

FOUR YEARS UNDERGRADUATE PROGRAM (2024-28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION			
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: I	Session: 2024-25
1	Course Code	PHGE-01 T	
2	Course Title	Mechanics	
3	Course Type	Generic Elective Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	<p><i>After going through the course, the student should be able to:</i></p> <ul style="list-style-type: none"> ➤ <i>Analyze and apply the laws of motion to various dynamical situations.</i> ➤ <i>Explain and demonstrate the principle of conservation of momentum and energy including their application in real-world scenario such as collision and energy transformation.</i> ➤ <i>Evaluate and calculate moment of inertia for objects of different shapes and analyze how these properties affect the motion of rotating bodies.</i> ➤ <i>Analyze flow of fluids.</i> ➤ <i>Describe special relativistic effects and their effects on the mass and energy of a moving object.</i> 	
6	Credit Value	03 Credits 1 Credit= 15 Hours for Learning & Observation	
7	Total Marks	Maximum Marks: 100	Minimum Pass Marks: 40
PART – B: CONTENT OF THE COURSE			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Periods
I	Historical Background: Contribution of Aryabhatta and Varahmihir to science and society, Brief biography of Vikram Sarabhai with his contribution. Vectors: Scalar and vector quantities & fields, Scalar & Vector products of two vectors, Derivatives of a vector, Gradient of scalar field and its physical significance. Laws of Motion: Review of Newton's Laws of motion, Dynamics of a system of particles, Concept of Center of Mass, Motion of center of mass, Conservation of linear momentum, Motion of Rocket. Work and Energy: Work-Energy theorem for conservative forces, Force as a gradient of Potential Energy, Conservation of energy, Elastic and in-elastic Collisions		12
II	Rotational Dynamics: 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 (Rectangular lamina, disc, solid cylinder, solid sphere). Elasticity: Stress & Strain, Hooke's law, Elastic constants, Poisson's Ratio, Relationship between various elastic moduli (without derivation), Work done in twisting a cylinder. Fluid Dynamics: Flow of fluids, Coefficient of viscosity, Derivation of Poiseuille's formula, Motion of a spherical body falling in a viscous fluid, Stoke's law, Expression for terminal velocity.		12
III	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).		11
IV	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, Lorentz Transformation, Length contraction, Time dilation, Relativistic transformation of velocity, Relativistic variation of mass, Mass-energy equivalence, Transformation of Energy and Momentum.		10
Keywords:	Aryabhatta, Vectors, Newton's Laws, Angular Momentum, Elasticity, Gravitation, Oscillations, Relativity		

Signature of Convener & Members (CBs) :

PART – C: LEARNING RESOURCES

Text Books, Reference Books Recommended and Others

Text Books Recommended-

1. Mechanics & Properties of matter, D.C. Tayal & P. Tayal, 2023, Pub. By Authors.
2. Unified Physics I –R. P. Goyal, Shivalal Agrawal Publication
3. Unified Physics I, Navbodh Publication

Reference Books Recommended-

1. Mechanics, Berkeley Physics, vol.1, C. Kittel, W. Knight, et.al. 2007, Tata McGraw-Hill.
2. Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
3. Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons.

Online Resources (e-books/ learning portals/ other e-resources)

1. All e-books of physics <https://www.e-booksdirectory.com/listing.php?category=2>
2. Free physics text book in PDF
3. https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0Kma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE
4. Cambridge University Books for Physics <https://www.cambridgeindia.org/>
5. Books for solving physics problems <https://bookboon.com/en/physics-ebooks>
6. NPTEL Online courses <https://nptel.ac.in/courses/115105098;>
[https://archive.nptel.ac.in/courses/115/106/115106123/;](https://archive.nptel.ac.in/courses/115/106/115106123/)
7. BSc Lectures by Prof. H C Verma: <https://bsc.hcverma.in/index.php/course/relativity;>
<https://bsc.hcverma.in/index.php/course/cm1>

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:

100 Marks

Continuous Internal Assessment (CIA):

30 Marks

End Semester Examination (ESE):

70 Marks

Continuous Internal Assessment (CIA):
(By course teacher)

Internal Test/ Quiz (2):	20 + 20
Assignment/ Seminar (1):	10
Total Marks:	30

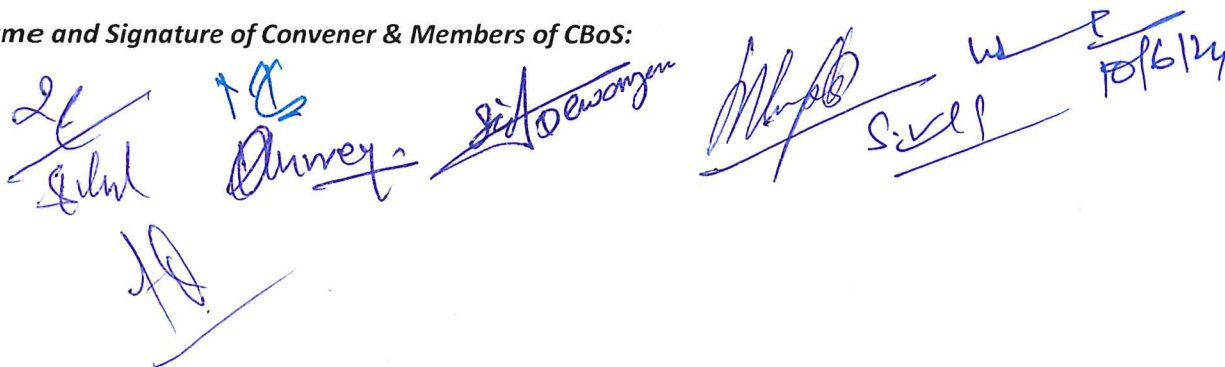
Better marks out of the two Test / Quiz
+ marks obtained in Assignment shall be
considered against 30 Marks

End Semester Exam (ESE):

Two section – A & B

Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 = 20 Marks
Section B: Descriptive answer type, 1 out of 2 from each unit-4 x 10=40 Marks

Name and Signature of Convener & Members of CBoS:



FOUR YEARS UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION			
Program: Bachelor in Science (Certificate/ Diploma/ Degree/ Honors)		Semester: I	Session: 2024-25
1	Course Code	PHGE- 01 P	
2	Course Title	Mechanics	
3	Course Type	Generic Elective Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	After the completion of the course, Students are expected to understand working mechanism and laws of classical mechanics. The Students will be able to <ul style="list-style-type: none"> ➤ Assemble required parts/devices and arrange them to perform experiments. ➤ Record/ observe data as required by the experimental objectives. ➤ Analyze recorded data and formulate it to get desired results. ➤ Interpret results and check for attainment of proposed objectives related to laws of mechanics and its applications 	
6	Credit Value	01 Credit	1 Credit = 30 Hours Laboratory Work
7	Total Marks	Maximum Marks: 50	Minimum Pass Marks: 20
PART – B: CONTENT OF THE COURSE			
Total No. of learning-Training/performance Periods- 30 Periods (30 Hours)			
Sr. No.	Objects (At least 10 of the following or related Experiments)	No. of Period	
1	Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.	30	
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	Study of bending of a beam/ cantilever		
13	To determine Moment of Inertia of an irregular body by Inertia Table		
Keywords	Moment of Inertia, Pendulum, Vernier Callipers, Screw Gauge, Travelling microscope, Elastic Constant, Searle's Method, Stoke's Method, Cappillary Rise Method, Viscosity, Surface Tension		

Signature of Convener & Members (CBoS) :

PART – C: Learning Resources

Text Books, Reference Books and others

Text Books Recommended-

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.
4. Practical Physics B.Sc. I : R P Goyal, Shival Publications

Reference Books Recommended-

1. Advanced Practical Physics for Students by B.L. Worsnop and H.T. Flint
2. Practical Physics by G.L. Squires
3. An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements by John R. Taylor
4. Mechanics and Properties of Matter by J.C. Upadhyaya

Online Resources (e-books/ learning portals/ other e-resources)

1. Link for e-Books for Physics:Physics Practical:
<https://www.uou.ac.in/sites/default/files/slm/BSCPH-104.pdf>
2. Virtual Lab :<https://vlab.amrita.edu/?sub=1&brch=74>
3. <https://vlab.amrita.edu/?sub=1&brch=74&sim=571&cnt=1>
4. <https://www.ae.msstate.edu/vlsm/>

PART – D : ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz - (2): 10 & 10	Better marks out of the two Test/Quiz +Marks obtained in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance – 05	
	Total Marks - 15	
End Semester Exam (ESE):	Laboratory Performance: On spot Assessment Performed the Task based on lab. work -20 Marks Spotting based on tools & technology (written) – 10 Marks Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:

