B.Sc. Syllabus (NCBCS)

Physics (Session 2016-17 17-18, 18-19)

Semester-V

Title: Quantum Mechanics, Atomic Physics and Nuclear Physics

~~GCWPHTC501~~

PHTC-501

Theory
Duration :-3 Hours

External Examination:80 marks
Internal Examination: 20 marks

The question paper shall be of 80 marks. There shall be l0 Questions in the paper, with two from each unit. Each question shall be of 16 marks. The students have to attempt 5 questions selecting one from each unit.

UNIT-I

QUANTUM MECHANICS-I

Limitations of Classical Laws(Qualitative description), Quantum Nature of Radiation(qualitative description), Compton Effect and its Experimental Verification, Wave-Particle duality, Davision and Germer Experiment, Wave Packets, Phase and Group Velocity, Wave Packets and Uncertanity Principle, Applications of Uncertanity Principle t (i)Particle in a box, (ii)Electron Diffraction from a single Slit.

Derivation of Shordinger Equation in time dependent and independent forms, Wave function and its physical Significance, Physical Observables and Operators, Experimental values, Probability Current Density and Continuity Equation.

UNIT-II

QUANTUM MECHANICS-II

One Dimensional Problems: Solution of Schordinger wave Equation for (i) Particle in a box (ii) Potential Barrier for E>0 and E<0 (Tunneling effect) and (iii) Harmonic Oscillator.

Three dimensional Problems: Schordinger Equation for a Spherically Symmetric Potential in Spherical Polar Cooordinates,its separation in to angular, radial equations using variable separable method, Solution of Radial Equation for Coulomb type of potential, Interpretation of Principal Quantum (n), Solution of equations of Angular part and Interpretation of *l* and m quantum numbers, hydrogen atom Wave Functions.

UNIT-III

ATOMIC PHYSICS

Frank and Hertz Experiment, Space Quantization, Larmor Precession, Bohr's Correspondence Principle, Electron Spin, Stern Gerlach Experiment, Vector Atom Model (*ls, jj* coupling), Spectroscopic Terms and their notations, Spin-Orbit interaction, Fine Structure of Hydrogen Atom, Normal and Anomalous Zeeman Effect(explanation by Classical and Quantum theory), D1, D2 lines of Sodium Atom, Lande' g factor, Paschen Back Effect for one electron atoms.

UNIT-IV

NUCLEAR PHYSICS-I

Basic nuclear properties: Size Measurement of Nuclear Radius by Electron Scattering method and Mirror Nuclei method, Nuclear Density, Packing Fraction, Mass Defect, Binding Energy, Discussion of average Binding Energy Curve, Nuclear stability, Nuclear Spin and Magnetic Moments, Liquid Drop Model of Nucleus, Weizsacker's Semi-Empirical Formula, Nuclear Forces and Their Properties(Qualitative treatment), Discrete nature of α-particle energies, Measurement of velocity of α-particle, Beta particle, Beta particle energy spectrum, Pauli theory of Neutrino, Simple idea about Gamma Decay.

UNIT-V

NUCLEAR PHYSICS-II

Energy Loss of charged particle through matter, Theory of particle detectors like Ionization Chamber, Proportional Counter and GM Counter, Classification of Elementary particles, Strangeness, Baryon Number and Isospin, Parity Quantum Number, Gell Mann Nishizima Scheme, Quark as the basic constituent of matter, quark properties, Quark contents in low lying Baryons and Mesons.

HINT FOR EXAMINERS/PAPER SETTERS

There will be two questions from each unit in the question paper. The students should attempt one question from each unit. In question paper, short answer type questions/numerical problems up to a maximum of 24 marks will be included. The weightage to short answer type questions and numerical problems should spread over all units.

Text & Reference Books

I. Quantum Mechanics by L.I Schiff, Mc Graw Hill Books Company Inc
2. Quantum Mechanics by B.Craseman and J.d.Powell, Addison
3. Concepts of Modern Physics by A. Beiser, Tata McGraw Hill Publication.
4. Atomic Spectra by H.E. White,Tata Mc Graw Hill.
5. Fundamentals of Molecular Spectroscopy, C.N. Banwell and E.M. Mac Cash, TataMcGraw Hill.
6. Atomic Spectra by G.Heizberg.
7. Molecular Spectra and Molecular Structure by G.Heizberg..
8.Nuclear Physics by D.C.Tayal, Himalaya Publishing House.
9.Nuclear Radiation Detector, S.S.Kapoor.
10.Nuclear Physics, Ghoshal.

GCWPHTC502

PRACTICAL **External Examination: 25 marks**
Internal Examination: 25 marks

1. To study Zener Diode Voltage regulating characteristics.
2. To study the ripple factor and efficiency of Half Wave Rectifier with L-type and pie type filter circuits.
3. To study the ripple factor and efficiency of Full Wave Rectifier with L-type and pie type filter circuits.
4. To study various logic gates viz: OR,AND,NOT,NAND and NOR using diodes and Transistors.
5. To study the voltage gain and frequency response of Two stage RC-Coupled Transistor Amplifier.
6. To find the refractive index of the material of given Prism by using Brewster'Law.
7. To find the wavelength of light from the given source using Michelson's Interferrometer.
8. To study the VI characteristics of Unijunction Transistor.s

Reference Books

1. B. Sc Practical Physics by C. L. Arora.
2. Practical Physics by Squires Cambridge University Press.
3. Advanced Practical Physics for Students by Worsnop and Flint.
4. Practical Physics by R K Shukla.
5. B.Sc Practical Physics by Harnam Singh and Dr.P.S.Hemne.

Note: The candidates are required to complete at least 5 practicals.
The Practicals can be added or deleted as per requirement.

Non-CBCS

B.Sc. Syllabus

Physics (Session 2016-17, 17-18, 18-19)

Semester-VI

Title: Solid State Physics, Electronics and Quantum Optics

PHTC601

Theory
Duration :-3 Hours

External Examination:80 marks
Internal Examination: 20 marks

The question paper shall be of 80 marks. There shall be l0 Questions in the paper, with two from each unit. Each question shall be of 16 marks. The students have to attempt 5 questions selecting one from each unit.

UNIT-I

SOLID STATE PHYSICS-I

Periodicity, Lattices and bases, Unit cell and Winger-Seitz cell, Symmetry operations, Bravais lattices in two and three dimensions, miller indices.Some examples of identification of Crystal planes, Interplanar spacing between Lattices, Reciprocal lattice and its application to simple cubic, bcc and fcc.

Laue' theory of X-ray diffraction, Bragg's law, Experimental methods in X-ray diffractions (Laue, Rotating crystal and powder method).

UNIT-II

SOLID STATE PHYSICS -II

OneLattice vibrations, Harmonic motion, Normal modes of lattice, Vibration of one-dimensional monoatomic chain under harmonic and nearest neighbour approximation, density of modes, Specific heat of solids, Einstein theory oand Debye's model of specific heat of solid.

Langvein's classical theory and quantum theory of paramagnetism, superconductivity, Meissner effect, Type I and Type II superconductors Josephson's junctions, BCS theory (elementary idea), crystal defects. Schottky and Frenkel defects.

UNIT-III

ELECTRONICS

Classification of amplifiers, General principles of operation of small signal amplifiers, Distortion in amplifiers, Hybrid parameters and equivalent circuit, Gain and frequency response (low, mid and high) of R-C coupled and transformer coupled amplifiers and its types, voltage gain of feedback amplifiers, noise in electronic circuits.

Classification of transistor oscillators, Barkhausen criteria, Hartley and Colpitt Oscillators.

UNIT-IV

QUANTUM OPTICS-I

Mechanism of light emission

Electric dipole, Retarted potentials, Oscillating electric dipole, Wave mechanical explanation of photon emission, Raman effect-classical and quantum mechanical explanation, properties of spectral lines, Luminescence.

Fibre Optics

Optical fibre and its types, critical angle of propogation, modes of propogation, Acceptance angles, numerical aperture, Pulse dispersion, Attenuation and its various mechanism, Advantages and applications of optical fibres.

UNIT-V

QUANTUM OPTICS –II

Attenuation of light in an optical medium, Thermal equilibrium, Interaction of light with matter, (absorption, spontaneous, Einsteins prediction, stimulated emission), Einstein's relations, light amplification, Population inversion, pumping, Principal pumping schemes (three and four levels), Optical resonant cavity, Condition for laser action.

Types of laser (Ruby, He-Ne lasers) Characteristics and applications of laser.

HINT FOR EXAMINERS/PAPER SETTERS

There will be two questions from each unit in the question paper. The students should attempt one question from each unit. In question paper, short answer type questions/numerical problems up to a maximum of 24 marks will be included. The weightage to short answer type questions and numerical problems should spread over all units.

Text & Reference Books

I. Introduction to Solid State Physics(7^{th} edition),C.Kittel,John Willey &Son.
2.Solid State Physics,S.O.Pillai,New Age International.
3. Solid State Physics, A.J. Decher, Macmillan
4.Superconductivity, T.V. Ramakrishnan and N.R Rao, Wiley Eastern Ltd.
5.Solid State Physics, R.L Singhal, Keder Nath and Co.
6.A Text Book of Electrical Technology, B.L. Theraja, S.chand and Co.
7.Principals of electronics, V.K Mehta, S.Chand and Co.
8.Integrated Electronics, Millman & Holskiar, McGraw Hill.
9.Optics Brijlal, Subrahmanyam and M.N.A. Vadhanulu (S. Chand & Co. Ltd).
10.Basic Electronics and Linear Circuits, Bhargava and Gupta,Tata McGraw.

Govt. College for women Parade Ground, Jammu
(Autonomous College)

B.Sc. Syllabus **(Physics CBCS)** ①

Title : Mechanics, oscillations and theory of Relativity

(Year 2016, 2017, 2018)

Course Code : UPHTC-101

Semester-I

~~**GCWPTHI01**~~

Theory
Duration:-3 Hours
Course Duration : 60 hrs

Total Marks : 100
External Examination: 80 marks
Internal Examination: 20 marks

UNIT-I

MECHANICS-I

Unit Vectors, displacement, area elements volume element, velocity and acceleration in Cartesian. Spherical polar and cylindrical coordinate systems. Intertial and non inertial frames of references, uniformly rotating frame; Coriolis force and centrifugal force, effect of centrifugal force due to rotation of the earth, Coriolis force acting on a freely falling body.

UNIT-II

MECHANICS-II

Two body system; laboratory and centre of mass system, relationship between displacement, velocities, kinetic energies and angles in lab and centre of mass system. Inverse square law of force: Concept of central and non-central forces. Centre of mass and its motion, Equivalent one body problem. Angular momentum, Differential equation of orbit in a central force field, Turning points of motion, relation between eccentricity and energy, Keplers **Laws**.

UNIT-III

OSCILLATION –I

Differential equation and its solution, energy of simple harmonic oscillator examples, Compound pendulum, torsional pendulum, bifiller oscillations. LC circuit, Nature of damping force, damped simple harmonic oscillator. Differential equation and its solution, energy power dissipation, logarithmic decrement Relaxation time, quality factor, resistance and electromagnetic damping. Example of damping in physical system, resistance damping, oscillatory discharge of a capacitor through circuit containing resistance and inductance.

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UNIT-IV

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OSCILLATION -II

Driven harmonic oscillator, transient and steady State behavior, solution of differential equation, velocity of the mechanical forced oscillator in the steady slate, behavior of displacement with driving force frequency. Behavior of velocity versus driving force frequency, power absorption and power dissipation, Sharpness of resonance, Quality factor Electrical resonance.

UNIT-V

Theory of Relativity

Galilean transformations, Search for ether and Michelson-Morley experiment. Postulates of special theory of relativity, Lorentz Transformations, Consequences of Lorentz transfonnations, Length contraction. time dilation, experimental evidence in support of time dilation, twin paradox, simultaneity of events, velocity theorem, variation of mass with velocity, mass-energy equivalence, energy-momentum relation, Illustrative examples in support of mass-energy equivalence, transformation relations between momentum and energy, particle with a zero rest mass

Text & Reference Books :

I. Mechanics by Hans and Puri.

2. Mechanics by. Sikri

3. Mechanics by D.S. Mathur

4. Classical Mechanics by Kumar and Gupta.

5. Classical Mechanics by Goldstien.

6. Waves and Vibrations by S.P. Puri.

7. Waves and oscillation by Brij Lal and Subramanum.

8. Waves and oscillation by S.L. Kakani.

9. Theory of Relativity by IL Resnick.

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UPHPC –101

~~GCWPP102~~

(3)

PRACTICAL

External Examination: 25 marks
Internal Examination: 25 marks

I. To find the value of g' by bar pendulum.
2. To find the surface tension of water by Jaeger's Method/capillary rise method.
3. To find Moment of Inertia of Fly-Wheel.
6. Bifillar Oscillator.
7. To find Capacity of a Capacitor by Electrical vibrator.
8. find frequency of AC supply by Electrical vibrator.
9. To find the frequency/velocity of sound wave by Sonometer.
10. To establish relation between torque and angular acceleration using Fly wheel.
11. To find the value of 'g'by Kater's pendulum. (Under star college scheme)
12. To find young's modulus, modulus of rigidity and Poisson's ratio by Searl's method..

Reference Books

1. B. Sc Practical Physics by C. L. Arora.
2. Practical Physics by 0 L Squires Cambridge University Press
3. Advanced Practical Physics for Students by Worsnop and Flint
4. Practical Physics by R K Shukla
5. B.Sc Practical Physics by Harnam Singh.

Note: The candidates are required to complete at least 5 practicals. The Practicals can be added or deleted as per requirement.

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Semester-II

~~GCWPTH201~~

Theory

Title :- Electricity Magnetism + E.M waves

Course Code UPHTC-201

Duration :- 3 Hours | **External Examination: 80 Marks**

Course Duration : 60 hrs | **Internal Examination: 20 Marks**

UNIT –I
VECTOR CALCULUS

Basic ideas of vector algebra, Scalar and vector fields, Gradient of a scalar field and its physical interpretation, Line, Surface and volume integrals, Divergence of a vector field and its physical significance, Solenoidal field , Gauss's divergence theorem. Curl of a vector field and its physical significance, Stokes' theorem. Green's theorem, Irrotational vector field, Vector identities.

Unit-II
ELECTROSTATICS

Gauss's law in integral and differential Forms, Line integral of electrostatic field, Conservative nature of electrostatic field, Electric field as the negative gradient of potential, Poisson's and Laplace's equations. Energy of electrostatic field.

Dielectrics, Polar and non-polar molecule, Polarisation of dielectric, Polarisation vector P, Displacement vector D, Relation $D= \epsilon_o E+P$,Atomic polarizability, Electric susceptibility, Relation $K=1+X_e$, Gauss's lawa in a dielectric medium (differential and integral forms), Energy in dielectric system, boundary conditions satisfied by **E** and **D** at the interface between two homogeneous dielectrics.

Unit-III
ELECTRIC CURRENT AND MAGNETOSTATICS

Current and current density, Equation of continuity, Electrical conductivity, vector form of Ohm's law, Failure of Ohm's law

Biot-Savart's law, Ampere's circuit law (integral and differential forms) and its limitation, Modified form of Ampere's Circuit Law, Displacement current, Divergence of magnetic field, Magnetic scalar and vector potentials, Divergence of vector potential. Derivation of Biot-Savart's law from vector potential.

Current loop as a magnetic dipole, Relation between magnetic dipole moment and angular momentum, magnetization vector **M**, Magnetizations current, Free and bound currents, Relation between **B, H** and **M**. Magnetic susceptibility and permeability.

Boundary conditions satisfied by **B** and **H** at the interface between two media.

continued

UNIT- IV
TIME VARYING FIELDS

Integral and differential forms of Faraday's laws of electromagnetic induction, Self inductance of a solenoid, Mutual inductance of two solenoids, Self inductance and mutual inductance of current loops(Reciprocity theorem of mutual inductance), Relation between self and mutual inductances, Coefficient of coupling.
Energy stored in a magnetic field, Maxwell's equations (differential and integral forms) and their interpretation. Poynting vector, Poynting theorem and its differential form.

UNIT-V
ELECTROMAGNETIC WAVES

Electromagnetic waves in vacuum: The wave equations for E and B, Monochromatic plane electromagnetic waves and their transverse nature. Characteristic impedance.

Electromagnetic waves in dielectric medium: Propagation in linear media, Reflection and transmission at normal incidence, Derivation of laws of reflection and refraction.
Electromagnetic waves in conductors: Modified wave equations, Skin Depth, and Characteristic impedance.

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Text and Reference Rooks:

1. Vectors by Speigal
2. Electromagnetic by B.B. Laud
3. Electricity and Magnetism by K.K. Tiwari
4. Electricity, Magnetism and E. M. waves by K.K. Sharma
5. Introduction to Electrodynamics by David J. Griffiths
6. Electricity and Magnetism by A. E. Kip.
7. Electricity and Magnetism by D.C Tayal
8. Electricity and Magnetism by Retiz and Millford.
9. Electricity and Magnetism by AK. Sikri

UPHPC – 201

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~~GCWPP202~~

Practical

External Examination: 25 marks
Internal Examination: 25 marks

1. To find the Young Modulus by bending beam Method
2. To find rigidity of wire by Maxwell needle.
3. To find the variation of Magnetic field with distance.
4. To find the Impedance of series LCR circuit.
   To find low resistance by Carey Foster Bridge with Calibration.
6. To find low resistance by Carey Foster Bridge without calibration.
7. Compare the capacitance by De-Sauty's Method.
8. Find Horizontal component of Earth's magnetic field by using vibration and deflection magnetometer.
9. To find the dielectric constant of a material by resonance method.
10. To find the value of high resistance by substitution method.

Reference Books

1. B. Sc Practical Physics by C. L. Arora.
2. Practical Physics by G L Squires Cambridge University Press
3. Advanced Practical Physics for Students by Woranop and Flint
4. Practical Physics by R. K Shukla
5. B.Sc Practical Physics by Harnam Singh

Note: The candidates are required to complete at least 5 practicals.
The Practicals can be added or deleted as per requirement.

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SEMESTER-III

(CBCS 2017, 2018 & 2019)

PHYSICS-GCWPHT 301

Course Title : Electronics, Thermodynamics and Statistical Mechanics/Physics

Course code : UPHTC-301

(Credits: Theory-04, Practicals-02) **Course Duration : 60 hrs**

Semester: III

UNIT-I
Thermodynamics-I

Second law of thermodynamics, Carnot theorem, thermodynamic scale of temperature and its identity with gas scale, Entropy, statistical definition of entropy, additive nature of entropy, entropy changes in reversible and irreversible processes, law of increase of entropy with examples. T-S diagram, entropy and disorder. Heat death of universe, impossibility of attaining absolute zero. Nernst heat theorem and third law of thermodynamics.

Adiabatic expansion, Joule Thomson expansion Boyle temperature, temperature of inversion and critical temperance of a gas. Principle of regenerative cooling and of cascade cooling.

UNIT-II
Thermodynamics-II

Extensive and intensive thermodynamic variables, Maxwell's general relationships. Application to Joule- Thomson cooling. Clasius Clapeyron latent heat equation. Thermodynamic potentials and equilibrium of thermodynamic system relation with thermodynamic variables. Cooling due to adiabatic demagnetization, production and measurement of very low temperatures.

UNIT-III
Electronics

P-N junction diode and its V-I characteristics, P-N junction diode as half wave and Full wave rectifier. Ripple factor and efficiency of HWR and FWR. Avalanche and Zener breakdown. Zener diode and its characteristics. Zener diode as voltage regulator, construction and characteristics of Schottky diode, tunnel diode and light emitting diode. Construction, working and characteristics of UJT, SCR,

Bipolar Junction Transistor Characteristics of a transistor in CB and CE –modes.

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UNIT-IV
Statistical Mechanics-I

Probability, macro and micro states, thermodynamic probability, effects of constraints on a system, deviation from the state of maximum probability, equilibrium state of a dynamic system. Distribution of n distinguishable particles in K compartments of unequal sizes. Phase space, types of statistics, Boltzmann's distribution law, Maxwell's distribution of speeds and velocities and experimental verification Average, r.m.s. and most probable speeds of gas molecules.

UNIT-V
Statistical Mechanics-II

Quantum Statistics: Bose - Einstein (B- E) statistics and distribution law, Photon gas, derivation of Planck's radiation law, Wien's displacement law and Stefan's Boltzmann law from Planck's law and Bose-Einstein gas. Degeneracy and B-E condensation.

Fermi Dirac (F - D) statistics and its distribution law, application of F-D statistics to electron gas in metals, Zero point energy, Electron gas, Comparison of three statistics.

Reference Books:

- Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.
- Thermodynamics, Enrico Fermi, 1956, Courier Dover Publications.
- Heat and Thermodynamics, M.W.Zemasky and R. Dittman, 1981, McGraw Hill.
- Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears & G.L.Salinger. 1988, Narosa
- Thermal Physics, A. Kumar and S.P. Taneja, 2014, R. chand Publications.
- Statistical and Thermal Physics by S. Lokanathan and R. S. Gambir
- Thermodynamics and Statistical Physics by J.K. Sharma
- Principles of Electronics by V. K. Mehta (S. Chard & Co.).
- Basic Electronics by B. L. Theraja (S. Chard & Co.).

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PHYSICS LAB

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Practical ~~GCWPP302~~ UPHPC-301

External Examination: 25 marks
Internal Examination: 25 marks

1. To Find V-I characteristics of PN Junction Diode.
2. To Find V-I characteristics of Zener Diode.
3. To find Input/output characteristics of common base PNP/NPN transistor.
4. To find Input/output characteristics of common emitter PNP/NPN transistor.
5. To find the V-I characteristics of Tunnel Diode.
6. To find the coefficient of thermal conductivity by Lee's method.
7. To find Refractive index of water by using hollow prism.
8. To find Cauchy Constants.

Reference Books:

1. BSc. Practical Physics. by C. L. Arora.
2. Practical Physics by G L Squires Cambridge University Press.3.
3. Advanced Practical Physics for Students by Worsnop and Flint
4. Practical Physics by R K Shukla
5. B.Sc Practical Physics by Harnam Singh

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SEMESTER-IV
(CBCS)
PHYSICS GCWPHT 401

Fourier Series

Title of the Course: Waves and Optics

(Credits: Theory-04, Practicals-02) ~~GCWPTH-401~~

Course Code: UPHTC-401

Semester – ~~IV~~

UNIT-I
Fourier Series

Periodic functions, even and odd functions continuous and discontinuous functions, Dirichlet's conditions, sine and cosine series, properties of Fourier series, complex form of Fourier series, graphical representation of a function, extension of interval, Fourier solution of simple functions. Applications of Fourier theorem to square wave, rectangular wave, half wave rectifier and full wave rectifier.

UNIT-II
Waves

Wave equation in simple and differential form, general solution of wave equation, velocity of transverse waves in a string, energy density and intensity of a progressive wave, characteristic impedance of a string, reflection and transmissions of transverse waves in a string at boundary (discontinuity), reflection and transmission coefficients.

Superposition principle, stationary/ standing waves on a string of fixed length, eigen functions, eigen frequencies, Energy of a vibrating string.

UNIT-III
Interference

Condition for interference, Young's double slit experiment, theory of interference fringes(fringe width), Fresnel's Biprism and its application to the determination of wave length of sodium light, phase change on reflection, thin films (reflected and transmitted cases/systems), Newton's rings, determination of refractive index of liquid and wavelength of monochromatic light. Michelson's interferometer and its application to determination of (i) wave length of monochromatic light (ii) thickness of thin transparent sheet (iii) resolution of spectral lines (iv) Determination of refractive index of glass.

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UNIT-IV
Diffraction

Fresnel's diffraction: Fresnel's half - period zones, rectilinear propagation of light, zone plate, action of zone plate, diffraction at a Straight edge, rectangular slit, Fraunhofer diffraction: one slit diffraction, two slit diffraction, plane transmission grating, determination of wavelength of monochromatic light using grating, width of principal maximum, absent spectra, dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of grating.

UNIT-V
Polarization

Polarization by reflection, Brewster's law, Malus Law , Uniaxial and Biaxial crystals, phenomenon of double refraction,. Huygen Theory of double refraction, Nicol prism, quarter wave plate and half wave plate; theory, production and detection of plane, circularly and elliptically polarized light, optical activity, specific rotation, Laurent's half shade polarimeter.

Reference Books:

- Fundamentals of Optics, F A Jenkins and H E White, 1976, McGraw-Hill
- Principles of Optics, B.K. Mathur, 1995, Gopal Printing
- Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publication
- University Physics. FW Sears, MW Zemansky and HD Young 13/e, 1986.

  Addison-Wesley

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PHYSICS LAB-DSC 4A

GCWPP402

(12)

Practical

External Examination: 25 marks
Internal Examination: 25 marks

1. To find Refractive index of O-ray and E-ray.
2. To find wave length by using Diffraction Grating.
3. To find wave length of Sodium light using Newton's Rings.
4. To find specific rotation of sugar by Polarimeter.
5. Determination of Planck's constant by Photocell.
6. To study the variation of light intensity with distance using Photovoltaic cell.(Inverse square law)
7. To find the coefficient of self inductance by Anderson's method.
8. To find the ionization potential of mercury.
9. To Find the VI-Characteristics of UJT.

Reference Books:

- Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

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Title: PHYSICS WORKSHOP SKILL **Course Code: GE~~WPHSEC303~~** DPHYS-301

Credits:04 **Total Marks:100**

Semester-III **Internal Examination: 20marks**

End Semester Examination: 80marks

Duration: 3hours

13

Validity of Syllabus: 2016, 2017, 2018 Exams

60 hrs

The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode

Unit I: Measurement skills: Measuring units. Conversion to SI and CGS. Familiarization with meter scale, Vernier caliper, Screw gauge, spherometer and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.

Unit II: Mechanical Skills: Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood. Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothening of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block. Use of bench vice and tools for fitting. Make funnel using metal sheet.

Unit III: Basic Electricity Principles and Measuring Instruments: Voltage, Current, Resistance, and Power, Ohm's law & Kirchoff's laws, series-parallel combinations, AC and DC Electricity, Use of Analog & digital multimeters, CRO, power supply and Function generator, testing various electrical and electronic components using multimeters and CRO.

UnitIV: Measurement Bridges: Accuracy and resolution of measurement, DC bridges and applications: Wheatstone, Kelvin, AC bridges, General form of AC Bridge balance. Measurement of Impedance- A.C. bridges, Measurement of Self Inductance (Anderson's bridge), Measurement of Capacitance (De Sauty's bridge), Measurement of frequency (Wien's bridge).

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UnitV: Electronic Components:

Resistors: classification of resistors, Materials used for resistors, Maximum power rating, tolerance, temperature co-efficient, and Carbon film resistors, standard Wire wound resistors, Color Coding.

Capacitors: Materials used for capacitors, working voltage, capacitive reactance. Coding of capacitors Fixed Capacitor types: Disc, Ceramic capacitor, Aluminum electrolytic capacitor, Variable capacitor types: Air Gang, PVC gang capacitor, Trimmer mica capacitor.

Inductors: Air core, iron core, ferrite core inductor, frequency range Inductors: A.F., R.F., I.F., Transformers used in electronic circuits.

Diodes: Use of p-n junction diode as a rectifier, Zener diode, LED, photo diode, etc.

Reference Books:

- Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press
- A text book in Electrical Technology - B L Theraja - S Chand& Co.
- A text book of Electrical Technology - A K Theraja
- Dhir S.M "Electronic Components and Materials," Tata McGraw Hills publishing company Ltd., N.Delhi.
- Thomas H.Jones, "Electronic Components Handbook," Reston Publishing.

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Title: RENEWABLE ENERGY AND ENERGY HARVESTING

(18)

Course Code: ~~GCWPHSEC 404~~ UPHTS -401

Credits:04

Semester-IV

Total Marks:100

Internal Examination: 30marks

End Semester Examination: 70marks

Duration: 3hours

Validity of Syllabus: 2017, 2018, 2019 Exams

Course Duration: 60hrs

The aim of this course is not just to impart theoretical knowledge to the students but to provide them with exposure and hands-on learning wherever possible

Unit I: Fossil fuels and Alternate Sources of energy: Fossil fuels and nuclear energy, theirlimitations, need of renewable energy, non-conventional energy sources. An overview ofdevelopments in Offshore Wind Energy, Tidal Energy, Wave energy systems, OceanThermal Energy Conversion, solar energy, biomass, biochemical conversion, biogasgeneration, geothermal energy tidal energy, Hydroelectricity.

Unit II: Solar energy: Solar energy, its importance, storage of solar energy, solar pond, nonconvective solar pond, applications of solar pond and solar energy, solar water heater,flat plate collector, solar distillation, solar cooker, solar green houses, solar cell,absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PVmodels and equivalent circuits,sun-tracking systems.

Unit III: Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and differentelectrical machines in wind turbines, Power electronic interfaces, and gridinterconnection topologies, Ocean Energy Potential against Wind and Solar, Wave Characteristics and statistics, Wave Energy Devices, Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass, Geothermal Resources, Geothermal Technologies, Hydropower resources, hydropower technologies, environmental impactof hydro power sources.

Unit IV: Piezoelectric Energy harvesting: Introduction, Physics and characteristics ofpiezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energyharvesting applications, Human power.

Unit V:Electromagnetic Energy Harvesting: Linear generators, physics mathematical models,recent applications, Carbon captured technologies, cell, batteries, power consumption, Environmental issues and Renewable sources of energy, sustainability.

Convener

Reference Books:

- Non-conventional energy sources, B.H. Khan, McGraw Hill
- Solar energy, Suhas P Sukhative, Tata McGraw - Hill Publishing Company Ltd.
- Renewable Energy, Power for a sustainable future, Godfrey Boyle, Oxford Univ Press.
- Renewable Energy Sources and Emerging Technologies, Kothari, PHI Learning.
- Solar Energy: Resource Assesment Handbook, P Jayakumar
- J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).

Convener

Scheme of Examination
(2017, 2018 & 2019)

(17)

Theory

Course Duration : 60 hrs

Scheme for Internal Assessment Test: The question paper would comprise of eight short answer type questions out of which candidate is required to attempt any five carrying 4 marks each.

20 Marks

Scheme for External Semester Examination: The question paper comprises of three sections: Section A, B and C.

Section A contains 10 very short answer type questions (Two from each unit) carrying 2 marks each. All the questions are compulsory

20 Marks

Section B contains 05 short answer type questions with internal choice from each unit and each question carries 6 marks.

30 Marks

Section C contains 05 long answer type questions carrying 10 marks (one from each unit) and the candidate is required to attempt any three questions.

30 Marks

Examination(Theory)	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Internal Assessment Test	Upto 50% (after 45 days)	1hour	20% (20marks
End Semester Examination (Ext.)	Upto 100% (after 90 days)	3hour	80% (80marks)
Total			100

SKILL ENHANCEMENT COURSE STUDIES UNDER B.SC. PHYSICS COURSE (CBCS):

1. ~~Weather Forecasting~~
2. Physics workshop skills — 3rd Sem.
3. ~~Renewable~~ energy and energy harvesting — IV Sem
4. ~~Applied Optics~~

convener

Scheme of Examination for B.Sc. Physics:

The students shall be evaluated during the conduct of the course in each semester as follows:

Examination(Theory)	Syllabus to becovered in theexamination	Time allotted	% Weightage (Marks)
Internal AssessmentTest	Upto 50% (after45 days)	1hour	15 % (15marks)
External Examination	Upto 100% (after90 days)	3hour	80% (80marks)
			Attendance= 5 marks (5%)
Total			100

Scheme for Internal Assessment Test: The question paper would comprise of eight short answer type questions out of which candidate is required to attempt any five carrying 3 marks each. **15 Marks**

Scheme for External Semester Examination: The question paper comprises of three sections: Section A, B and C.

Section A contains 10 very short answer type questions (Two from each unit) carrying 2 marks each. All the questions in this section are compulsory. **20 Marks**

Section B contains 05 short answer type questions with internal choice from each unit and each question carries 6 marks. **30 Marks**

Section C contains 05 long answer type questions carrying 10 marks each and the candidate is required to attempt any three questions. **30 Marks**

HOD Physics

Govt. College for women Parade Ground, Jammu
(Autonomous College)

B.Sc. Syllabus

Physics ✓

(Session 2015-16, 2016-17, 2017-18)

NON-CBCS

Semester-I ✓

Course Code: PHTC-101 ~~GE-WPHY01~~

Title: Mechanics, oscillations and Relativity

Theory
Duration:-3 Hours

External Examination: 80 marks
Internal Examination: 20 marks

The question paper shall be of 80 marks. There shall be 10 Questions in the paper, with two from each unit. Each question shall be of 16 marks. The students have to attempt 5 questions selecting one from each unit.

UNIT-I

MECHANICS-I

Unit Vectors, displacement, area elements volume element, velocity and acceleration in Cartesian. Spherical polar and cylindrical coordinate systems.

Intertial and non inertial frames of references, uniformly rotating frame; Coriolis force and centrifugal force, effect of centrifugal force due to rotation of the earth and Coriolis force acting on a freely falling body.

UNIT-II

MECHANICS-II

Two body system; laboratory and centre of mass system, relationship between displacement, velocities, kinetic energies and angles in lab and centre of mass system.

Inverse square law of force: Concept of central and non-central forces. Centre of mass and its motion, Equivalent one body problem. Angular momentum

conservation in a central force field, Energy of reduced mass & Its conservation, differential equation of orbit in a central force field, Turning points of motion, relation between eccentricity and energy, Kepler's Laws.

UNIT-III

OSCILLATION –I

Differential equation and its solution, energy of simple harmonic oscillator examples, Compound pendulum, torsional pendulum, bifiller oscillations. LC circuit,

Nature of damping force, Damped simple harmonic oscillator. Differential equation and its solution, energy power dissipation, logarithmic decrement. Relaxation time, quality factor, resistance and electromagnetic damping. Example of damping in physical system, resistance damping, oscillatory discharge of a capacitor through circuit containing resistance and inductance,

UNIT-IV

OSCILLATION —II

Driven harmonic oscillator, transient and steady state behavior, solution of differential equation, velocity of the mechanical forced oscillator in the steady slate, behavior of displacement with driving force frequency. Behavior of velocity versus driving force frequency, power absorption and power dissipation, Sharpness of resonance, Quality factor Electrical resonance.

UNIT-V

Theory of Relativity

Galilean transformations, Search for ether and Michelson-Morley experiment. Postulates of special theory of relativity, Lorentz Transformations, Consequences of Lorentz transformations, Length contraction. time dilation, experimental evidence in support of time dilation, twin paradox, simultaneity of events, velocity theorem, variation of mass with velocity, mass-energy equivalence, energy-momentum relation, Illustrative examples in support of mass-energy equivalence, transformation relations between momentum and energy, particle with a zero rest mass.

HINT FOR EXAMINERS/PAPER SETTERS

There will be two questions from each unit in the question paper. The students should attempt one question from each unit. In question paper, short answer type questions/numerical problems up to a maximum of 24 marks will be included. The weightage to short answer type questions and numerical problems should spread over all units.

Text & Reference Books

1. Mechanics by Hans and Puri.
2. Mechanics by Sikri
3. Mechanics by D.S. Mathur
4. Classical Mechanics by Kumar and Gupta.
5. Classical Mechanics by Goldstien.
6. Waves and Vibrations by S.P. Puri.
7. Waves and oscillation by Brij Lal and Subramanum.
8. Waves and oscillation by A.P. French.
9. Waves and oscillation by S.L. Kakani.
10. Theory of Relativity by R. Resnick.
11. Theory of Relativity by French.
12. Theory ofRelativiry by Patharia

PHPC-107

(4)

~~GCWPP102~~

PRACTICAL

External Examination: 25 marks
Internal Examination: 25 marks

1. To find the value of g' by bar pendulum.
2. To find the surface tension of water by Jaeger's Method/capillary rise method.
3. To find Moment of Inertia of Fly-Wheel.
4. To find the Young Modulus by bending beam Method,
5. To find rigidity of wire by Maxwell needle.
6. Bifillar Oscillator.
7. To find the frequency/velocity of sound wave by Sonometer.
8 To establish relation between torque and angular acceleration using flyweel.
9. To find the value of 'g'by Kater's pendulum.
10 To find young's modulus, modulus of rigidity and Poisson's ratio by Searl's method.

Reference Books

1. B. Sc Practical Physics by C. L. Arora.
2. Practical Physics by 0 L Squires Cambridge University Press
3. Advanced Practical Physics for Students by Worsnop and Flint
4. Practical Physics by R K Shukla
5. B.Sc Practical Physics by Harnam Singh.

Note: The candidates are required to complete at least 5 practicals. The Practicals can be added or deleted as per requirement.

Semester-II

GCWPT~~II201~~

PHTC-201

Title: Electricity, magnetism and e.m waves

Theory
Duration: - 3 Hours

External Examination: 80 Marks
Internal Examination: 20 Marks

The question paper shall be of 80 marks. There shall be l0 questions in the paper with two from each unit Each question shall be of 16 marks. The students have to attempt 5 questions selecting one from each unit.

UNIT -I
VECTOR CALCULUS

Basic ideas of vector algebra, Scalar and vector fields, Gradient of a scalar field and its physical interpretation, Line, Surface and volume integrals, Divergence of a vector field and its physical significance, Solenoidal field , Gauss's divergence theorem.
Curl of a vector field and its physical significance, Stokes' theorem. Green's theorem, Irrotational vector field, Vector identities.

Unit-II
ELECTROSTATICS

Gauss's law in integral and differential Forms, Line integral of electrostatic field, Conservative nature of electrostatic field, Electric field as the negative gradient of potential, Poisson's and Laplace's equations.Energy of electrostatic field.

Dielectrics, Polar and non-polar molecule, Polarisation of dielectric, Polarisation vector $\vec{P}$, Displacement vector $\vec{D}$, Relation $\vec{D} = \epsilon_0 \vec{E} + \vec{P}$, Atomic polarizability, Electric susceptibility, Relation $K = 1 + X_e$, Gauss's law in a dielectric medium (differential and integral forms), Energy in dielectric system, boundary conditions satisfied by $\vec{E}$ and $\vec{D}$ at the interface between two homogeneous dielectrics.

Unit=III
ELECTRIC CURRENT AND MAGNETOSTATICS

Current and current density, Equation of continuity, Electrical conductivity, and vector form of Ohm's law, Failure of Ohm's law

Biot-Savart's law, Ampere's circuit law (integral and differential forms) and its limitation, Modified form of Ampere's Circuit Law, Displacement current,

Divergence of magnetic field, Mag netic scalar and vector potentials, Divergence of vector potential. Derivation of Biot-Savart's law from vector potential.

Current loop as a magnetic dipole, Relation between magnetic dipole moment and angular momentum, magnetization vector $\vec{M}$, Magnetisation current, Free and bound currents, Relation between $\vec{B}$, $\vec{H}$ and $\vec{M}$. Magnetic susceptibility and permeability, Boundary conditions satisfied by $\vec{B}$ and $\vec{H}$ at the interface between two media

UNIT- IV
TIME VARYING FIELDS

Integral and differential forms of Faraday's laws of electromagnetic induction, Self inductance of a solenoid, Mutual inductance of two solenoids, Self inductance and mutual inductance of current loops(Reciprocity theorem of mutual inductance), Relation between self and mutual inductances, Coefficient of coupling.

Energy stored in a magnetic field, Maxwell's equations (differential and integral forms) and their interpretation, Poynting vector, Poynting theorem and its differential form.

UNIT-V
ELECTROMAGNETIC WAVES

Electromagnetic waves in vacuum: The wave equations for $\vec{E}$ and $\vec{B}$, Monochromatic plane electromagnetic waves and their transverse nature. Characteristic impedance.

Electromagnetic waves in dielectric medium: Propagation in linear media, Reflection and transmission at normal incidence, Derivation of laws of reflection and refraction.

Electromagnetic waves in conductors: Modified wave equations, Skin Depth, and Characteristic impedance.

Note for paper setters:

There will be two questions from each unit in the question paper. The students should attempt one question from each unit. in question paper, short answer type questions/numerical problems up to a maximum of 24 marks will be included.

Reference Rooks:

1. Vectors by Speigal
2. Electromagnetic by B.B. Laud
3. Electricity and Magnetism by K.K. Tiwari
4. Electricity, Magnetism and E. M. waves by K.K. Sharma
5. Introduction to Electrodynamics by David J. Griffiths
6. Electricity and Magnetism by A. E. Kip.
7. Electricity and Magnetism by D.C Tayal
8. Electricity and Magnetism by Retiz and Millford.
9. Electricity and Magnetism by AK. Sikri

~~GCWPP302~~
DHPC-301

Practical

External Examination: 25 marks
Internal Examination: 25 marks

1. To find Capacity of a Capacitor by Electrical vibrator.
2. To find frequency of AC supply by Electrical vibrator.
3. To find the variation of Magnetic field with distance.
4. To find the Impedance of series LCR circuit.
5. To find low resistance by Carey Foster Bridge with Calibration.
6. To find low resistance by Carey Foster Bridge without calibration.
7. Compare the capacitance by De-Sauty's Method.
8. Find Horizontal component of Earth's magnetic field by using vibration and deflection magnetometer.
9. To find the dielectric constant of a material by resonance method.
10. To find the value of high resistance by substitution method.

Reference Books

1. B. Sc Practical Physics by C. L. Arora.
2. Practical Physics by G L Squires Cambridge University Press
3. Advanced Practical Physics for Students by Woranop and Flint
4. Practical Physics by R. K Shukla
5. B.Sc Practical Physics by Harnam Singh

Note: The candidates are required to complete at least 5 practicals.
The Practicals can be added or deleted as per requirement.

Semester-III

PHTC-301

Title: Thermodynamics ~~GCWPTH301~~ Electronics and Statistical Physics

Theory

Duration: 3 hours
External Examination: 80 marks
Internal Examination: 20 marks

The question paper shall be of 80 marks. There shall he 10 questions in the paper with two from each unit. Each question shall be of 16 marks. The students have to attempt 5 questions selecting one from each unit.

UNIT-I
FOURIER SERIES

Periodic functions, even and odd functions continuous and discontinuous functions, Dirichlet's conditions, sine and cosine series, properties of Fourier series, complex form of Fourier series, graphical representation of a function, extension of interval, Fourier solution of simple functions. Applications of Fourier theorem to square wave, rectangular wave, half wave rectifier and full wave rectifier. Triangular wave.

UNIT-II
ELECTRONICS

P-N junction, PN- diode as half wave and Full wave rectifier. Ripple factor and efficiency of HWR and FWR, Zener diode and its characteristics. Zener diode as voltage regulator, construction and characteristics of unijunction diode, tunnel diode and light emitting diode. Construction, working and characteristics of UJT, SCR and JFET.

Chacteristics of a transistor in common- base and common emitter modes (both NPN & PNP). Operational amplifier and its applications as adder and inverter. Logic gates: OR, AND. NOT, NOR and NAND, XOR.

Unit - III
THERMODYNAMICS- I

Second law of thermodynamics, Carnot theorem, thermodynamic scale of temperature and its identity with gas scale, Entropy, statistical definition of entropy, additive nature of entropy, entropy changes in reversible and irreversible processes, law of increase of entropy with examples. T-S diagram, entropy and disorder. Heat death of universe, impossibility of attaining absolute zero. Nernst heat theorem and third law of thermodynamics.

Adiabatic expansion, Joule Thomson expansion. Boyle temperature, temperature of inversion and critical temperance of a gas. Principle of regenerative cooling and of cascade cooling.

Unit - IV
THERMODYNAMICS- II

Extensive and intensive thermodynamic variables, Maxwell's general relationships. Application to Joule- Thomson cooling. Clasius Clapeyron latent heat equation. Thermodynamic potentials and equilibrium of thermodynamic system relation with thermodynamic variables. Cooling due to adiabatic demagnetization, production and measurement of very low temperatures.

UNIT-V
STATISTICAL MECHANICS

Probability, macro and micro states, thermodynamic probability, effects of constraints on a system, deviation from the state of maximum probability, equilibrium state of a dynamic system. Distribution of n distinguishable particles in K compartments of unequal sizes. Phase space, types of statistics, Boltzmann's distribution law, Maxwell's distribution of speeds and velocities, mean, r.m.s. and most probable speeds, Bose - Einstein (B- E) statistics and distribution law, derivation of Planck's radiation law. Fermi Dirac (F - D) statistics and its distribution law, application of F-D statistics to electron gas in metals, Zero point energy.

Hint for Examiners/Paper setters

The question paper shall be of 80 marks. There shall be 10 questions in the paper with two from each unit. Each question shall be of 16 marks. The students have to attempt 5 questions, selecting one question from each Unit. In question paper, short answer type questions/ numerical problems up to a maximum of 24 marks will be included. The weightage of short answer type questions and numerical problems should spread over all the units.

Reference Books:

1. Principles of Electrodes by V. K. Mehta (S. Chard & Co.).
2. Basic Electronics by B. L. Theraja (S. Chard & Co.).
3. Basic Electronics and Linear Circuits by N N Bhargava (Tata McGraw Hill).
4. Solid State Physics and Electronics by Babbar and Puri.
5. Mathematical Physics by Pining.
6. Mathematical Physics by Satya Parkash.
7. Statistical Physics and Thermodynamics and V.S. Bhatia
8. Heat, Thermodynamics and Statistical Physics by Singhal, Agarwal and Satya Parkash.
9. Heat and Thermodynamics by M. S. Yaday.
10: Statistical and Thermal Physics by S. Lokanathan and R. S. Gambir
11. Thermodynamics and Statistical Physics by J.K. Sharma
12. Heat and Thermodynamics by M. W. Zeemansky and R. Dittman.

PHPC-301

~~GCWPP302~~

Practical

External Examination: 25 marks
Internal Examination: 25 marks

1. To Find V-I characteristics of PN Junction Diode.
2. To Find V-I characteristics of Zener Diode.
3. To find Input/output characteristics of common base PNP/NPN transistor.
4. To find Input/output characteristics of common emitter PNP/NPN transistor.
5. To find the V-I characteristics of Tunnel Diode.
6. To find the coefficient of thermal conductivity by Lee's method.
7. To find Refractive index of water by using hollow prism/material of the prism.
8. To find Cauchy Constants.

Reference Books

1. BSc. Practical Physics. By C. L. Arora.
2. Practical Physics by G L Squires Cambridge University Press
3. Advanced Practical Physics for Students by Worsnop and Flint
4. Practical Physics by R K Shukla
5. B.Sc Practical Physics by Harnam Singh

Note: The candidates are required to complete at least 5 practicals.
The Practicals can be added or deleted as per requirement.

Semester-IV

@ PHTC-401

~~GGWPTH401~~

Title: Differential equation waves and optics

Theory
Duration: 3 hours

ExternalExamination: 80 Marks
Internal Examination: 20 marks

The question paper shall be of 80 marks. There shall be 10 questions in the paper with two from each unit and each question shall be of 16 marks. The students have to attempt 5 questions selecting one from each unit.

UNIT- III
DIFFERENTIAL EQUATIONS

Legendre differential equation and its series solution. Legendre polynomial, generating function, orthogonality property, recurrence relations.
Hermite differential equation and its series solution. Hermite polynomial, generating function, orthogonality Property, recurrence relations.

UNIT- II
WAVES

Wave equation in simple and differential form, general solution of wave equation, velocity of transverse waves in a string, velocity of longitudinal waves in a fluid, energy density and intensity of a progressive wave, phase and group velocity, characteristic impedance of a string, reflection and transmissions of transverse waves in a string at boundary (discontinuity), reflection and transmission coefficients, impedance matching.
Superposition principle, stationary/ standing waves on a string of fixed length, Eigen functions, Eigen frequencies, energy of a vibrating string.

UNIT -III
OPTICS-I: INTERFERENCE

Condition for interference, Young's double slit experiment, theory of interference fringes(fringe width), Fresnel's Biprism and its application to the determination of wave length of sodium light, phase change on reflection, thin films (reflected and transmitted cases/systems), Newton's rings, determination of refractive index of liquid and wavelength of monochromatic light. Michelson's interferometer and its application to determination of (i) wave length of monochromatic light (ii) thickness of thin transparent sheet (iii) resolution of spectral lines (iv) Determination of refractive index of glass.

UNIT- IV
OPTICS- II: DIFFRACTION

Fresnel's diffraction, Fresnel's half - period zones, rectilinear propagation of light, zone plate, action of zone plate, diffraction at a Straight edge, rectangular slit and thin wire, Fraunhofer diffraction, one slit diffraction, two slit diffraction, plane transmission grating, determination of wavelength of monochromatic light using grating, width of principal maximum, absent spectra, dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of grating.

UNIT -V
OPTICS -111: POLARIZATION

Polarization by reflection, Brewster's law, Malus Law , Uniaxial and Biaxial crystals, phenomenon of double refraction,. Huygen Theory of double refraction, Nicol prism, quarter wave plate and half wave plate; theory, production and detection of plane, circularly and elliptically polarized light, optical activity, specific rotation, Laurent's half shade polarimeter.

Hint for Examiners/Paper setters

The question paper shall be of 80 marks. There shall be 10 questions in the paper with two from each unit. Each question shall be of 16 marks. The students have to attempt 5 questions, selecting one question from each Unit. In question paper, short answer type questions/ numerical problems up to a maximum of 24 marks will be included. The weightage of short answer type questions and numerical problems should spread over all the units.

Text and Reference Books:

1. Waves and Oscillations, Berkeley Physics course Vol. Ill.
2. The Physics of Vibrations and Waves by H. Pain (Mac, Milian).
3. Vibrations and Waves by French.
4. Optics by Brijlal, Subrahmanyam and MN. Avadhanulu (S. Chand & Co.).
5. Optics by Jenkins & While (McGraw Hill).
6. Waves, Optics and Electronics by K. Sharma (Sharma Publication!).
7. Introduction to Statistical Mechanics by B. B. Laud
8. Statistical Physics by M. Reif.
9. Statistical Physics by K. Haung.
10. Statistical and Thermal Physics by S. Lokanathan and R. S. Gambir.
11. Thermodynamics and Statistical Physics by J.K. Sharma.

GCWPP402

Practical

External Examination: 25 marks
Internal Examination: 25 marks

1. To find Refractive index of 0-ray and E-ray.
2. To find wave length by using Diffraction Grating.
3. To find wave length of Sodium light using Newton's Rings.
4. To find specific rotation of sugar by Polarimeter.
5. Determination of Planck's constant by Photocell.
6. To study the variation of light intensity with distance using Photovoltaic cell. (Inverse square law)
7. To find the coefficient of self inductance by Anderson's method.
8. To find the ionization potential of mercury.
9. To Find the VI-Characteristics of UJT

Reference Books

1. B. Sc Practical Physics by C. L. Arora.
2. Practical Physics by G t. Squires Cambridge, University Press.
3. Advanced Practical Physics for Students by Worsnop and Flint.
4. Practical Physics by R K Shukla.
5. B.Sc Practical Physics by Harnam Singh.

Note: The candidates are required to complete at least 5 practicals.
The Practicals can be added or deleted as per requirement.

U PH-DSE · 501

Semester V

(1)

PHYSICS-DSE:1

Title: QUANTUM MECHANICS & NUCLEAR PHYSICS

(CBCS system)

(Session 2018-19, 2019-20 & 2021-22)

Course Code UPHDSE: 501

(Credits: Theory-04, Practicals-02) **Theory: 60 Lecture**

Internal Examination: 20 Marks
External Examination: 80 Marks

The question paper shall be of 80 marks. There will be **3** sections in the question paper. Section **A** contains 5 short answer type each of 3 marks one from each unit. Section **B** contains 5 medium type answer questions each of 7 marks one from each unit. Section **C** contains 5 long answer type questions each of 15 marks one from each unit.

Note:- Candidate has to attempt all the questions from sections **A&B** and 2 questions from section **C**.

UNIT-I

QUANTUM MECHANICS-I

Limitations of Classical Laws(Qualitative description), Quantum Nature of Radiation(qualitative description), Compton Effect and its Experimental Verification, Wave-Particle duality, Wave Packets, Phase and Group Velocity, Wave Packets and Uncertanity Principle, Applications of Uncertanty Principle (i)Particle in a box, (ii)Electron Diffraction from a single Slit.

Derivation of Shrodinger Equation in time dependent and independent forms. Wave function and its physical Significance, Physical Observables and Operators, Experimental values, Probability Current Density and Continuity Equation.

(12 Lectures)

1 2 3 4 5.

S. Bhattacharya

UNIT-II

(2)

QUANTUM MECHANICS-II

One Dimensional Problems: Solution of Schordinger wave Equation for (i) Particle in a box (ii) Potential Barrier for E>0 and E<0 (Tunneling effect) and (iii) Harmonic Oscillator.

Three dimensional Problems: Schordinger Equation for a Spherically Symmetric Potential in Spherical Polar Cooordinates, its separation in to angular, radial equations using variable separable method, Solution of Radial Equation for Coulomb type of potential, Interpretation of Principal Quantum (n), Solution of equations of Angular part and Interpretation of *l* and m quantum numbers,

(12 Lectures)

UNIT-III

ATOMS IN ELECTRIC AND MAGNETIC FIELD

Frank and Hertz Experiment, Space Quantization, Larmor Precession, Bohr's Correspondence Principle, Electron Spin, Stern Gerlach Experiment, Vector Atom Model (*ls, jj* coupling), Spectroscopic Terms and their notations, Spin-Orbit interaction, Fine Structure of Hydrogen Atom, Normal and Anomalous Zeeman Effect(explanation by Classical and Quantum theory), D1, D2 lines of Sodium Atom, Lande' g factor,

(12 Lectures)

UNIT-IV

NUCLEAR PHYSICS-I

Basic nuclear properties: Nuclear size, Nuclear Density, Packing Fraction, Mass Defect, Binding Energy, Discussion of average Binding Energy Curve, Nuclear stability, Nuclear Spin and Magnetic Moments, Liquid Drop Model of Nucleus, Weizsacker's Semi-Empirical Formula, Nuclear Forces and Their Properties(Qualitative treatment), Discrete nature of α-particle energies, Measurement of velocity of α-particle, Beta particle, Beta particle energy(qualitative only) spectrum, Pauli theory of Neutrino.

(12 Lectures)

UNIT-V

NUCLEAR PHYSICS-II

Elementary particles: Energy Loss of charged particle through matter (qualitative only), Theory of particle detector (GM Counter), Classification of Elementary particles, Strangeness, Baryon Number and Isospin, Parity Quantum Number, Gell Mann Nishizima Scheme, Quark as the basic constituent of matter, quark properties, Quark contents in low lying Baryons and Mesons.

(12 Lectures)

Text & Reference Books

1. Quantum Mechanics by L.I Schiff, Mc Graw Hill Books Company Inc
2. Quantum Mechanics by B.Craseman and J.d.Powell, Addison
3. Concepts of Modern Physics by A. Beiser, Tata McGraw Hill Publication.
4. Atomic Spectra by H.E. White,Tata Mc Graw Hill.
5. Fundamentals of Molecular Spectroscopy, C.N. Banwell and E.M. Mac Cash, TataMcGraw Hill.
6. Atomic Spectra by G.Heizberg.
7. Molecular Spectra and Molecular Structure by G.Heizberg..
8.Nuclear Physics by D.C.Tayal, Himalaya Publishing House.
9.Nuclear Radiation Detector, S.S.Kapoor.
10.Nuclear Physics, Ghoshal.

1. 2. 3. 4.

5. 6.

~~UPHDSE-502~~ (4)

Semester-V
PHYSICS- DSE:2
ELEMENTS OF MODERN PHYSICS
Title :
Course Code UPHTDSE – 502
(CBCS system)

(Session 2018-19, 2019-20 & 2021-22)

(Credits: Theory-04, Practicals-02) **Theory: 60 Lecture**

Internal Examination: 20 Marks
External Examination: 80 Marks

UNIT-I

Planck's quantum, Planck's constant and light as a collection of photons; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment.

(8 Lectures)

Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra.

(4 Lectures)

UNIT-II

Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a particle trajectory; Estimating minimum energy of a confined using uncertainty principle; Energy-time uncertainty principle.

(4 Lectures)

1. 2. 3. 4.

5. 6.

Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles; Momentum and Energy operators; stationary states; physical interpretation of wavefunction, probabilities and normalization; Probability and probability current densities in one dimension.

(8 Lectures)

UNIT- III

One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; Quantum dot as an example; Quantum mechanical scattering and tunnelling in one dimension - across a step potential and across a rectangular potential barrier **(12 Lectures)**

UNIT-IV

Size and structure of atomic nucleus and its relation with atomic weight; Size Measurement of Nuclear Radius by Electron Scattering method and Mirror Nuclei method, Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy.

(12 Lectures)

UNIT-V

Radioactivity: stability of nucleus; Law of radioactive decay; α decay; β decay - energy released, spectrum and Pauli's prediction of neutrino; γ-ray emission.

Fission and fusion - mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions.

(12 Lectures)

Reference Books:

- Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
- Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A.Dubson,2009, PHI Learning
- Six Ideas that Shaped Physics: Particle Behave like Waves, Thomas A. Moore, 2003, McGraw Hill
- Quantum Physics, Berkeley Physics Course Vol.4, E.H. Wichman, 2008, Tata McGraw-Hill Co.
- Modern Physics, R.A. Serway, C.J. Moses, and C.A.Moyer, 2005, Cengage Learning
- Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill

Sem-V

~~GCWPHTC502~~

UPHPDSE-501

PRACTICAL

External Examination: 25 marks
Internal Examination: 25 marks

1. To study Zener Diode Voltage regulating characteristics.
2. To study the ripple factor and efficiency of Half Wave Rectifier with L-type and pie type filter circuits.
3. To study the ripple factor and efficiency of Full Wave Rectifier with L-type and pie type filter circuits.
4. To study various logic gates viz: OR, ,NOT,NAND and NOR using diodes and Transistors.
5. To study the voltage gain and frequency response of Two stage RC-Coupled Transistor Amplifier.
6. To find the refractive index of the material of given Prism by using Brewster'Law.
7. To find the wavelength of light from the given source using Michelson's Interferrometer.
8. To study the VI characteristics of Unijunction Transistor.s

Reference Books

1. B. Sc Practical Physics by C. L. Arora.
2. Practical Physics by Squires Cambridge University Press.
3. Advanced Practical Physics for Students by Worsnop and Flint.
4. Practical Physics by R K Shukla.
5. B.Sc Practical Physics by Harnam Singh and Dr.P.S.Hemne.

Note: The candidates are required to complete at least 5 practicals

~~PH-SEC-3~~

~~UPH-SEC-501~~

UPHTS-501

B.Sc. Sem-V

(8)

SEC:BASIC INSTRUMENTATION SKILLS

(Credits: 04) **Theory: 60Lectures**

Internal Examination: 20 Marks

External Examination: 80 Marks

Note: A candidate has to attempt 05 short answer questions each of 03 marks, 05 medium answer type questions each of 07 marks and 02 long answer types question each of 15 marks out of five questions, covering whole syllabus.

Unit-I

Basic of Measurement:

Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance. **(4 Lectures)**

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. **AC millivoltmeter:** Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance. **(8 Lectures)**

Unit-II

Cathode Ray **Oscilloscope:** Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. **(8 Lectures)**

Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working. **(4 Lectures)**

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Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

(5 Lectures)

Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges.

(7 Lectures)

Unit-IV

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

(5 Lectures)

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/frequency counter, time- base stability, accuracy and resolution. **(7 Lectures)**

Reference Books:

- A text book in Electrical Technology - B L Theraja - S Chand and Co.
- Performance and design of AC machines - M G Say ELBS Edn.
- Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
- Logic circuit design, Shimon P. Vingron, 2012, Springer.
- Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
- Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012. Tata Mc-Graw Hill
- Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Spring

UPHTGE - 501

(10)

Papers Generic Elective (GE) (Minor-Physics) for other Departments/Disciplines (Credit :06)

Semester V (CBCS)

MECHANICS & SPACE COMMUNICATION

(Credits: Theory-04, Practicals-02) **Theory: 60**
Lecture

Internal Examination: 20 Marks
External Examination: 80 Marks

The question paper shall be of 80 marks. There will be **3** sections in the question paper. Section **A** contains 5 short answer type each of 3 marks one from each unit. Section **B** contains 5 medium type answer questions each of 7 marks one from each unit. Section **C** contains 5 long answer type questions each of 15 marks one from each unit.

Note:- Candidate has to attempt all the questions from sections **A&B** and 2 questions from section **C**.

UNIT-I

Vectors: Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter.

Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.

(6 Lectures)

Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass.

Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets. **(6 Lectures)**

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UNIT:II

(11)

Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum.

(4 Lectures)

Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellite in circular orbit and applications. Geosynchronous orbits. Basic idea of global positioning system (GPS). Weightlessness. Physiological effects on astronauts.

(8 Lectures)

UNIT:III

Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages.Damped-oscillations.

(6 Lectures)

Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Twin paradox

(6 Lectures)

UNIT:IV

Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion – Torsional pendulum-Determination of Rigidity modulus and moment of inertia.

(12 Lectures)

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UNIT:V

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SPACE COMMUNICATION: Transmission medium or communication channel, Antenna: Types, Modulation and its types, Demodulation.
INTERNET: Basic idea, working applications, Mobile telephone.
Modes of Space Communication, Ground Wave or Surface wave propagation, Sky or Ionosphere wave propagation, Space wave propagation, Satellite communication.

Note: *Students are not familiar with vector calculus. Hence all examples involve differentiation either in one dimension or with respect to the radial coordinate*

Reference Books:

- University Physics. F.W. Sears, M.W. Zemansky and H.D. Young, 13/e. 1986. Addison-Wesley
- Mechanics Berkeley Physics, v.1: Charles Kittel, et. al. 2007, Tata McGraw-Hill.
- Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

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PHYSICS LAB: GE LAB: MECHANICS

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To determine the Moment of Inertia of a Flywheel.
3. To determine the Young's Modulus of a Wire by bending beam Method.
4. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
5. To determine the Elastic Constants of a Wire by Searle's method.
6. To determine g by Bar Pendulum.
7. To determine g by Kater's Pendulum.
8. To study the Motion of a Spring and calculate (a) Spring Constant, (b) g.

Reference Books:

- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Additional Books for Reference

- Quantum Mechanics, Eugen Merzbacher, 2004, John Wiley and Sons, Inc.
- Introduction to Quantum Mechanics, David J. Griffith, 2nd Ed. 2005, Pearson Education
- Quantum Mechanics, Walter Greiner, 4thEdn., 2001, Springer

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Semester VI

PHYSICS-DSE:1 UPHTDSE 6.1

Title: **SOLID STATE PHYSICS AND QUANTUM OPTICS**

(CBCS system)

(Session 2018-19, 2019-20 & 2021-22)

(Credits: Theory-04, Practicals-02) **Theory: 60 Lecture**

Internal Examination: 20 Marks
External Examination: 80 Marks

The question paper shall be of 80 marks. There will be **3** sections in the question paper. Section **A** contains 5 short answer type each of 3 marks one from each unit. Section **B** contains 5 medium type answer questions each of 7 marks one from each unit. Section **C** contains 5 long answer type questions each of 15 marks one from each unit.

Note:- Candidate has to attempt all the questions from sections **A&B** and 2 questions from section **C**.

Unit I

Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice TranslationVectors. Lattice with a Basis, Symmetry elements . Unit Cell. Miller Indices. Reciprocal Lattice and its application to simple cubic, bcc and fcc, Brillouin Zones, Diffraction of X-rays by Crystals(Bragg's Law). Laue' theory of X-ray diffraction,

(12 Lectures)

Unit II

Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomicand Diatomic Chains. Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solids. Specific heat of Solids, Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T^3 law.

1. 2. 3. 4.
5. 6.

Superconductivity: Meissner effect, Type I and Type II superconductors, BCS theory (elementary idea) **(12Lectures)**

Unit III

Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials.Classical Langevin Theory of dia – and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss. **(12 Lectures)**

Unit IV

Quantum optics-Electric dipole, Retarted potentials, Oscillating electric dipole, Wave mechanical explanation of photon emission, Raman effect-classical and quantum mechanical explanation, properties of spectral lines, Luminescence.

Optical fibres: Optical fibres and Principle of light propagation through a fibre, The numerical aperture, Single mode and multimode fibres, Advantages and applications of optical fibres.

(12 Lectures)

Unit V

LASER: Attenuation of light in an optical medium, Thermal equilibrium, Interaction of light with matter, (absorption, spontaneous, Einsteins prediction, stimulated emission), Einstein's relations, light amplification, Population inversion, pumping, Principal pumping schemes (three and four levels), Optical resonant cavity, Condition for laser action, He-Ne laser, Semiconductor lasers, characteristics and applications of lasers. **(12 Lectures)**

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Reference Books:

- Introduction to Solid State Physics, Charles Kittel, 8th Ed., 2004, Wiley India Pvt. Ltd.
- Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India
- Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill
- Solid State Physics, Neil W. Ashcroft and N. David Mermin, 1976, Cengage Learning
- Solid State Physics, Rita John, 2014, McGraw Hill

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Semester VI

PHYSICS-DSE:2 UPHTDSE-6

Title:

NUCLEAR AND PARTICLE PHYSICS

UNIT-I

General Properties of Nuclei: Constituents of nucleus and their Intrinsic properties, quantitative facts about size, mass, charge density (matter energy), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments, nuclear excites states. **(12 Lectures)**

UNIT-II

Nuclear Models: Liquid drop model approach, semi empirical mass formula and significance of various terms, condition of nuclear stability. Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.

(12 Lectures)

UNIT-III

Radioactivity decay:(a) Alpha decay: basics of α-decay processes, theory of α-emission, Gamow factor, Geiger Nuttall law, α-decay spectroscopy. (b) β-decay: energy kinematics for β-decay, positron emission, electron capture, neutrino hypothesis. (c) Gamma decay: Gamma rays emission & kinematics, internal conversion.

(12 Lectures)

UNIT-IV

Interaction of Nuclear Radiation with matter: Energy loss due to ionization (Bethe-Block formula), energy loss of electrons, Cerenkov radiation, Gamma ray interaction through matter, photoelectric effect, Compton scattering, pair production, neutron interaction with matter.

(8 Lectures)

Particle Accelerators: Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator), Linear accelerator, Cyclotron, Synchrotrons.

(4 Lectures)

UNIT-V

Particle physics: Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons.

(12 Lectures)

Reference Books

- Introductory nuclear Physics by Kenneth S. Krane (Wiley India Pvt. Ltd., 2008).
- Concepts of nuclear physics by Bernard L. Cohen. (Tata Mcgraw Hill, 1998).
- Introduction to the physics of nuclei & particles, R.A. Dunlap. (Thomson Asia, 2004)
- Introduction to Elementary Particles, D. Griffith, John Wiley & Sons
- Quarks and Leptons, F. Halzen and A.D. Martin, Wiley India, New Delhi
- Basic ideas and concepts in Nuclear Physics - An Introductory Approach by K. Heyde (IOP- Institute of Physics Publishing, 2004).
- Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000).
- Theoretical Nuclear Physics, J.M. Blatt & V.F.Weisskopf (Dover Pub.Inc., 1991)

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Sem-VI

~~GCWPHTC602~~

UPHPADSE – 602

PRACTICAL **External Examination:**
25 marks

25 marks **Internal Examination:**

1. To plot a graph between current and frequency in a series LCR circuit and to find the resonant frequency, Quality factor and Bandwidth of a series Resonant circuit.
2. To plot a graph between current and frequency in a Parallel LCR circuit and to find the resonant frequency, Quality factor and Bandwidth of a Parallel Resonant circuit.
3. To study the inverting and non-inverting operational amplifier.
4. To find the dispersive power of the material of prism using mercury vapour lamp.
5. To study the Hartley Oscillator and determine the frequency of oscillator generated by it.
6. To study the Colpitt Oscillator and find the frequency of oscillator by using CRO.
7. To determine the value of e/m for electron by long solenoid (Helical) method.
8. To study the VI characteristics of Field effect Transistor.

Reference Books

1. B. Sc Practical Physics by C. L. Arora.
2. Practical Physics by Squires Cambridge University Press.
3. Advanced Practical Physics for Students by Worsnop and Flint.
4. Practical Physics by R K Shukla.

(20)

B.Sc. Sem-VI UPHTSEC-601

Title; **SEC:WEATHER FORECASTING**

(Credits: 04) **Theory: 60Lectures**

Internal Examination: 20 Marks
External Examination: 80 Marks

Note: A candidate has to attempt 05 short answer questions each of 03 marks, 05 medium answer type questions each of 07 marks and 02 long answer types question each of 15 marks out of five questions, covering whole syllabus.

Unit I

Introduction to atmosphere: Elementary idea of atmosphere: physical structure andcomposition; compositional layering of the atmosphere; variation of pressure and temperature with height; air temperature; requirements to measure air temperature; temperature sensors: types; atmospheric pressure: its measurement; cyclones andanticyclones: its characteristics. **(15 Periods)**

Unit II

Measuring the weather: Wind; forces acting to produce wind; wind speed direction: units, its direction; measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws. **(9 Periods)**

Weather systems: Global wind systems; air masses and fronts: classifications; jetstreams; local thunderstorms; tropical cyclones: classification; tornadoes; hurricanes. **(6 Periods)**

Unit III

Climate and Climate Change: Climate: its classification; causes of climate change;global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain,environmental issues related to climate.

(15Periods)

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Unit IV

Basics of weather forecasting: Weather forecasting: analysis and its historicalbackground; need of measuring weather; types of weather forecasting; weather forecasting methods; criteria of choosing weather station; basics of choosing site and exposure; satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts.

(15 Periods)

Note:- Practicals /Visit to weather Observatory Lab

Reference books:

- Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books
- The weather Observers Hand book, Stephen Burt, 2012, Cambridge University Press.
- Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.
- Text Book of Agrometeorology, S.R. Ghadekar, 2005, Agromet Publishers, Nagpur.
- Why the weather, Charls Franklin Brooks, 1924, Chpraman & Hall, London.
- Atmosphere and Ocean, John G. Harvey, 1995, The Artemis Press

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Demonstrations and Experiments:

1. Study of synoptic charts & weather reports, working principle of weather station.
2. Processing and analysis of weather data:
   To calculate the sunniest time of the year.

   (a) To study the variation of rainfall amount and intensity by wind direction.

   (b) To observe the sunniest/driest day of the week.

   (c) To examine the maximum and minimum temperature throughout the year.

   (d) To evaluate the relative humidity of the day.

   (e) To examine the rainfall amount month wise.
3. Exercises in chart reading: Plotting of constant pressure charts, surfaces charts, upper wind charts and its analysis.
4. Formats and elements in different types of weather forecasts/ warning (both aviation and non aviation)

Generic Elective paper for BSc. Semester VI (CBCS system)

Title **Electricity And Magnetism**

Course Code: UPHTGE – 601

(Credits: Theory-04, Practicals-02)
Theory: 60 Lecture

Internal Examination: 20 Marks
External Examination: 80 Marks

The question paper shall be of 80 marks. There will be **3** sections in the question paper. Section **A** contains 5 short answer type each of 3 marks one from each unit. Section **B** contains 5 medium type answer questions each of 7 marks one from each unit. Section **C** contains 5 long answer type questions each of 15 marks one from each unit.

Note:- Candidate has to attempt all the questions from sections **A&B** and 2 questions from section **C**.

UNIT I

Vector Analysis: Scalar and Vector product, gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only). **(12 Lectures)**

UNIT II

Electrostatics-I : Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- field due to point charge, infinite line of charge, uniformly charged spherical Electric shell and solid sphere, infinite plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, Calculation of electric field from potential. **(12 Lectures)**

UNIT III

Electrostatics-II : Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field.

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5. 6.

Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

(12 Lectures)

UNIT IV

Magnetism: Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Ampere's circuital law.

Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para-and ferro-magnetic materials.

(12Lectures)

Unit V

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.

Maxwell`s equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, electromagnetic wave propagation through vacuum, Tranverse nature of em waves.

(12 Lectures)

Reference Books:

- Electricity and Magnetism. Edward M. Purcell, 1986, McGraw-Hill Education
- Electricity & Magnetism. J.H. Fewkes & J.Yarwood. Vol. I, 1991, Oxford Univ. Press
- Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
- D.J.Griffiths. Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.

GE LAB: ELECTRICITY AND MAGNETISM

UPHPGGE – 601

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages,
   (c) AC and DC Current, and
2. To compare capacitances using De'Sauty's bridge.
3. Measurement of field strength B and its variation with distance along the axis of a circular coil carrying current
4. To study the Characteristics of a Series RC Circuit.
5. To study a series LCR circuit LCR circuit and determine its
   (a) Resonant frequency, (b) Quality factor
6. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and
   (b) Quality factor Q
7. To determine a Low Resistance by Carey Foster's Bridge.

Reference Books

- Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Ed.2011, Kitab Mahal

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