Scheme of B. Sc. Physics

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	PHY-1T	Mechanics	Theory	4	50	17
	PHY-2T	Electricity and Magnetism	Theory	4	50	17
	PHY-1P	LAB 1: Mechanics, Electricity and Magnetism	Practical	2	50	17
Second year	PHY-3T	Thermal Physics and Statistical Mechanics	Theory	4	50	17
	PHY-4T	Waves and Optics	Theory	4	50	17
	PHY-2P	LAB 2: Thermal Physics, Statistical Mechanics, Waves and Optics	Practical	2	50	17
Third year	PHY-5T	Digital and Analog Circuits and Instruments	Theory	4	50	17
	PHY-6T	Elements of Modern Physics	Theory	4	50	17
	PHY-3P	LAB 3: Digital and Analog Circuits and Instruments, Modern Physics	Practical	2	50	17

Note: There shall be four extra credits in all the years of under graduation for internship/apprenticeship. The certificate of extra credits would be provided by the university concern.

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc.**	Year: **First**	Session: **2022-2023**
1	Course Code	**PHY 1P**		
2	Course Title	**LAB 1: Mechanics, Electricity and Magnetism**		
3	Course Type	**Practical**		
4	Pre-requisite (if any)	NO		
5	Course Learning Outcomes (CLO)	**Expected Outcomes:** • To get knowledge about the use of various measuring instruments. • To get understanding about the simple harmonic motion, elasticity, surface tension and viscosity. • Students will be able to understand applications of basic principle of Electricity and Magnetism theory in real world.		
6	**Credit Value**	**Practical : 2**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course	
	Total Lectures: 30
Tentative Practical List	At least 14 experiments from the following: 1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope. 2. To study the random error in observations.

	3. To study the motion of the spring and calculate (a) Spring constant and, (b) g. 4. To determine the Moment of Inertia of a Flywheel. 5. To determine g and velocity for a freely falling body using Digital Timing Technique. 6. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method). 7. To determine the Young's Modulus of a Wire by Optical Lever Method. 8. To determine the Modulus of Rigidity of a Wire by Maxwell's needle. 9. To determine the elastic constants of a wire by Searle's method. 10. To determine the value of g using Bar Pendulum. 11.To determine the value of g using Kater's Pendulum. 12. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c)DC Current, and (d) checking electrical fuses. 13. To compare capacitances using De'Sauty's bridge. 14. Measurement of field strength B and its variation in a Solenoid (DeterminedB/dx). 15. To study the Characteristics of a Series RC Circuit. 16.To study the ı series LCR circuit and determine its (a) Resonant Frequency, (b)Quality Factor. 17. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q. 18. To determine a Low Resistance by Carey Foster's Bridge. 19. To verify the Thevenin and Norton theorem. 20. To verify the Superposition, and Maximum Power Transfer Theorem.

Part C - Learning Resource
Text Books, Reference Books, Other Resources
Reference Books: 1. Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House. 2. Engineering Practical Physics, S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd. 3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi. **Link for e-Books for Physics:**

Physics Practical: https://www.uou.ac.in/sites//default/files/slm/BSCPH-104.pdf		
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Continuous Comprehensive Evaluation (CCE): As per University Guideline University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	As per University Guideline

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17/ Dr. Vikas Gulhare, Govt. G.N.A. P.G. College, Bhathapara -- Member

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc.**	Year: **First**	Session: **2022-2023**
1	Course Code	**PHY – 1T**		
2	Course Title	**MECHANICS**		
3	Course Type	**Theory**		
4	Pre-requisite (if any)	No		
5	Course Learning Outcomes (CLO)	**After completion of the course students will be able to:** • Get knowledge about the vectors and differential equations used in physics. • Get an idea of different types of motions and conservation laws. • Get an idea about rotational motion and various properties of matter like elasticity and viscosity. • Understand various types of oscillatory motion and GPS system. • Get an idea about Frame of reference and special theory of relativity. • Solve numerical problems based on entire syllabus.		
6	**Credit Value**	**Theory : 4**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course		
Total Periods: 60		
Unit	**Topic**	**Number of Periods**
I	**Vectors**: Vector algebra, Derivatives of a vector with respect to a parameter, Scalar and vector products of two, three and four vectors, Gradient, divergence and curl of vectors fields, Polar and Axial vectors. **Ordinary Differential Equations:** 1st order homogeneous differential equations, exact and non-exact differential equations, 2nd order homogeneous and nonhomogeneous differential equations with constant coefficients (Operator Method Only).	12
II	**Laws of Motion:** Review of Newton's Laws of motion. Dynamics of a system of particles, Concept of Centre of Mass, determination of center of mass for discrete and continuous systems having cylindrical and spherical symmetry. **Work and Energy:** Motion of rocket, Work-Energy theorem for conservative forces, Force as a gradient of Potential Energy, Conservation of momentum	12

	and energy, Elastic and in-elastic Collisions.	
III	**Rotational Dynamics:** Angular velocity, Angular momentum, Torque, Conservation of angular momentum, Moment of Inertia, Theorem of parallel and perpendicular axes (statements only), Calculation of Moment of Inertia of discrete and continuous objects (rod, disc, cylinder, solid sphere). **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 modules, Elementary idea of Surface tension and Viscosity, flow of fluids, coefficient of viscosity, Stoke's law, expression for terminal velocity, wetting.	12
IV	**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 (statements only), Satellite in circular orbit and applications, Geosynchronous orbits. **Oscillations:** Simple harmonic motion, Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Compound pendulum, Differential equations of damped oscillations and forced oscillations (Conceptual only).	12
V	**Special Theory of Relativity:** Frame of reference, Galilean Transformations, Inertial and Non-inertial frames, Outcomes of Michelson Morley's Experiment, Postulates of Special Theory of Relativity, Length contraction, Time dilation, Relativistic transformation of velocity, Relativistic variation of mass, Mass-energy equivalence, Transformation of Energy and Momentum.	12

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Reference Books:

1. University Physics. FW Sears, MW Zemansky & HD Young 13/e, 1986.AddisonWesley
2. Mechanics Berkeley Physics course, v.1:Charles Kittel, et.al. 2007, Tata McGrawHill
3. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley
4. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

Link for e-Books for Physics:

1. *All e-books of physics* https://www.e-booksdirectory.com/listing.php?category=2
2. *Free physics text book in PDF* https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0

Kma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE

3. *Cambridge University Books for Physics https://www.cambridgeindia.org/*
4. *Books for solving physics problems https://bookboon.com/en/physics-ebooks*

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Min Marks : 17
Continuous Comprehensive Evaluation (CCE): As per University Guideline
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	As per University Guideline

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Part A: Introduction				
Program: **Practical Course**		Class: **B.Sc.**	Year: **Second**	Session: **2022-2023**
1	Course Code	**PHY – 2P**		
2	Course Title	LAB 2: Thermal Physics, Statistical Mechanics, Waves and Optics		
3	Course Type	**Practical**		
4	Pre-requisite (if any)	No		
5	Course Learning Outcomes (CLO)	**Expected Outcomes: -** • Students able to get working knowledge of laws and methods of thermodynamics and elementary statistical mechanics and to use this knowledge students can explore various application related to physics of condensed matter. • Students experience experimental evidence of laws of wave optics and how light has wave nature is confirmed through experiment.		
6	**Credit Value**	**2**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course	
Total Lectures: 30	
Tentative Practical List	Any 14 practical from the following 1. To determine the thermal conductivity of a non-conducting material by Lee's disc method. 2. To determine the specific rotation of sugar solution with the help of polarimeter. 3. To verify Newton's law of cooling. 4. To study binomial distribution law of probability using 4 coins. 5. To determin e the frequency of electric generator by Melde's experiment. 6. To determine the coefficient of thermal conductivity(k) by rubber tubing method. 7. To study the heat efficiency of an electric kettle with varying voltage. 8. To determine the frequency of A.C. mains using sonometer. 9. To determine the ratio of specific heat at constant pressure and constant volume ($\gamma=C_p/C_v$) of air Clement and Desorme's method. 10. To study the variation of thermos-Emf of thermos couple with Difference of Temperature of its Two Junctions. 11. To determine the refractive index of the material of the prism with the help of spectrometer. 12. To determine the radius of curvature of a plano-convex lens by Newton's circular ring method. 13. To find out wavelength of monochromatic light source with the help of Newton's Ring. 14. To determine the wavelength of laser light by diffraction grating. 15. To determine the resolving power of a telescope. 16. To determine the resolving power of a plane diffraction grating. 17. To determine the wavelength of monochromatic light source by

	single slit diffraction. 18. To determine the dispersive power of the prism with the help of spectrometer. 19. To determine the refractive index of ordinary and extra-ordinary rays for the calcite prism using spectrometer. 20. To determine the refractive index of water using laser light and photocell.

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Reference Books:

1. Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, AsiaPublishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition,2011, Kitab Mahal, New Delhi.
4. A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal,1985, Vani Publication.

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50

Continuous Comprehensive Evaluation (CCE): As per University Guideline

University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Class Test/Assignment/Presentation	As per University Guideline

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Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc.**	Year: **First**	Session: **2022-2023**
1	Course Code	**PHY – 2T**		
2	Course Title	**ELECTRICITY AND MAGNETISM**		
3	Course Type	**Theory**		
4	Pre-requisite (if any)	No		
5	Course Learning Outcomes (CLO)	**After completion of the course students will be able to –** • Get knowledge about the vectors analysis and able to apply in electrostatic and Magnetostatics. • Get idea about electric fields, force and potential. • Get idea about Dielectric and Electric currents and also the application in AC circuits. • Get idea about Magnetic properties of material. • To get idea about Electromagnetic Induction and Maxwell's equation and Electromagnetic wave propagation. • Solve numerical problems based on entire syllabus.		
6	**Credit Value**	**Theory : 4**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course		
Total Periods: 60		
Unit	Topic	Number of Periods
I	**Vector Analysis**: Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors and its application in electrostatics and magnetostatics.	12
II	**Electrostatics:** Electrostatic Field, electric flux, Gauss's theorem of electrostatics, Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere, Calculation of electric field from potential, Capacitance of an isolated spherical conductor, Parallel plate, spherical and cylindrical condenser, Energy per unit volume in electrostatic field.	12

III	**Dielectric & Electric Currents:** Dielectric medium, Polarisation, Displacement vector, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric. Steady current, current density J, non – steady current an ontinuity equation, Kirchoff's law (statement only), Ideal constant – voltage and constant – current sources, Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem and maximum power transfer theorem, Rise and decay of current in LR, CR, LCR circuits.	12
IV	**Magnetism:** Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law, Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, Brief introduction of dia, para and ferro-magnetic materials.	12
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, Wave equation in free space.	12

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Reference Books:

1. Vector analysis – Schaum's Outline, M.R. Spiegel, S. Lipschutz, D. Spellman, 2nd Edn., 2009, McGraw- Hill Education.
2. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
3. Electricity & Magnetism, J.H. Fewkes & J.Yarwood. Vol. I, 1991, Oxford Univ. Press
4. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
6. D.J.Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.

Link for e-Books for Physics:

1. *All e-books of physics* https://www.e-booksdirectory.com/listing.php?category=2
2. *Free physics text book in PDF* https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0Kma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE
3. *Cambridge University Books for Physics* https://www.cambridgeindia.org/
4. *Books for solving physics problems* https://bookboon.com/en/physics-ebooks

Part D: **Assessment and Evaluation**		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Min Marks: 17 Continuous Comprehensive Evaluation (CCE): As per University Guideline University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	As per University Guideline

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Part A :Introduction				
Program: **Degree Course**		Class: **B.Sc. III year**	Year: **2024** Third Year	Session: **2024-25**
1	Course Code	**PHY- 3 P**		
2	Course Title	LAB 3		
3	Course Type	Practical		
4	Pre-requisite (if any)	NO		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Understand the working of semiconductor diode, LED, transistor, and their characteristics • Understand the working of rectifier, filter, regulator etc. • Understand the function of Zener diode as voltage regulator • Gain knowledge about amplifier and logic gates,		
6	Credit Value	Practical : 2		
7	Total Marks	**Max. Marks: 50**	**Min. Passing Marks: 17**	

Part B: Content of the Course
Total No. of Lectures: 60
Experiments
At least 12 experiments from the following or other experiments of equal standards 1. To study IV characteristics of p n junction diode, Zener diode and LED 2. To study the characteristics of p n p and n p n transistor in CE configuration 3. To study the characteristics of p n p and n p n transistor in CB configuration 4. To study regulated power supply and determination of ripple factor and voltage regulation factor 5. To draw and study the frequency response curve of two stage RC coupled amplifier 6. To design and study the CE amplifier of a given gain using voltage divider biasing circuit 7. To measure voltage and frequency of a periodic waveform using a CRO 8. To design and study Wein Bridge Oscillator 9. To design and verify the truth table of AND, OR, NOT AND XOR gates 10. To determine Boltzmann constant using I-V characteristics of p n diode 11. To determine function of material of filament of directly heated vacuum diode valve 12. To determine Planck's constant using LEDs of at least four different colors 13. To determine ionization potential of mercury 14. To measure the susceptibility of paramagnetic solution (Quinke's method) 15. To draw the B-H curve of iron using a solenoid and determine the energy loss from hysteresis 16. To measure the resistivity of semiconductor (Ge) crystal with temperature by four probe method and to determine its band gap 17. To determine the Hall coefficient of a semiconductor sample 18. To study the photo electric effect by drawing photo current versus intensity curve and to determine the wavelength of light 19. To study the diffraction pattern of a single and double slit using laser source 20. To study Half adder, Full adder and 4-bit binary adder 21. Study of adder, subtractor using full adder IC 22. To minimize a given logic circuit

Part C: Learning Resources
Text Books, Reference Books, Other Resources

Suggested Readings:

- Basic Electronics- A Text Lab Manual, P.B. Zbar, A.P. Malvino, M. A. Miller, 1994,Tata Mc Graw Hill
- Electronics: Fundamentals and Applications, J. D. Ryder, 2004, Prentice Hall of India
- Electronic Principles, A.P. Malvino,2008, Tata Mc Graw Hill
- Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
- Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata Mc-Graw Hill.
- Microelectronic Circuits, M.H. Rashid, 2ndEdn.,2011, Cengage Learning.
- Modern Electronic Instrumentation & Measurement Tech., Helfrick&Cooper,1990, PHI Learning
- Digital Principles & Applications, A.P. Malvino, D.P. Leach & Saha, 7th Ed.,2011, Tata McGraw Hill
- Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
- Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.
- OP-AMP and Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd.
- e-Resources:
  https://link.springer.com
  https://web.pdx.edu
  https://yooktal.in
  https://www.bookfobia.com.av
  https://www.nhbs.com

Part D: Assessment and Evaluation
Suggested Continuous Evaluation Method:
Maximum Marks: 50
Continuous Comprehensive Evaluation(CCE): Not Applicable
University Exam. (UE): 50 Marks

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Part A: Introduction				
Program: **Diploma**		Class: **B.Sc.**	Year: **Second**	Session: **2022-2023**
1	Course Code	**PHY – 3T**		
2	Course Title	**THERMAL PHYSICS AND STATISTICAL MECHANICS**		
3	Course Type	**Theory**		
4	Pre-requisite (if any)	No		
5	Course Learning Outcomes (CLO)	**After completion of the course students will be able to :** • Understand the relations between heat, work, temperature, and energy. • Understand how the thermal energy in a system change and perform useful work on its surroundings. • Understand the interrelationship between thermodynamic functions and ability to use such relationships to solve practical problems. • Get the understanding about black body radiation. • Get the introductory knowledge of statistical mechanics • Solve numerical problems based on entire syllabus		
6	**Credit Value**	**4**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks: 17**	

Part B: Content of the Course		
Total number of Periods: 60		
Unit	Topic	Number of Periods
I	**Laws of Thermodynamics:** **Thermodynamic Description of system**: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, various Thermodynamical Processes, Work Done during Isothermal and Adiabatic Processes, Reversible & irreversible processes. Second law of thermodynamics & Entropy, Carnot's cycle, Carnot's theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics.	12
II	**Thermodynamic Potentials:** Internal Energy, Enthalpy, Helmholtz Free Energy and Gibbs function. Maxwell's relations & applications, Clausius- Clapeyron Equation, Expression for $(C_P - C_V)$, C_P/C_V, TdS equations, Thermodynamic energy equation- change in internal energy of an ideal and Vander Waal's gas, Joule-Thompson Effect, Cooling by adiabatic demagnetization	12
III	**Kinetic Theory of Gases:** Maxwellian distribution of speeds in an ideal gas: distribution of speeds and velocities, experimental verification, distinction between mean, rms and most probable speed values, Moleculer Collision and Mean Free Path ,Transport Phenomena in gases: Viscosity, Conduction and Diffusion, Law of equipartition of energy.	12
IV	**Theory of Radiation:** Blackbody radiation, Spectral distribution, Concept of Energy Density, Stefan Boltzmann Law, Newton's law of cooling from Stefan Boltzmann's law. Wien's displacement law and Rayleigh-Jeans Law (Only qualitative).Planck's radiation Law, Deduction of Wien's distribution law and Rayleigh- Jeans Law from Planck's law. Experimental verification	12

	of Planck's radiation law.	
V	**Statistical Mechanics:** Introductory Idea, Phase space, Macro-state and Microstate, Entropy andThermodynamic probability, fundamental postulates of statistical mechanics. Boltzmann's Canonical Distribution Law. Maxwell-Boltzmann distribution law, Quantum statistics - Fermi-Dirac distribution law and its application for Fermi Levels and Fermi Energy, Bose-Einstein distribution law and its application for Liquid Helium, comparison of three statistics.	12

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Reference Books:

1. Heat and Thermodynamics, M.W.Zemasky and R. Dittman, 1981, McGraw Hill
2. Heat and Thermodynamics, Enrico Fermi, 1956, Courier Dover Publications.
3. Heat and Thermodynamics: Singhal, Agrawal and Satya Prakash, Pragati Prakashan 1984
4. A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1969, Indian Press.
5. Physics (Part-2): Editor, Prof. B.P.Chandra, M.P. Hindi Granth Academy
6. Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears & G.L.Salinger. 1988, Narosa
7. Introduction to Statistical Mechanics: B.B.laud, New age International Publications Second Edition
8. Statistical Mechanics : R.K. Pathria and Paul D.Beale, ELSEVIER ,Fourth Edition,

Link for e-resources:

1. Basics of thermodynamics ***https://www.youtube.com/watch?v=9GMBpZZtjXM&list=PLD8E646BAB3366BC8***
2. Thermodynamics ***https://www.youtube.com/watch?v=E9cOAMhFUz0***
3. Second law of thermodynamics ***https://www.youtube.com/watch?v=F_flGosPY8o***
4. Introduction of statistical mechanics ***https://www.youtube.com/watch?v=N7ykXugu3D0&list=PLZbgNdSTyWDYtZXp9DN9mGP1sNAjPNGgO***
5. Basic of statistical mechnics ***https://www.youtube.com/watch?v=M4nvGS30b-s&list=PLuBpI7LKkMlGolbgdfvtzMTR2l4hdQv-r***
6. Classical Statistical Mechanics https://youtu.be/XIXQ38JnF0k
7. Bose-Einstein Statistics https://youtu.be/1aHFG7VLr-g

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50

Continuous Comprehensive Evaluation (CCE): As per University Guideline

University Exam (UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	As per University Guideline

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Part A: Introduction				
Program: **Diploma**		Class: **B.Sc.**	Year: **Second**	Session: **2022-2023**
1	Course Code	**PHY – 4T**		
2	Course Title	**WAVE AND OPTICS**		
3	Course Type	**Theory**		
4	Pre-requisite (if any)	No		
5	Course Learning Outcomes (CLO)	On successful completion of this course students will: • Solve wave equation and understand significance of transverse waves • Acquire skills to identify and apply formulas of optics and wave physics • Understand the properties of light like interference, diffraction and polarization • Understand the applications of interference in design and working of interferometers. • Understand the resolving power of grating • Get knowledge about laser and its application. • Solve numerical problems based on entire syllabus		
6	**Credit Value**	**Theory: 4**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks: 17**	

Part B: Content of the Course		
Total number of Periods: 60		
Unit	Topics	Number of Periods
1	**Waves in Medium:** Speed of transverse waves on uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves. Group velocity and phase velocity and relationship between them. Reflection, refraction and diffraction of sound: Acoustic impedance of a medium, percentage reflection & refraction at a boundary, diffraction of sound, principle of a sonar system.	12
2	**Interference:** Interference: Division of amplitude and division of wavefront. Young's Double Slit experiment. Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index. Michelson's Interferometer: Formation of fringes, Determination of wavelength, Wavelength difference.	12
3	**Diffraction:** Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. Fraunhofer diffraction: Single slit, Double slit. Multiple slits &Plane	12

	Diffraction Grating, Resolving Power of Grating.	
4	**Polarization:** Polarized light and its mathematical representation, Electromagnetic theory of double refraction, Nicol Prism, Double image prism, Polaroid, Phase retardation plates, Circular and elliptical polarization. Polarization by double refraction and Huygens's theory, Rotation of plane of polarization, Biquartz polarimeter.	12
5	**LASER:** Basic properties of LASERs, 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, He-Ne Laser and Semiconductor Laser, Application of Laser in communication and Holography. .	12

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Reference Books:

1. Fundamentals of Optics, F A Jenkins and H E White, 1976, McGraw-Hill
2. Principles of Optics, B.K. Mathur, 1995, Gopal Printing
3. Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, S. Chand Publication
4. University Physics. FW Sears, MW Zemansky and HD Young 13/e, 1986. Addison-Wesley
5. Physical Optics , A.K. Ghatak
6. Berkely Physics Course: Vol.-III, 'Waves and Oscillations'

Link for e-resources:

1. Wave an introduction https://youtu.be/SuQE7eUEriU
2. Interference https://youtu.be/hvpYKPyT-vc
3. Diffraction https://youtu.be/3RZZQvEVrEA
4. Polarization https://youtu.be/nELYaf_N528
5. Laser and application https://youtu.be/EK4yFAGHSFc

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50

Continuous Comprehensive Evaluation (CCE): As per University Guideline

University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	As per University Guideline

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Part A :Introduction				
Program: **Degree Course**		Class: **B.Sc.**	Year: **Third Year**	Session: **2024-25**
1	Course Code	**PHY- 5T**		
2	Course Title	Digital, Analogue Circuits and Instrumentation		
3	Course Type	Theory		
4	Pre-requisite (if any)	Passed B.Sc. II		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Understand the basic principles and industrial applications of semiconductor diode, Zener diode and transistor • Understand the construction working and applications of transistor • Gain the knowledge of analogue and digital circuits • Understand the construction and working principles of various instruments that are used in the physics laboratory • Develop interest in electronic components		
6	Credit Value	Theory :4		
7	Total Marks	**Max. Marks: 50**	**Min. Passing Marks: 17**	

Part B: Content of the Course		
Total No. of Lectures: 60		
Unit	**Topics**	**No. of Lectures**
1	Semiconductor Devices and Amplifiers: Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode, PN junction and its characteristics, Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell.	12
2	Power Supply: Half-wave Rectifier, Central-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, L-section filter and π-section filter, Zener diode as voltage regulator. Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Active, Cutoff, and Saturation Regions. Current gains α, β and γ. Relations between α, β and γ. Load Line analysis of Transistors. DC Load line and Q-point. Classification of Amplifiers: Class A, B, and C	12
3	Voltage Divider Bias Circuit for CE Amplifier. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output impedance. Current, Voltage and Power Gains. Operational Amplifiers (Black Box approach): Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop & Closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers (2) Adder (3) Subtractor (4) Differentiator (5) Integrator, (6) Zero Crossing Detector.	12
4	Sinusoidal Oscillator: Barkhausen's criterion for Self-sustained oscillations, Determination frequency of RC oscillator. Wein Bridge Oscillator, Hartley oscillator and Phase shift oscillator Introduction to CRO: Block diagram, construction and working of CRO, Applications of CRO in (i) study of waveform (ii) measurement of voltage, current , frequency and phase difference,	12
5	Digital Circuits Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates. De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Minterms and Maxterms. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map. Binary Addition. Binary Subtraction using 2's Complement Method).Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor.	12

Part C: Learning Resources
Text Books, Reference Books, Other Resources
Suggested Readings: • Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill. • Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata Mc-Graw Hill. • Microelectronic Circuits, M.H. Rashid, 2nd Edn.,2011, Cengage Learning. • Modern Electronic Instrumentation & Measurement Tech., Helfrick&Cooper,1990, PHI Learning • Digital Principles & Applications, A.P. Malvino, D.P. Leach & Saha, 7th Ed.,2011, Tata McGraw Hill • Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press. • Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd. • OP-AMP and Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd. • **e-resources:** 1. https://www.quora.com 2. https://www.allaboutcircuit.com 3. https://www.wileyindia.com 4. https://www.instrumentationtools.com 5. https://www.ibiblio.com 6. https://www.easyengineering.net 7. https://www.elsevier.com

Part D: Assessment and Evaluation
Suggested Continuous Evaluation Method: Maximum Marks: 50 Continuous Comprehensive Evaluation(CCE): Not Applicable University Exam. (UE): 50 Marks
Internal Assessment: Max. Marks: 10 Class Test/Assignment/Presentation (Proposed)

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Part A :Introduction				
Program: **Degree Course**		Class: **B.Sc. III year**	Year: **2024** Third Year	Session: **2024-25**
1	Course Code	**PHY- 6T**		
2	Course Title	ELEMENTS OF MODERN PHYSICS		
3	Course Type	Theory		
4	Pre-requisite (if any)	B.Sc. II		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Gain of advanced theoretical and experimental method including the use of numerical method • Understand the basic postulates of quantum mechanics • Gain knowledge about physical quantities as operators • Understand the Schrodinger equation and its applications • Gain knowledge about structure of nucleus, nuclear fission and fusion and be familiar of nuclear energy		
6	Credit Value	Theory :4		
7	Total Marks	**Max. Marks: 50**	**Min. Passing Marks: 17**	

Part B: Content of the Course		
Total No. of Lectures: 60		
Unit	**Topics**	**No. of Lectures**
1	Planck's quantum theory, 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. 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.	12
2	Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle, Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence	12
3	Matter waves and wave function; probabilistic interpretation of wave function, Probability and probability current densities in one dimension. Normalization of wave function, Expectation value of dynamical variables, Operators: Position, Momentum and Energy operators; stationary states; probabilities and normalization; Schrodinger equation for non-relativistic particles;	12
4	One dimensional infinitely rigid box- energy eigenvalues and eigen function, Quantum dot; Quantum mechanical scattering and tunneling in one dimension - across a step potential and across a rectangular potential barrier. Schrodinger equation in spherical polar co-ordinates, spherical symmetric potential, energy states of hydrogen using Schrodinger equation	12
5	Size and structure of atomic nucleus and its relation with atomic weight; 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. Radioactivity: stability of nucleus; Law of radioactive decay; Mean life & half-life; 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

Part C: Learning Resources
Text Books, Reference Books, Other Resources
Suggested Readings: • 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 • e-Resources: 1. https://link.springer.com 2. https://web.pdx.edu 3. https://yooktal.in 4. https://www.bookfobia.com.av 5. https://www.nhbs.com

Part D: Assessment and Evaluation
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