Faculty of Science and Humanities
B.Sc. (Physics) (Semester - 5)
In Effect from Academic Year 2023-24

Branch Name:	Physics
Program Code:	SC105
Course Name:	Physics 501
Course Code:	**2SC1050501**
Pre-requisite Course:	Basic knowledge of Quantum, Classical and Mathematical Physics.

Course Objectives:

1. To develop an actual understanding of the Mathematical Physics.
2. To know the basic concept of quantum mechanics.
3. To understand about various function of classical mechanics.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
				Theory (Marks)		Practical (Marks)		
Lecture (L)	Tutorial (T)	Practical (P)	Credit	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	Total (Marks)
3	--	--	3	70	30	--	--	100

Subject Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	**MATHEMATICAL PHYSICS** **(a) Differential Equations** Some partial differential Equations Physics, The method of separation of variables, Separation of Helmholtz equation in Cartesian Coordinates, Separation of Helmholtz equation in spherical polar Coordinates, separation of Helmholtz equation in cylindrical coordinates, Laplace's equation in various coordinate systems. **(b) Second order differential Equations** Ordinary and singular points, Series solution around and ordinary point, Series Solution around a regular singular point (The method of Frobenius).	15	33
2	**CLASSICAL MECHANICS** **Tensors:** Types of tensors and their algebra, Contraction and inner product, Metric tensors, Quotient rule, Dual and irreducible tensors, Christoffel symbols, covariant derivative, Geodesic equation. **Lagrangian Formulation** Constraints, generalized coordinates, D'aleffibert's principle, Lagrange's equations, A general expression for kinetic energy, Symmetries and the laws of conservation, Cyclic or ignorable coordinates, Velocity dependent potential of electromagnetic field **Motion of Rigid Body** Euler's theorem, Angular momentum and kinetic energy, The inertia tensor, Euler's equation motion.	15	33
3	**QUANTUM MECHANICS**	15	34

	General formalism of Wave Mechanics The Schrodinger equation and Probability interaction for N- particle system, The fundamental postulates of wave mechanics, Adjoint of an operator and self Adjointness, The Eigen value problem, Degeneracy, Eigen values and Eigen functions of self-adjoint operators, The Dirac delta function, Observables, completeness and normalization of Eigen functions, Closer, physical interpretation of Eigen values, Eigen function and expansion coefficients, Momentum Eigen functions : wave functions in momentum space, uncertainly Principle, States with minimum value for uncertainly product, commuting observable : Removal of degeneracy, Evolution of system with time Constants of the motion.		

Text Books:

1. Physics paper -6, semester-5, Nirav Prakashan

Reference Books:

1. Mathematical Methods for Physicists by G. Arfkenand Weber, Academic Press, 6th Ed (2005).

2. A text book of Quantum Mechanics, by Mathews &Venkatesan, TMH Publication (2010)

3. Mathematical Physics by P. K. Chattopadhyay (Wiley Eastern Limited, (1990).

4. Vector Analysis Murray Spiegel (Schuam Series).

5. Mathematical Methods in Physical Sciences by M. L. Boas, Second Edition, John Wiley & Sons, (1996).

6. Mathematical Methods of Physics by Mathews & Walker, 2nd Ed. 2004 Pearson Education, (Singapore) Indian Br. Delhi, India.

7. Elements of Group Theory for Physicists by A W Joshi, New Age Int. Pub, New Delhi (1997).

8. Matrices and Tensors in Physics by A W Joshi 3rd Ed., New Age International (P) Ltd. New Delhi.

List of Open Source Software/learning website:

1. https://www.youtube.com/watch?v=sB4KS4rpccE
2. https://www.youtube.com/watch?v=fY6TrK24ZK0&list=PLNU8gQTpgTRN9SK2aG4wFSDpGi_f7MdJ3

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe the some partial differential Equations Physics	1 Remembering
CLO2	Discuss the Second order differential Equations.	2 Understanding
CLO3	Solve the Langrangian equations.	3 Applying
CLO4	Explain General formalism of Wave Mechanics.	4 Analyzing
CLO5	Evaluate the problems related to Motion of Rigid Body	5 Evaluating
CLO6	Create some numerical problems regarding wave mechanics.	6 creating

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Programme Outcomes (POs)									Programme Specific Outcome (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CLO1	L										
CLO2			M							M	
CLO3					M						
CLO4		M								L	
CLO5			H								
CLO6			H							H	

H: High, M: Medium, L: Low