Course Structure (UG)

B.Sc. Part I

Paper I: Mechanics, Oscillations and Properties of Matter.

Paper II: Electricity, Magnetism and Electromagnetic theory.

B.Sc. Part II

Paper I: Kinetic theory, Thermodynamics and Statistical physics

Paper II: Waves, Acoustics and Optics.

B.Sc. Part III

Paper I: Relativity, Quantum Mechanics, Atomic, Molecular and Nuclear Physics.

Paper II: Solid State physics, Solid State devices and Electronics.

SYLLABUS

GOVT. SWAMI ATMANAND COLLEGE, NARAYANPUR (C.G)
SYLLABUS FOR: (2018–2019)
B.Sc-I (PHYSICS)
PAPER-I
MECHANICS, OSCILLATIONS AND PROPERTIES OF MATTER

UNIT-1

Laws of motion ,motion in a uniform field, components of velocity and acceleration in different coordinate system (catesian, cylindrical and spherical).Uniformly rotating frame, centripetal acceleration, coriolis force and its application, motion under a central force, Kepler's law. Gravitational law and field. Potential due to a spherical body. System of particles, centre of equation of motion, conservation of linear and angular momentum, mass conservation of energy.

UNIT-II

Rigid body motion, rotational motion, moment of inertia and their product, principle moments and axes. Introductory idea of Euler's equation. Potential well and periodic oscillation, case of harmonic oscillation, differential equation and its solution, kinetic and potential energy, examples of simple harmonic oscillations, spring and mass system, simple and compound pendulum, torsion pendulum, bifillar oscillation, Helmholtz resonator, L C circuit, vibration of a magnet, oscillation of two masses connected by a spring.

UNIT-IV

Superposition of two simple harmonic motion of the same frequency, Lissajous figures, cases of different frequency. Damped harmonic oscillator, power dissipation, quality factor, examples, driven harmonic oscillator, transient and study state, power absorption, resonance.

Note: (The emphasis here should be on the mechanical aspects and not on the details of the apparatus mentioned which are indicated as application of principle involved.)

UNIT-IV

E as an accelerating field, electron gun, case of discharge tube, linear accelerator, E as deflecting field – CRO sensitivity. Transverse B field, deflection, mass spectrograph, curvature of tracks for energy determination, principle of cyclotron. Mutually perpendicular E and B fields – velocity selector, its resolution. parallel E and B fields, positive ray parabolas, discovery of isotopes, element of mass spectrograph, principle of magnetic focusing lens.

UNIT-V

Elasticity, small deformation, Hook's law, elastic constant for an isotropic solid and relations between them beams supported at both the ends, cantilever, torsion of cylinder, bending moment and sharing forces. Kinamatics of moving fluids, equation of continuity. Eulers equation, Bernaulli's theorem, viscous fluids, stream line turbulent flow, Poiseulle's law, capillary tube flow, Reynold's number. Stoke's law. Surface tension and surface energy, molecular interpretation of surface tension, pressure on a curved liquid surface, wetting.

REFERENCE:

1. Berkele Physics Vol. I
2. Unified Physics by R.P.Goyal

GOVT. SWAMI ATMANAND COLLEGE, NARAYANPUR (C.G)
SYLLABUS FOR: (2018–2019)
B.Sc-I (PHYSICS)
PAPER-II
ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC THEORY
Note:- Numerical problems based on the topics must be asked in each unit.

UNIT-I

Function of two and three variable, partial derivatives, geometrical interpretation of partial derivatives of function of two variables. Total differential of a two and three variables. Repeated integrals of a function of more than one variables,definition of a double and triple integral. Scalars and vectors, dot and cross product, gradient of a scale field and its geometrical interpretation, divergence and curl of a vector field, line surfaceand volume integrals, flux of a vector field. Gauss's divergence theorem, Green's theorem and stokes theorem.

UNIT-II

Coulombs law in vacuum expressed in vector forms, calculation of E for simple distributions of charged at rest dipole and quadrupole fields. Work done on a charge in a electrostatic field expressed as a line integral, conservative nature of the electrostatic field. Electric potential ϕ, $E = -\Delta \phi$ torque on a dipole in a uniform electric field and its energy. Flux of the electric field, Gauss's law and its application for finding E for symmetric charge distributions, Gaussian pillbox, fields at the surface of a conductor screening of E field by a conductor, capacitors, electrostatic field energy, force per unit area of the surface of a conductor in an electric field, conducting sphere in a uniform electric field, point charge in front of a infinite conductor.

UNIT-III

Dielectrics parallel plate capacitor with a dielectric, electric susceptibility, permittivity and dielectric constant, polarization and polarization vector, displacement vector D, molecular interpretation of Claussius – mossotti equation, Steady current, current density J, non steady currents and continuity equation, Kerchoff's law and analysis of multiloop circuits, rise and decay

of current in LR and CR circuits, decay constant, transients in LCR circuits ,AC circuits, complex numbers and their applications in solving AC circuits problems, complex impedance and reactancs, series and parallel resonance, Q factor, power consumed by an a AC circuits power factor.

UNIT-IV

Force on a moving charge, Lorentz force equation and definition of B, force on a straight conductor carrying current in a uniform magnetic field, torque on a current loop magnetic dipole moment, angular momentum and gyromagnatic ratio.$\Delta.B=0$, $\Delta \times B = \mu.J$. Biot and Savart's law, Ampere's Law, field due to a magnetic dipole, magnetization current, magnetization current, magnetization vector, magnetic permeability (linear cases), interpretation of a bar magnet as a surface distribution of solenoidal current.

UNIT-V

Electromagnetic induction, faraday's law, electromotive force, $\int=\int$ E.dr. Integral and differential forms of Faraday's law. Mutual and self induced, transformers, energy in a static magnetic field. Maxwell's displacement current, Maxwell's equations, electromagnetic field energy density.
The wave equation satisfied by E and B, plane electromagnetic waves in vacuum, pointing vector.

REFERENCE:

1. Berkeley Physics Vol. I
2. Unified Physics by R.P.Goyal

GOVT. SWAMI ATMANAND COLLEGE, NARAYANPUR (C.G)
SYLLABUS FOR: (2018–2019)
B.Sc-I (PHYSICS)

LIST OF EXPERIMENTS

1.Study of fly wheel
2. Study of compound pendulum.
3. Study of damping constant with bar pendulum.
4. Study of cantilever.
5. Tortion of wire (static method).
6. Surface tension of liquid by capillary rise method.
7. Surface tension of liquid by Jaegers method.
8. "H" (Horizontal component of earth) by magneto meter.
9. Specific resistance by carey fosters bridge.
10. Study of charging and discharging of condenser through register.
11. Moment of inertia of unknown body by inertia table.
12. Modulus of rigidity by Bartons apparatus.
13. Poissions ratio of rubber tube.
14. Coefficient of viscosity by Poiseulle's method.
15. Coefficient of viscosity by stokes law.
16. Young's modulus by bending of beam.
17. Variation in Magnetic Fiels along the axis of circular coil.
18. Power factor of L- R circuit.
19. Determination of "g" by keters pendulum.
20. Modulus of rigidity by Maxwells needle.
21. Determination of Y, η, σ by Searl's method.

GOVT. SWAMI ATMANAND COLLEGE, NARAYANPUR (C.G)
SYLLABUS FOR: (2018–2019)
B.Sc. – II, PHYSICS
PAPER – II
Waves, Acoustics and optics

UNIT – I:

Waves in media: speed of transverse waves on a uniform string, speed oflongitudinal waves in a fluid. Energy density and energy transmission in waves, typical measurements, waves over fluid surfaces: gravity waves and ripples.Group velocity and phase velocity and their measurements, Harmonics and the quality of sound with examples, production and detection of ultrasonic and infrasonic waves and their application. Reflection, refraction and diffraction of sound: acoustic impedance of medium, percentage reflection and refraction at a boundary, impedance matching for
transducers, diffraction of sound, principle of a sonar system, sound ranging.

UNIT – II:

Fermat's Principle of extremum path, the aplanatic point of a sphere and other
applications, Cardinal Points of an optical system, thick lens and lenscombinations, Lagrange's equation of magnification, telescopic combinations, telephoto lenses, monochromatic aberrations and their reductions, aspherical mirrors and Schmidt corrector plates, aplanatic points, oil immersion objectives, meniscus lens. Optical instruments; Entrance exit pupils, need for a multiple lens eyepiece, common types of eyepieces (Ramsdon and Hygen's eyepieces).

UNIT – III:

Interference of light: The principle of superposition, two slit interference, coherence requirement for the sources, optical path retardation, lateral shift of fringes, Rayleigh refractometer, localized fringes, thin films, Haldinger fringes**:** fringes of equal inclination. Michelson interferometer, its application for precision determination of wavelength difference and the width of spectral lines, Twymann- green interferometer and its uses, intensity distribution in multiple beam interference. Tolansky fringes, Febry –Perot interferometer and etalon.

UNIT-IV:

Fresnel half period zones, zone plates, straight edge, rectilinear propagation, Fraunhoffer diffraction: diffraction at a slit, half-period zones, phasor diagram and integral calculus methods, the intensity distribution, diffraction at a circular aperture and a circular disc, resolution of images, Rayleigh criterion, resolving power of telescope and microscopic systems. Diffraction gratings: Diffraction at N parallel slits, intensity distribution, plane diffraction grating, reflection grating and blazed gratings, concave grating and different mountings, resolving power of a grating and comparison with resolving power of prism and of a fabry- perot etalon. Double refraction and optical rotation: Refraction in uni-axial crystals, phase retardation plates, double image prism, rotation of plane of polarization, origin of optical rotation in liquids and in crystals.

UNIT-V:

Laser system: Purity of a spectral line, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients, Spontaneous and induced emissions, conditions for laser action, population inversion, types of laser: Ruby and He-Ne semiconductor lasers. Application of lasers: Application in communication, Holography and non-linear optics (Polarization P including higher order terms in E and generation of harmonics).

Text and Reference Books:

1. A.K.Ghatak, “Physical optics”.
2.D.P.Khandelwal,”Optics and aomic physics”(HimalayaPublishing House, Bombay,1998).
3. K.D. Moltev; ‘Optics’ (Oxford University Press) Sears; ‘Optics’.
4. Jenkins and White; ‘Fundamantal of Optics’ (McGraw – Hill).
5. B.B. Laud, Laser and Non- Linear Optics (Wiley eastern 1985).
6. Smith and Thomson; ‘Optics’ (John Wiley and Sons).
7. Berkely Physics courses; Vol. – III ‘Waves and oscillations’.

GOVT. SWAMI ATMANAND COLLEGE, NARAYANPUR (C.G)
SYLLABUS FOR: (2018–2019)
B.Sc. – II, PHYSICS

LIST OF EXPERIMENTS

Minimum 16 (Sixteen) out of the following or similar experiments of equal standard:-

1. Study of Brownian motion.
2. Study of adiabatic expansion of a gas.
3. Study of conversion of mechanical energy into heat.
4. Heating efficiency of electrical kettle with varying voltage.
5. Study of temperature dependence of total radiation.
6. Study of temperature dependence of special density of radiation.
7. Resistance thermometry.
8. Thermo emf thermometry.
9. Conduction of heat through poor conductors of different geometries.
10. Experimental study of probability distribution for a two option system using a coloured dice.
11. Study of statistical distribution on nuclear disintegration data (GM counter used as a black box).
12. Speed of waves on a stretched string.
13. Studies on torsional waves in a lumped system.
14. Study of interference with two coherent sources of sound.
15. Chlandi’s figures with varying excitation and loading points.
16. Measurement of sound intensities with different situation.
17. Characteristics of a microphone –loudspeaker system.
18. Designing and an optical viewing system.
19. Study of monochromatic defects of images.
20. Determining the principle points of a combination of lenses.
21. Study of interference of light (biprism of wedge film).
22. Study of diffraction at a straight edge or a single slit.
23. Study of F – P etalon fringes.
24. Use of diffraction grating and its resolving limit.
25. Resolving limit of a telescope system.
26. Polarization of light by reflection; also cos – squared law.
27. Calculation of days between two dates of a year.
28. To check if triangle exists and the type of the triangle.
29. To find the sum of the since and cosine series and print out the curve.

30. To solve simultaneous equations by elimination method.
31. To prepare a mark list of polynomials.
32. Fitting a straight line or a simple curve to a given data.
33. Convert a given integer into binary and octal systems and vi versa

Text and Reference Books:

1. D. P. Khandelwal; "Optical and Atomic Physion" (Himalaya Publishing House, Bombay 1988).
2. D.P. Khandelwal; "A Laboratory annual for Undergraduate classes" (Vani Publishing House, New Delhi.).
3. S. Lipsehutz and A Poe; "Schaum's Outline of Theory and Problems of programming with fortran"(McGraq – Hill Book Company 1986).
4. Dixon; "Numerical analysis".

GOVT. SWAMI ATMANAND COLLEGE, NARAYANPUR (C.G)
SYLLABUS FOR: (2018–2019)
B.Sc. III PHYSICS
Paper-I

RELATIVITY, QUANTUM MECHANICS, ATOMIC MOLECULAR AND NUCLEAR PHYSICS.

UNIT-I

Reference system, internal frames, Galilean invariance and conservation laws, propagation of light, Michelson-Morley experiment, search for ether. Postulates for the special theory of relativity, Lorentz transformations, length contraction time dilation, velocity addition theorem, variation of mass –energy equivalence, particle with a zero rest, Compton effect.

UNIT-II

Origin of the quantum theory: failure of classical physics to explain the phenomena such as black-body spectrum, photoelectric effect.Wave-particle duality and uncertainty principle: de Broglie's hypothesis for matter waves: the concept off wave and group velocities, evidence for diffraction &interference of particles, experimental demonstration of mater waves. Davission and Germer's experiment. Cosequence of de Broglie's concepts quantization in hydrogen atom, energies of a particle in a box, wave packets. Consequence of the uncertainty relation: gamma ray microscope, diffraction at a slit.

UNIT-III

Quantum mechanics: Schrodinger's equation postulates of quantum mechanics, operators, expectation values, transition probabilities, application to particle in a one and three dimensional boxes, harmonic oscillator in one dimension, reflection at a step potential, transmission across a potential barrier. Hydrogen atom: natural occurrence of n, I and m quantum numbers the related physical quantities.

UNIT-IV

Spectra of hydrogen, deuteron and alkali atoms spectral terms, doublet fine structure screening constants for alkali spectra for s,p,d and f states, selection rules. Discrete set of electronic energies of molecules, quantization of vibrational and rotational energies, determination of internuclear distance, pure rotational and rotation vibration spectra. Dissociation limit for the ground and other electronic states, transition rule for pure vibration and electronic vibration spectra. Raman effect,

Stokes and anti-Stoke lines, complimentary charcter of Raman and infrared spectra, experimental arrangements for Raman spectroscopy**.**

UNIT-V

Interaction of charged particles and neutrons with mater, working of nuclear detectors, G-M counter, proportional counter and scintillation counter, cloud chambers, spark chamber, emulsions. Structure of nuclei, basic properties deuteron binding energy, p-p and n-p scattering and general concepts of nuclear forces. Beta decay, range of alpha particle Geiger-Nuttal law. Gamow's explanatin of heta decay, alpha decay, continuous and discreate spectra. Nuclear reactions, channels, compound nucleus, direct reaction (concepts). Shell model & liquid drop modal, fission and fusion (concepts), energy production in stars by p-p and carbon cycles (concepts).

Text and Reference Book:

1. H.S. Mani and G.K. Metha: "Introduction to Modern Physics" (Affiliated East-West press, (1989)
2. A Beiser, "prospective of Modern Physics"
3. H.E. White, Introduction to Atomic physics.
4. Barrow, "Introduction to Molecular physics"
5. R.P.Feymann, R.B.Leighton and M Sands "the Feynann Lectures on Physics",Vol.III (B.I.Publications, Mumbai, Delhi, Kolkata, Chennai).
6. T.A.Littlefield and N thorley, "Atomic and Nuclear Physics" (engineering Language Book Society)
7. H.A.Enge. "Introduction to Nuclear Physics"(Addision-Wesly)
8. Eisenberg and Resnik "Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles" (John Wiley)
9. D.P.Khandelwal. "optics and Atomic Physics" (Himalaya Publising house, Mumbai.(1988).

GOVT. SWAMI ATMANAND COLLEGE, NARAYANPUR (C.G)
SYLLABUS FOR: (2018–2019)
Class: B.Sc. III
PHYSICS
Paper-II
SOLID STATE PHYSICS, SOLID STATE DEVICES AND ELECTRONICS

Max.Marks-50

UNIT-I

Amorphous and crystalline solids, elements of symmetry, Seven System, Cubic lattices, Crystal planes, miller indices, Laue's equation for X-ray diffraction, Bragg's law, Bonding in solids classification. Cohesive energy of solid. Madelung constant, evaluation of parameters. Specific heat of solids, classical theory (Dulongpetit's law). Einstein and Debye theories. Vibration modes of one-dimensional monoatomic lattice, Dispersion relation, Brillouin zone.

UNIT-II

Free electron model of a metal solution of one dimensional "Schrodinger equation in a constant potential. Density of states. Fermi Energy. Energy bands in solid Kroning penny modal (without mathematical detail). Metals, insulator and semiconductors. Hall effect. Dia, Para and ferromagnetism.langevin's theory of dia and para-magnetism. Curieweiss's law. Qualitative description of ferromagnetism (magnetic domains) B-H.curve and Hysteresis loss.

UNIT-III

Intrinsic semiconductor, carrier concentration in thermal equlibrium, Fermi level, impurriy, doped semiconductor, doner and acceptor levels, Diode equation, junction breakdown, Depletion width and junction capacitance, abrupt junction breakdown, Tunnel diode, Zener diode. Light emitting diode, solar cell, Bipolar transistors, pnp and npn transistors, characteristics of transistors, different configuration, current amplification factor, FET.

UNIT-IV

Half and full wave rectifier, efficiency, ripple factor, Filters, Inductor filter, Tand □ □filters, Zener diode, regulated power supply.Applications of Transistors. Bipolar Transistor as amplifier. Single stage and CE small signal amplifiers, Emitter follower, transistor power amplifier, Transistor as oscillator, Wein-Bridge and Hartley oscillator.

UNIT-V

Introduction to computer organization, time-sharing and multi programming systems, window base word-processing packages, MS word. Introduction to C programming and application to simple problems of arranging numbers inascending/descending order: sorting a given data in an array, solution of simultaneous equation.

BOOK RECOMMENDED:

1. Introduction to solid state physics: C.Kittel
2. solid State Physice : A.J.Dekker
3. Electronic Circuits : Mottershesd
4. Electronic Circuits : Millman and Halkinas
5. Semiconductor Devices : S.M.Sze
6. Computer Fundamental : Balaguara Swami

GOVT. SWAMI ATMANAND COLLEGE, NARAYANPUR (C.G)
SYLLABUS FOR: (2018–2019)
Class: B.Sc. III
PHYSICS

Max.Marks-50

LIST OF EXPERIMENTS

MINIMUM 16 (Sixteen) out of following or similar experiment of equal standard:

1. Determination of Planck's constant.
2. Determination of e/m by using Thomson's tube.
3. Determination of e by Millikan's methods.
4. Study of spectra of hydrogen and deuterium (Rydberg constant and ratio of masses of electron proton)
5. Absorption spectrum of iodine vapour.
6. Study of alkali or alkali or earth spectra using a concave gra's.
7. Study of Zeeman effect for determination of Lande g-factor.
8. Analysis of given band spectrum.
9. Study of Raman spectrum using laser as an excitation source.
10. Study of absorption of alpha and beta rays.
11. Study of statistics in radioactive measurement
12. Coniometric study of crystal faces.
13. Determination of dielectric constant.

14. Hysteresis curve of transformer core.
15. Hall-probe method for measurement of magnetic field.
16. Specific resistance and energy gap of a semiconductor.
17. Characteristics of transistor.
18. Characteristics of tunnel diode.
19. Study of voltage regulation system.
20. Study of a regulated power supply.
21. Study of lissajous figures using CRO.
22. Study of VTVM.
23. Study of RC and TC coupled amplifiers.
24. Study of AF and RF oscillators.
25. Find roots of F (X)=0 by using Network-Raphson method.
26. Find roots of F (X)=0 by using secant method.
27. Integration by Simpson rule.
28. Towers of Hanoi (Nonrecursive).
29. Finding first four perfect numbers.
30. Quaddratic interpolation using Network's forward-difference formula of degree two.

TEXT AND REFFERANCE BOOKS:

1. B.G.Strecj,am: "solid state electronic devices**"** II Edition (Prentice-Hall of India, New Delhi,1986)
2. W.D. Stanley; "Electronic devices, circuits and applications" (Prentice Hall, New jersey, USA 1988)
3. S.Lipschutsz A Poe; Schum's Outline of theory and problems of programming with Fortran" (McGraw-hall Book Co.Singapore 1986)
4. C.Dixon; "Numerical Analysis.