of the material of a wire.
14. Potentiometer - Internal resistance of a cell.
15. Potentiometer -Calibration of high range voltmeter.
16. Figure of merit of a periodic moving coil galvanometer.
17. B.G- Comparison of emf of two cells.
18. B.G. - Comparison of capacities.
19. Melde's string-Specific gravity of a solid and liquid.
20. Determining the focal length of a high power microscope objective.
21. Study of interference fringes in a bi-prism arrangement
22. Study of polarization of light by simple reflection.
23. Study of optical rotation by solutions.
24. Study of the rise and decay of current in a RC circuit
25. Study of the rise and decay of current in a RL circuits
26. Study of the impedance of an inductor at varying frequencies to measure R and L
27. Study of the impedance of a capacitor of varying frequencies to measure C.
28. Computer simulation of effect of magnetic field on charged particles
29. Computer simulation circuit analysis using Kirchhoff’s laws.
30. Computer simulation of double slit interference
31. Computer simulation of propagation of electromagnetic waves.

TEXTBOOKS

1. D P Khandelwal, A Laboratory Manual in Physics for Undergraduate Students (Vani Publication, New Delhi)
2. B Saraf et al. "Physics through Experiments, Vol. II., EMF constant and varying, (Vika Publications, New Delhi)
3. V Y Rajopadhye and V L Purohit, Text book of experimental Physics
4. Verma, Ahluwalia, Sharma, Computational Physics, an Introduction (New Age Int. (P) Ltd.)

REFERENCE BOOKS

1. Olon, "Experiments in Modern Physics"
2. Adrian C. & Melissinos, Experiments in Modern Physics (Academic Press).

SYLLABUS FOR B.Sc (PHYSICS)

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V-SEMESTER

PHYS 351: STATISTICAL MECHANICS

Unit -I

Basic Concepts: Definition of system-Microstates and microscopic physical quantities, macrostates and macroscopic physical quantities-phase space- p-space and T-space and their properties. Isolated system - Postulates of statistical Mechanics. Number of microstates and thermodynamic entropy.

Unit- II

Classical Statistics: Introduction, Classical Maxwell-Boltzmann distribution law, MB distribution for molecules of more than one kind, Evaluation of Lagrange multipliers a and p, application of MB distribution, most probable, average and RMS velocities, calculation of internal energy , calculation of Cv and Cp. Principle and proof of law of equipartition of energy, calculation of gas pressure, entopy of an ideal gas. Limitations of MB distribution.

Unit- III

Quantum Statistics: Transition from classical to quantum statistics. Indistinguishability and quantum statistics, Quantization of energy - volume of a cell in phase space (quantum description). Calculation of accessible states for free particles in one and three dimensions (quantum approach). Energy states and mean energy of a quantum oscillator. Indistinguishabilty of particles in a system- Bose Einstein energy distribution law (derivation). Evaluation of the constant e^{u} , Pauli's exclusion principle- Fermi - Dirac energy distribution law (derivation).

Unit- IV

Applications of Quantum Statistics: BE Statistics: Calculation of energy and pressure of a gas, Degeneracy of molecular hydrogen and helium, BE condensation, Black body radiation. FD Statistics: Calculation of energy and pressure of a gas, slight and strong degeneracy, thermodynamic function of degenerate Fermi gas. Free electron gas. Comparison MB, BE and FD statistics.

TEXTBOOKS:

1. B.B.Laud, Statistical Mechanics, (New Age International Publishers.)
2. Sharma and Sarkar, Thermodynamics and Statistical Physics, (Himalaya Pub. House)
3. Gupta and Kumar, Statistical Mechanics, (Pragati Prkashan).
4. Mrugeshan, Modern Physics, (S.Chand & Co.)
5. Arthur Beiser, Concepts of Modern Physics (TMH)

REFERENCE BOOKS:

1. F.Reif, Statistical Physics, Berkeley Physics Course -Volume 5.
2. K.Huang, Statistical Mechanics, (Wiley Eastern.)
3. Saha and Srivastava, A treatise on Heat, (The Indian Press, Allahabad.)
4. Ritchtmyer , Kennard,Cooper, Introduction to Modern Physics (Tata McGraw Hill.)
5. A.N.Matveev, Molecular Physics (Mir Publishers.)

SYLLABUS FOR B.Sc (PHYSICS)

(*For the student admitted from the academic year 2008-2009 onwards*)

V-SEMESTER

PHYS 352: SOLID STATE PHYSICS

UNIT-I

Basics of Crystallography*:* Crystal geometry: Crystal lattice; crystal planes and Miller indices, unit cells. Typical crystal structures; coordination number, packing fraction. Symmetry elements; rotation, inversion and reflection, basics of point groups and crystal classes, space groups, reciprocal lattice Crystallography: Diffraction of X-rays by a crystal lattice. Laue's formulation of X-ray diffraction, Laue spots rotating crystal.

UNIT-II

Lattice Vibrations: Types of bonding in solids: Covalent, Ionic, metallic and Van der Waals bonding, hydrogen bond. Lattice Vibrations: Elastic and atomic force constants; Dynamics of a chain of atoms, chain of two types of atoms, optical and acoustic modes, interaction of light with ionic crystals. Einstein's and Debye's theories of specific heats of solids.

UNIT-III

Electrical Conduction in Solids: Conduction in metals: Drude's theory, DC conductivity, Hall effect and magneto resistance, AC conductivity, plasma frequency, thermal conductivity of metals, Fermi-Dirac distribution, thermal properties of free-electron gas. Conduction in semiconductor: Bands in solids; metals, insulators and semiconductor - electrons and holes - effective mass, donor and acceptor impurity levels.

UNIT -IV

Magnetic Properties of Solids: Magnetism: Diamagnetism, Paramagnetism due to free ions and conduction electron Curie's law, ferromagnetism, domains, hysterisis loop, outline of antiferro- and ferrimagnetism, ferrites. Superconductivity: Zero resistivity; critical temperature, critical B field. Meissner effect Type I and Type II superconductors, specific heat and thermal conductivity.

TEXTBOOKS

1. C Kittel, Introduction to Solid State Physics (Wiley Eastern , Ed., 1976)
2. S.O. Pillai, Solid State Physics (New Age International Ltd, New Delhi).
3. J.P.Srivastava, Elements of Solid State Physics, 2nd Ed.(PHI, 2007)
4. J S Blackmore, Solid State Physics (Cambridge University Press, 1985)
5. L. V. Azaroff, Introduction to Solids, Tata McGraw Hill, 1987)
6. Saxena, Gupta and Saxena, Fundamentals of Solid State Physics, 12th Ed. (Pragathi Prakasan).

REFERENCE BOOKS

1. Mermin and Ashcroft, Solid State Physics (New York, Holt, Rinehart and Winston)
2. W A Harrison, Electronic structure and the properties of solids (Freeman, 1980)
3. J P McKelvey, Solid state and semiconductors physics (Krieger, 1982)
4. H M Bosenberg, The Solid State" (Oxford University press, 1979)
5. S L Altmann, "Band Theory of Metals, The Elements" (Pergamon Press, 1970)
6. A J Dekker, Solid State Physics (Prentice-Hall, 1957)

SYLLABUS FOR B.Sc (PHYSICS)

(*For the student admitted from the academic year 2008-2009 onwards*)

V-SEMESTER

PHYS 353: LASER AND MOLECULAR SPECTROSCOPY

UNIT-I

Laser System, Types and Applications: Origin of spectral width, Schalow-Townes limit, Purity of a spectral line; Coherence: spatial and temporal, Einstein's A and B coefficients; Conditions for laser action; existence of a metastable state, population inversion by pumping and cavity resonance condition.

Ruby Laser, He-Ne Laser, Dye laser; Applications of lasers: Laser communication, Medical applications and Material processing. Elementary idea of second harmonic generation.

UNIT- II

Spectroscopic Methods: Emission spectroscopy: Emission source, prism and grating spectrographs, constant deviation systems, monochromators. Absorption spectroscopy: Continuum source for absorption studies, single-beam and double beam IR spectrometers.

UNIT-III

Rotation and Vibration of Molecules: Classification of molecules as various tops, Rotational energy levels of diatomic molecules(no derivation), internuclear distance. Pure rotation spectra; selection rules, isotope effects on rotational energies. Vibrational energy levels, force constants, anharmonicity, dissociation energy, Spectra of diatomic molecules: Vibration-rotation spectra; selection rules, P, Q.
and R branches.

UNIT -IV

Electronic levels, Raman Effect: Sharing of electrons; formation of molecular orbitals, molecular orbitals in H^+ ion, MO theory of H_2 molecule, diatomic molecular orbitals, molecular orbital energy level diagram. Electronic band systems, sequences and progressions, Franck-Condon principle. Raman effect: Stokes and anti-Stokes lines, quantum theory of Raman effect, selection rules in Raman and IR spectra.

TEXTBOOKS

1. C.N. Banwell, Fundamentals of molecular spectroscopy, (Tata-Mc-Graw Hill)
2. G Aruldhas, Molecular Structure & Spectroscopy, (Prentice-Hall of India)
3. Walker and Straughan; Spectroscopy, Vol 1, II, III (Wiely)
4. M.N.Avadhanulu, An Introduction to Lasers (S.Chand and Co)

REFERENCE BOOKS

1. B B Laud; Lasers and Non-linear Optics, (Wiley Eastern, 1985)
2. G Herzberg; "Molecular spectra and Molecular structure, (prentice Hall, New York)
3. R C Johnson; An Introduction to Molecular spectra (Methuen).

SYLLABUS FOR B.Sc (PHYSICS)

(*For the student admitted from the academic year 2008-2009 onwards*)

V-SEMESTER

PHYS 354: DIGITAL ELECTRONICS

UNIT-I

Digital Principles: Number system, binary arithmetic, Basic gates and universal gate operations. Boolean algebraic theorems and properties - Karnaugh map: two and four variable map, POS and SOP simplification, NAND and NOR implementation, don't care condition, Logic families: characteristics and parameters. TTL gates, TTL open collector gates Three state devices, CMOS gates, TTL - CMOS interface. Combinational logic design: parity checker, half and full adders, demultiplexer, multiplexer, decoders, encoders, PAL

UNIT-II

Flip Flops and Counters: RS flip-flops, clocked RS flip-flop, edge-triggering. JK flip-flop, D-type flip-flop, JK master slave flip-flop design procedure; serial-in-serial out. serial-in-parallel out shift registers asynchronous counters ; decade counter (Mod 10 counter); design counters. NE 555 counter inastable mode.

UNIT-III

A/D, D/A Converters: Principle of variable network and binary ladder type: four bit D/A converter, A/D converter, counter method and successive approximation, resolution and accuracy of D/A and A/D converter; frequency counters and digital voltmeters.

UNIT -IV

Microprocessors: Components of a microprocessor system, Architechture of 8085, Addressing modes, instruction set. pin configuration, stack operation, memory stack and cascade stack, assembly language programming of Intel 8085. Software programmes involving addition and subtraction. Simple i/o operations using 8255 ports. Elementary introduction to 16 bit processor

TEXTBOOKS

1. Malvino & Leach, Digital Principles and Applications (Tata McGraw Hill)
2. R.P Jain, Modem Digital Electronics, (Tata McGraw-Hill. New Delhi)
3. Morris Mano.M, Digital logic and computer design, (Prentice Hall of India)
4. Ramesh S. Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085 (Prentice Hall)

REFERENCE BOOKS

1. Milliman & Halkias, Integrated Electronics (Tata McGraw-Hill)
2. Floyd L. Thomas; "Digital fundamentals" (Universal Book stall.)
3. Jacob Millman, Microelectronics, (McGraw Hill)
4. Badri Ram, Fundamentals of Microprocessors and microcomputers, (Dhanpat Rai Publication)

SYLLABUS FOR B.Sc (PHYSICS)

(*For the student admitted from the academic year 2008-2009 onwards*)

V-SEMESTER

PHYS 355: ASTROPHYSICS (OPTIONAL)

UNIT-I

Radiointerferometry: Radiogalaxie - characteristics and classification - Radiointerferometry - quarsers - radio and optical properties of quarsers - red shift of quarters.

Basics of orbiting telescope, Hubble space telescope, Focault's experiment, Van Allenbelts, Aurora.

UNIT-II

Astronomical Objects: Red giants, Heavy element synthesis, white dwarfs - Chandrasekar's mass limit, rotating black holes, Shwarzchild radius.

Tidal and Planetesimal theories - Kupier's proto-planet theory, Hertzsprung-Russel diagram applications, outline of Saha's ionization theory.

UNIT-III

Solar system: Structure of photosphere, chromosphere, corona and their characteristics - Mechanism of energy production in the Sun, Solar prominences, spicules and plages.

Steady state theory, evidence in favour of Big-bang theory - Future of the Universe, pulsating theory standard model, inflation.

UNIT -IV

Applications: Bio-astronomy. Habitable planets - project SETI and other search for extra terrestrial civilizations - UFO phenomenon.

Rocket equation, thrust and acceleration, space shuttles. Theory of Geosynchronous satellite, Trajectory adjustments, Launch site tracking, radio telemetry, space probes.

TEXTBOOKS

1. Baidyanathan Basu, An Introduction to Astrophysics (Prentice Hall of India)
2. K.D.Abhyankar, Astrophysics -Stars and Galaxies (University Press India)
3. J.V.Narlikar, Introduction to Cosmology (Cambridge University Press, UK).

REFERENCE BOOKS

1. Ion Nicolson, Unfolding our Universe (Cambridge University Press)
2. D.D. Clayton, Principles of Stellar Evolution and Nucleosynthesis, (McGraw Hill, NewYork)
3. Robert Dixen, Dynamic Astronomy (Prentice Hall International)

SYLLABUS FOR B.Sc (PHYSICS)

(*For the student admitted from the academic year 2008-2009 onwards*)

VI-SEMESTER

PHYS 361: ELECTROMAGNETIC WAVES AND RELATIVITY

UNIT-I

Maxwell's equations and electromagnetic waves: Maxwell's equations in Integral and differential forms. Plane-wave solution for Maxwell's equation; speed of waves and refractive index of a medium, Orthogonality of E, B and propagation vector, Characteristic impedance, POynting vector; energy of propagation. Reflection and transmission at dielectric boundaries, normal incidence, oblique incidence, polarization by reflection, Brewster's angle. Electromagnetic waves in conductors: Modified field equation; attenuation of the wave, penetration depth, reflection and transmission at dielectric- conductor boundary at normal incidence.

UNIT-II

Electromagnetic Radiation: Radiation of oscillating dipole: Concept of retarded potentials, Fields of oscillating dipole, fields in the radiation zone and their polarization. Radiation from accelerated charges: Lienard and Wiechert potentials. *E* and *B* fields of a moving charge (qualitative discussion of final expressions, no derivation), the generalized Coulomb field, velocity and acceleration fields. Bremstrahlung and Cerenkov radiation (both qualitative).

UNIT-III

Relativity and Lorentz transformations: Galilean transformations; Newtonian relativity. Instances and their failure; electromagnetism, aberration of light, Michelson-Morley experiment. Einstein's basic postulates and geometric derivation of Lorentz transformations; length contraction, time dilation, simultaneity, synchronization of clocks, Einstein's velocity addition rule, Doppler effect in light.

UNIT-IV

Relativistic dynamics: Variation of mass with velocity, mass energy equivalence, relativistic formulae for momentum and energy. The structure of space-time: Four-vectors; invariance of an interval, time like, space like and light like intervals, Minkowski world. Relativistic electrodynamics: Electric field of a point charge in uniform motion, transformation of E and B fields, covariance of Maxwell's equations in vacuum.

TEXTBOOKS

1. A S Mahajan and A A Rangawala Electricity and Magnetism-(Tata McGraw-Hill);
2. S.L.Guptha, S.P. Singh, V. Kumar Electrodynamics (Prakati Praksan).
3. A.P. French, Special Relativity (The English Language Book Society and Nelson)
4. DJ. Griffiths, Introduction to Electrodynamics (Prentice-Hall of India, 1989)
5. Murugesan, Modem Physics, (S.Chand & Co.)

REFERENCE BOOKS

1. E. C. Jordan and K.G. Balmain; Electromagnetic Waves and Radiating Systems, II Edition (Prentice-Hall of India, New Delhi, 1971)
2. Reitz and Milford, Introduction to Electrodynamics (Addision-Wesley)
3. J.B. Marion, Classical electromagnetic radiation (Academic Press)
4. R.P. Feymann, R.B. Leighton and M. Sands, The Feymann Lectures Physics, Vol. 11 (B.l Pub.)
5. D. R. Corson and P. Lorrain, Introduction to Electromagnetic Fields and Waves (Freeman-Taraporevala, Bomaby,1970)

SYLLABUS FOR B.Sc (PHYSICS)

(*For the student admitted from the academic year 2008-2009 onwards*)

VI-SEMESTER

PHYS 362: ATOMIC PHYSICS

UNIT-I

Angular Momentum: Orbital angular momentum, operators for its Cartesian components, commutation relations, step operators L^+ and L^-, Angular momentum operators in spherical polar coordinates. Eigenvalues of I^2 and L_a. Schrodinger equation for hydrogen atom in spherical polar coordinates, separation into radial and angular variables, qualitative discussion of spherical harmonics.

UNIT-II

Spin of an Electron: Stem-Gehrlach experiment, Uhlenbeck and Goudsmit's hypothesis of electron spin; Pauli's method of spin variable, along with the three coordinates in Schrodinger equation. Eigenvalues and eigen functions of the spin operator, Pauli spin operators and commutation relations.

UNIT-III

Atomic and X-ray Spectra: Atomic spectra, Coupling schemes, L - S, J - J couplings, Spectral terms, s, p, d, f, notation, selection rules. Spectra of mono- and divalent atoms: Doublet fine structure of hydrogen lines; screening constants for monovalent atoms, series limits, doublet structure of alkali spectrum. X-ray spectra: The continuum X-ray spectrum; Duane and Hunt limit. Characteristic X-rays; Moseley's law, doublet fine structure, X-ray absorption spectra, absorption edges.

UNIT -IV

Effect of magnetic field on energy levels*:* Angular momentum and magnetic moment of electron due to orbital motion Gyromagetie ratios for orbital and spin motions; Bohr magneton, vector model, Lande g factor, Normal and anomalous Zeeman effects with reference to sodium D-lines.

TEXTBOOKS

1. J.B.Rajam, Atomic Physics (S.Chand & Co)
2. Beiser, Concepts of Modem Physics, (McGraw Hill International)
3. Richtmeyer et al, Introduction to Modem Physics (Tata McGraw Hill, India)
4. Murugesan, Modem Physics, (S.Chand & Co.)

REFERENCE BOOKS

1. Walker and Straugh; "Spectroscopy, Vol 1,11, III, (Wiely)
2. G Herzberg; Atomic spectra and atomic structure, (Courier Dover Publication)
3. R C Johnson, Introduction to Molecular spectra, (Methuen)
4. S.P.Khare, Modem Physics, (Rastogi Publications).

SYLLABUS FOR B.Sc (PHYSICS)

(*For the student admitted from the academic year 2008-2009 onwards*)

VI-SEMESTER

PHYS 363: NUCLEAR PHYSICS

UNIT-I

Nuclear Properties, Nuclear Forces And Models: Nuclear charge, size, radius - Nuclear composition - Isotopes, Isobars, Isotones and Isomers - Nuclear mass, mass defect, packing fraction -Nuclear density and volume - Nuclear magnetic moment - Electric quadrupole moment - Binding energy, Explanation of B.E curve - Nuclear stability. Nuclear forces and properties -Two-nucleon system, deuteron problem, Yukawa theory of mesons.

Liquid drop model - Weizsacker's semi empirical mass formula - Shell model - magic numbers - merits and demerits of LDM and shell model - Collective model (conceptual ideas only).

UNIT-II

Radioactivity*:* Characteristic properties of radioactive radiations — disintegration - laws of radioactive decay - Half life period - Mean life time - Geiger Nuttal law - radioactive equilibrium - radio carbon dating - Alpha decay - Gamow's theory - Beta decay - Fermi theory - Gamma decay - Nuclear radiation - energy levels.

UNIT-III

Nuclear Reactions and Reactors: *Nuclear Reactions:* Conservation theorem - Q-value - threshold energy - cross section of nuclear reactions - excited states - compound nuclear production - detection of neutrinos. Nuclear fission - neutron reactions - chain reactions.

Reactors, parts of reactors - criticality - critical size and mass - Thermal and Breeder reactors - Nuclear fusion - Fusion reactors - magnetic confinement - magnetic bottle – thermo nuclear reactions (elementary ideas only)

UNIT-IV

Particle Accelerators, Detectors and Elementary Particles: *Accelerators:* Need for accelerators - LIN AC - Cyclotron, synchrocyclotron. Betatron - Phase stability- superconducting magnets.

Detectors: Geiger Muller counter - cloud chamber - photographic emulsion technique - Bubble chamber - Scintillation counter.

Elementary particles: classification -Hadrons and Leptons, Baryons and Mesons, quarks and quark model hadrons.

TEXTBOOKS

1. M.L.Pandya and R.P.S.Yadav, Elements of Nuclear Physics, (Kedar Nath Ramnath Meerut, 1993)
2. D.C.Tayal, Nuclear Physics. (Himalaya Pub. House, 1991)
3. B.B.Srivastava, Fundamentals of Nuclear Physics, (Rastogi Publications, 2006)
4. Arthur Beiser, Concepts of Modem Physics, (Tata McGraw Hill, 2003)
5. M.P.Khanna, Introduction to Particle Physics, (Prentice Hall of India, 2004).

REFERENCE BOOKS

1. Bernard L.Cohen, Concepts of Nuclear Physics, (Tata McGraw Hill, 1971)
2. S.B.Patel, Nuclear Physics — An Introduction, (New Age Int 2005)
3. R.R.Roy and B.P.Nigam, Nuclear Physics -Theory and Expt. (New Age Int,1996.)
4. Samuel S. M. Wong, Introductory Nuclear Physics, (Prentice Hall of India, 2002)
5. Gordon Kane, Modem Elementary Particle Physics, (Addison Wesley Inc., 1987).

SYLLABUS FOR B.Sc (PHYSICS)

(*For the student admitted from the academic year 2008-2009 onwards*)

VI-SEMESTER

PHYS 364: COMMUNICATION ELECTRONICS - II

UNIT- I

Modulation: Amplitude modulation, modulation index, sidebands, power output, Base modulation, Detection: Diode and transistor detectors, super-heterodynereceivers, double conversion receivers. Frequency modulation; theory, side bands, qualitative discussion of Bessel harmonics band width, modulation percentage, direct FM transmitter, - FM detectors, the slope detectors, the discriminator, ratio detector.

UNIT-II

Image Transmission: Image transmission principles, scanning, synchronization & blanking pulse ; composite signal; TV camera: Image orthicon ; B/W TV transmitter & receiver (block diagram); NTSC & PAL systems; transmission of colour information; colour TV transmitter & reviver (block diagram); colour picture tube - shadow mask tube; TV channels & their frequencies; cable TV (elementary ideas).

UNIT-III

Wave Propagation in Space: Ground waves propagation, line of sight distance, reflection of radio waves by earth's surface. Space wave propagation, effect of earth's curvature, duct propagation; sky waves, theory of Ionospheric refractive index and bending of sky waves, expression for skip-distance &maximum usable frequency; ionospheric anomalies.

UNIT-IV

Antenna: Basic antenna action, antenna parameters; Expressions *for E & B* radiated, power radiated, power pattern, radiation resistance, directive gain and directivity of short doublet and half-wave antenna; general principle & power pattern of Two element (half-wave) array, qualitative .ideas of: end- fire array, broad side array, Yagi antenna, helical antenna, parabolic reflectors.

TEXTBOOKS

1. Gupta & Kumar, Hand book of electronics (Pragati Prakashan).
2. M.L.Gupta, Electronic & Radio Engineering (Dhanpat Rai & sons).
3. Roody & Coolen, Electronic Communications (Printice Hall of India).
4. G. Kennedy, Electronic Communications Systems (Tata McGraw Hill, India).

REFERENCE BOOKS

1. Ramabhadran, Basic Telecommunication (Khanna Publishers).
2. Ramabhadran, Telecommunication Principles - Circuits & Systems (Khanna Publishers).
3. Kiver Kaufman, Television Electronics, Theory & Servicing (CBS publishers).

SYLLABUS FOR B.Sc (PHYSICS)

(*For the student admitted from the academic year 2008-2009 onwards*)

VI-SEMESTER

PHYS 365: NUMERICAL METHODS AND COMPUTER APPLICATIONS

UNIT-I

Numerical Methods: Numerical Methods: Introduction- Straight line fitting (group average and least square methods) - fitting a parabola (least square methods) - successive approximation method - condition for the convergence- order of convergence - Regula- Falsi method - Newton Rapson method -criterion for the convergence - order of convergence - Elimination method - Gauss - Jordan method

UNIT-II

Numerical Differentiation: Numerical Differentiation-forward and backward - Integration: - Trapezoidal - Interpolation - Lagrangian - unequal - Newton's forward interpolation formula (equal intervals)-Matrix: Solving the simultaneous equations - eigen vale of a matrix by power methods.

UNIT-III

Computer & FORTRAN: Computers: Introduction -input & output devices - CPU, Applications - languages & packages (outline only).

Fortran: Constants, variables, operators - mode of expressions - arithmetic to FORTRAN expression - Hierarchy of operators, Statements- conditional and unconditional - i/p & o/p Statements - executable Statements - format and go to Statements - computed go to - arithmetic IF - logical IF, Built-in functions, Do statement - simple Do loop - function sub program Subroutine sub program (Introduction)

UNIT -IV

Programming: Algorithm - Flow Chart - Simple programs using FORTRAN: Area and volume of geometrical structures, sum of series, product of 'n' numbers, Straight line, ellipse, parabola and their slope.

TEXTBOOKS:

1. M.KVenkatraman, Numerical methods in Science & Engineering, (National Pub. Co.)
2. Santosh Kumar, Computer based Numerical and Statistical techniques, (S.Chand & Co, 2008)
3. Rajaraman, Computer Programming in Fortran 90 and 95, (Prentice Hall of India)
4. Kandasamy, Thilagavathy & Gunavathy, Numerical methods, (S.Chand & Co., 2007)

REFERENCE BOOKS:

1. B.S.Grewal, Numerical methods in Engineering & Science with Programes in FORTRAN 77, C & C^{++}, (Khanna Pub. VII edition, 2005)
2. Rajaraman, Computer Programing in FORTRAN 77, (Prentice Hall of India, IV edition, 2002)
3. James B Scarborough, Numerical Mathematical Analysis, (Oxford and IBH, New Delhi, 1971)
4. S.S.Sastry**,** Elementary Numerical Analysis, (PHI).

SYLLABUS FOR B.Sc (PHYSICS)

(*For the student admitted from the academic year 2008-2009 onwards*)

VI-SEMESTER

PHYS 350: PHYSICS PRACTICAL – III

(Choose any 10 experiments from the list given below for semester V and another 10 experiments for Semester VI)

LIST OF EXPERIMENTS:

1. Newton's Rings: determination of refractive index of the material of the lens.
2. Airwedge: Determination of the thickness and insulation of the wire.
3. Spectrometer: Hartmann's Interpolation Formula - Determination of wavelength
4. Spectrometer: i - i' curve and determination of refractive index.
5. Spectrometer: i - i' curve for given angle of deviation.
6. Spectrometer: Small angled prism.
7. Spectrometer: Determination of Cauchy's constants.
8. Spectrometer: Dispersive power of the material of a prism.
9. Spectrometer: Grating - wavelength by normal incidence method.
10. Spectrometer: Dispersive and resolving power of a grating.
11. Young's modulus: Elliptical fringes method.
12. Ultrasonic velocity and compressibility of the liquids - Interferometer method.
13. Field along the axis of a circular coil - Determination of moment of a magnet
14. Field along the axis of a circular coil - Determination of BH using Searl's vibration magnetometer.
15. Temperature co-efficient of a Thermistor.
16. Potentiometer: Verification of laws of resistance and resistivity of the material of a wire.
17. Potentiometer: Resistance of the potentiometer and calibration of low range voltmeter.
18. Potentiometer: Resistance of the potentiometer and measurement of emf of a thermocouple.
19. Potentiometer: Temperature coefficient of resistance of the material of a coil of wire.
20. B.G.: Internal resistance of a cell.
21. B.G: Current and voltage sensitivities.
22. B.G: Quantity or charge sensitivity.
23. B.G: Absolute capacity of a condenser.
24. B.G: Comparison of mutual inductance of two pairs of coils.
25. B.G: Absolute determination of mutual inductance.
26. B.G: High resistance by leakage.
27. Determination of refractive index: Abbe's refractometer.
28. Wien's bridge: Measurement of frequency.
29. Conductivity of electrolytic solutions using digital conductivity bridge.
30. Measurement of e by Milliken's method
31. Determination of Planck's constant
32. Diode laser : characteristic study
33. Study of divergence of a laser beam
34. Obtaining the B-H curve of a ferromagnetic material (any method)
35. Study of plane of polarization using quarter and half wave plates
36. Characteristics of a solar cell
37. Hall probe in magnetic field measurement
38. Computer simulation of Lennard-Jones potential; binding parameters, elastic constants
39. Computer simulation of 1 -D and 2-D lattice vibrations
40. Simulation of 3-D models of a given kind of crystal and their study
41. Computer simulation of nuclear chain reactions and nuclear energy.
42. Computer simulation of Driven LCR Circuit.

43. Computer simulation of Motion of a travelling pulse.
44. Computer simulation of Formation of sanding wave
45. Computer simulation of charging and discharging of a capacitor
46. Computer simulation of growth of current in RL circuit

TEXTBOOKS

1. D P Khandelwal, A Laboratory Manual for Physics for Undergraduate Students (Vani Publications, New Delhi)
2. B Saraf et al, Physics through Expriments, Vol. II., EMF constant and varying (Vikas Publications, New Delhi)
3. Verma, Ahluwalia & Sharma, “Computational Physics, an Introduction” (New Age Int.)

REFERENCE BOOKS

1. Olon, "Experiments in Modern Physics"
2. Adrian C. & Melissinos, Experiments in Modern Physics, (Academic Press).

SYLLABUS FOR B.Sc (PHYSICS)

(*For the student admitted from the academic year 2008-2009 onwards*)

VI-SEMESTER

PHYS 360: PHYSICS PRACTICAL – IV

(Choose any 10 experiments from the list given below for semester V and another 10 experiments for Semester VI)

LIST OF EXPERIMENTS:

1. Junction diode and Zenor diode characteristics.
2. Transistor characteristics - common base & common emitter.
3. Power pack - construction with Bridge rectifier and IC regulator.
4. Single stage RC coupled CE amplifier - Frequency response curve.
5. Tuned collector oscillator- Frequency measurement by CRO and Frequency counter.
6. Tuned base oscillator - Frequency measurement by CRO and Frequency counter.
7. Hartley oscillator - Frequency measurement by CRO and Frequency counter.
8. Colpitt's oscillator- Frequency measurement by CRO and Frequency counter.
9. Astable multi vibrator- Using Transistor and 555 Timer- Frequency measurements
10. Clipping and Clamping circuits using diodes.
11. Emitter follower.
12. Phase shift oscillator - Frequency measurement by CRO and Frequency counter.
13. Basic Logic and Universal gates using diodes and transistors components.
14. Basic and Universal logic gates using ICs
15. JFET characteristics.
16. Two stage RC coupled amplifier and study of its frequency and feed back
17. Transistor Amplitude modulator and measurement of percentage of modulation.
18. OP-AMP characteristics (741 IC) -parameter measurement
19. Basic OP-AMP circuits - Half-wave rectifier, Clipper, Clamper, Comparator,
20. OP-AMP addition, subtraction, multiplication, Integration and differentiation.
21. NAND and NOR as universal gates using ICs
22. Implementation of logic expression and their simplification
23. Arithmetic circuits using gates
24. Half-adder and full-adder
25. IC adder and subtracter
26. Parity generator / checker
27. Multiplexers, Demultiplexers
28. Flip-flop circuits using gates
29. RS, D, JK and Master Slave flip-flops
30. Shift Registers
31. Asynchronous counters using ICs
32. Synchronous counters using ICs
33. Base (AM) modulation using a transistor
34. Diode AM detection
35. Measurement of Radiation by GM counter.
36. Gama ray detection with Nal(Tl) crystal.
37. Assembly language programming - microprocessor - addition
38. Assembly language programming - microprocessor - subtraction
39. Assembly language programming - microprocessor - stepper motor.

TEXTBOOKS

1. Jain R.P, Anand M.M.S, "Digital electronics Practice Using Integrated Circuits" (Tata McGraw-Hill, 1999, New Delhi).
2. Zbar & Malvino, Basic Electronics-A text Lab Manual (Tats McGraw-Hill, 1999)
3. Verma, Ahluwalia, Sharma, “Computational Physics, an Introduction” (New Age International)

REFERENCE BOOKS

1. Malvino, Electronic principles, 6^{th} Ed. (Tata McGraw-Hill, 1999, New Delhi).
2. Takheim, Digital electronics, 3rd Ed (McGraw-Hill International).

FOR B. Sc (MATHS & CHEMISTRY)

(For the students admitted from the academic year 2004 - 2005)

I-SEMESTER
ALLIED PHYSICS-I

UNIT-I:

Moment of inertia - radius of gyration - parallel and perpendicular axis theorem - calculation of moment of inertia of (a) ring (b) disc (c) hollow and solid spheres - angular momentum and torque and relation between them.

Simple harmonic motion, equation of SHM; Composition of two SHM at right angles, Lissajous figures.

UNIT-II:

Young's modulus — bulk modulus — rigidity modulus and Poisson's ratio — derivation of the expression for bending moment of a beam in terms of it curvature of neutral axis - determination of Young's modulus of a rectangular bar — non-uniform bending — pin and microscope method - with theory (mathematical derivation) - expression for couple per unit twist - determination of rigidity modulus - torsion pendulum.

UNIT-III:

Surface tension and surface energy - interfacial surface tension - experimental determination of surface tension by drop weight method - variation of surface tension with temperature — Jaeger's method - streamline and turbulent motion - equation of continuity.

UNIT - IV:

Newton's law of cooling - determination of specific heat of liquid - Barton's cooling correction in calorimetric experiments - specific heat capacity of gases - ratio of specific heat capacities — determination of the ratio of specific heats of gases - Clement and Desormes method.

Coefficient of thermal conductivity of a bad conductor - Lee's disc method - determination of thermal conductivity by Forbe's method.

Black body radiation - Stefan's law - determination of Stefan's constant — second law of thermodynamics - Carnot cycle - indicator diagram - derivation of efficiency - Kelvin temperature scale.

UNIT - V:

Interference — method of producing coherent sources - Fresnel's biprism — Newton's rings through transmission and reflection - Interferometers - Michelson's Interferometer - wavelength determination - Jamin's refractometer.

Diffraction - Fresnel's diffraction - Fraunhoffer diffraction - half-period zones - rectilinear propagation of light - diffraction at a straight edge.

Polarization - optical activity - specific rotatory power -Polarimeter - Lawrence half shade - determination of specific rotatory power - double refraction - optic axis.

TEXT BOOKS:

1. Dr.Sabesan and others, A Textbook of Allied Physics Vol-I and Vol-H
2. Ponnusamy and others, Ancillary Physics.
3. Kamalakannan and others, Ancillary Physics.

REFERENCE BOOKS

1. Halliday, Resnik, Walker, Fundamentals of Physics, 5 Ed.(Asian Books Pvt. Ltd., New Delhi)

FOR B. Sc (MATHS & CHEMISTRY)

(For the students admitted from the academic year 2004 — 2005)

II-SEMESTER

ALLIED PHYSICS-II

UNIT-I:

Ultrasonics - magnetostriction - piezoelectric methods - properties of ultrasonic waves and applications.

UNIT -II:

Gauss's law with proof - Electric intensity and potential due to a uniformly charged hollow conductor at a point outside, on the surface and inside a spherical conductor — capacity of a parallel plate condenser with and without a dielectric slab - capacity of a spherical conductor- Biot & Savart's law — field along the axis of a circular coil carrying current - force on current carrying conductor placed in a magnetic field - theory of moving coil galvanometer.

UNIT - III:

Magnetic properties of materials- relation between- the three magnetic vectors - susceptibility and permeability - para, dia and ferro magnetism (qualitative ideas) - magnetic hysterisis - super conductivity - persistent current and Meissner Effect.

UNIT-IV:

Breakdown of classical mechanics — photoelectric effect — Compton effect - Davison- Germer experiment - Matter waves - wave pockets - de Broglie ideas - Heisenberg uncertainty principle.

Radioactive isotopes (production and uses) - particle accelerator - linear accelerator - particle detectors - Wilson cloud chamber - Scintillation counter - nuclear models - Liquid drop model - Fission and Fusion reaction - nuclear reactors.

UNIT-V:

Rectfiers & filters (qualitative ideas)- Transistor characteristics - transistor as a RC coupled amplifier -frequency response (without derivation) - bandwidth - basic principles of ar oscillator - Hartley oscillator - working (without derivation) - elementary ideas about modulatioi - elementary ideas about TV transmission and reception.

TEXT BOOKS:

1. Dr.Sabesan and others, A Textbook of Allied Physics - Vol-I and Vol-II.
2. Ponnusamy and others, Ancillary Physics.
3. Kamaiakannan and others, Ancillary Physics.

REFERENCE BOOKS

1. Halliday, Resnik, Walker, Fundamentals of Physics, 5 th Ed.(Asian Books Pvt. Ltd., New Delhi)

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I & II -SEMESTER

ALLIED PRACTICAL PHYSICS-I

Choose any 14 experiments from the list given below

LIST OF EXPERIMENTS:

1. Young's modulus - Non-Uniform bending - Pin & Microscope
2. Rigidity modulus - Torsional oscillations without masses.
3. Comparison of coefficient of viscosity.
4. Surface tension of a liquid and interfacial surface tension by drop weight method.
5. Spectrometer - Refractive index of a liquid - Hollow prism.
6. Spectrometer -Grating - N determination by normal incidence method.
7. Spectrometer -Grating - wavelength determination by minimum deviation method.
8. Newton's Rings.
9. Thermal conductivity of a bad conductor - Lee's disc method
10. Post office box - laws of resistance and specific resistance.
11. Melde's apparatus - Determination of frequency.
12. Meter Bridge - Temperature coefficient of the material of a coil of wire
13. Potentiometer - calibration of low range voltmeter (0 - 1.5 V).
14. Potentiometer - calibration of ammeter (0-1.5 amps).
15. Figure of merit of a periodic moving coil galvanometer.
16. Field along the axis of the circular coil carrying current - Determination of B_H.
17. Newton's law of cooling and specific heat determination
18. Frequency measurement by forming Lissajous figures
19. Study of Half wave rectifier.
20. Transistor characteristics - CE mode - only transfer characteristics.

TEXT BOOKS:

1. Ouseph and V.Srinivasan, Practical Physics- Part-I & II.

REFERENCE BOOKS

1. Mathchan, Lazarus and others - Practical Physics.