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: **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

DECLARATION

This is to certify that the syllabus is framed by the Central Board of studies (Physics) as per the guidelines (TOR) of The Department of Higher Education, Raipur, Chhattisgarh

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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 poiarization • 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: **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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