Course Syllabus

Gyanmanjari Science College

Semester-1(B.Sc.)

Subject: Classical Mechanics 1- BSCPH11301

Type of course: Major

Prerequisite: Concept of oriented surface area, Concept of effective potential energy, Basic Wave Terminology, Impulse and Momentum concepts.

Rationale: This course has been designed to make the students know about basic principles of Physics. The students learn fundaments of physics understand the physics applications in real world and developing critical thinking skills. It helps students to develop problem-solving abilities and prepare them to shape career in advanced physics. Ultimately, pursuing a B.Sc. in Physics offers a combination of intellectual stimulation, practical skills, and versatile career opportunities. It equips you with a deep understanding of the physical world and provides a strong foundation for further education or a wide range of professional endeavors

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				SEE		CCE			
CI	T	P	C	Theory	Practical	MSE	LWA/V	ALA	
3	0	2	4	75	25	30	20	50	200

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA - Lab Work Assessment; V – Viva voice; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

3 Credits * 25 Marks = 75 Marks (each credit carries 25 Marks) Theory

1 Credits * 25 Marks = 25 Marks (each credit carries 25 Marks) Practical

SEE 100 Marks will be converted in to 50 Marks

CCE 100 Marks will be converted in to 50 Marks

It is compulsory to pass in each individual component.

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Report writing** Students have to Write helical motion, calculate cyclotron frequency, and mention real-life applications (Cyclotron, Mass spectrometer). and upload it to GMIU Web Portal.	10
2	**Minor project** Students prepare a working model based on any topic related to syllabus Prepare a small video on your project and upload it to GMIU Web Portal.	10
3	**Draw and explain** Students will draw a compound pendulum and explain derivation of its time period. Then upload in PDF format on GMIU web Portal (10 MCQs).	10
4	**Video Presentation** Student will prepare short video on the topic given by the faculty and upload on the GMIU web portal.	10
5	**Attendance** Student should present in class room during lecture.	10
Total		**50**

Course Content:

Unit No	Course content	Hrs.	% Weightage
1	Chapter:1**Vector and Classical Mechanics**: Surface area as vector, Scalar triple product, Geometrical interpretation of scalar triple product, Rotational behavior of scalar triple product, Vector triple product, Reciprocal vector, The derivative of a vector Differentiation of Vector, Formulae of **Differentiation of Vector**: Gradient of a Scalar field, Divergence of a Vector field, Curl of a Vector field. **Classical Mechanics**: Newton's Laws of motion, Frames of reference, Mechanics of a particle, Examples	10	25
2	Chapter: 2 **Motion in a Central Force Field**: Equivalent one body problem, Motion in a central force field, Unit vector in polar co-ordinate system, Radial and tangential acceleration component in polar co-ordinate system, General features of the motion, Motion in an Inverse-square law force fieki, Equation of the orbit, Types of the orbit Kepler's Laws of planetary motion Examples	10	25
3	Chapter:3 **Wave and Oscillations Traveling Waves**: Speed of propagation of waves in a stretched string longitudinal waves in a bar, Plane waves in a fluid, Transmission of energy by a travelling wave . **Simple Harmonic Motion**: Characteristics of simple harmonic motion, Graphical Method: Composition of two linear simple harmonic motions in the same direction and at right angles with each other, Analytical Method : Composition of two linear simple harmonic motions in the same direction and at right angles with each other, Lissaious figures, Compound pendulum and derivation of time period, Examples	12	25
4	Chapter:4 **Classical Mechanics**: Equation of motion of a particle: a) Motion under constant force, b) Motion under a force which depends on time only, c) Motion under a force dependent on distance only, d) Motion of a particle subjected to a resistive force: Motion of a charged particle in electromagnetic field, a) Motion in a Constant Electric field, b)Motion in a Constant Magnetic field, c)Motion in Crossed Fields, Mechanics of System of particles: a) Angular Momentum of the System, b) Energy of the System, c) Kinetic Energy of the System, d) Laws of Conservation,	13	25

Suggested Specification table with Marks (Theory):75

Distribution of Theory Marks (**Revised Bloom's Taxonomy**)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20 %	30%	30%	-	20%	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Understand and apply classical mechanics principles.
CO2	Understand central force concepts and equivalent one-body reduction
CO3	Understand the fundamentals of waves
CO4	Analyze motion of charged particles in electromagnetic fields

List of Practical

Sr. No	Descriptions	Unit No	Hrs.
1	To determine Young's modulus of a given wire.	1	2
2	To determine expansion coefficient of pressure of constant volume air thermometer and to determine absolute zero temperature and atmosphere ice pressure.	1	4
3	To determine moment of inertia of body with different shapes using bi-filler suspension.	1	4
4	Calibration of spectrometer with help of prism spectra.	2	2
5	To deter mine wavelength of sodium light using Newton's ring.	2	2
6	To determine refractive index of liquid by using liquid lens method.	2	2
7	To determine 'g' by bar pendulum.	3	4
8	To determine the surface tension of water by capillary rise method.	3	2
9	To find the co-efficient of viscosity of water by noting its flow through a capillary tube.	4	4
10	To study one dimensional elastic collision using two hanging spheres.	4	4
		Total	**30**

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

References Books:

1) Introduction to classical mechanics by R.G.Takwale & P.S. Puranik
2) Classical Mechanics & Properties of Matter by A.B.Gupta
3) A textbook of optics by Dr. N. Subrahmanyam & Brij LalSingh
4) Text Book: Introduction to classical mechanics RG Takwale & Puranik. Pub: Tata McGraw Hill
5) Classical mechanics Rana & Jog
6) Classical mechanics A.B.Bhatia
7) Classical Mechanics by Gupta, Kumar and Sharma Advanced practical physics by Chauhan and Singh
8) B.Sc.Practical Physics by C L Arora
9) Practical Physics by Kumar and Gupta