

# Vidyasagar University

## Curriculum for B.Sc (General) in Physics [Choice Based Credit System]

### Semester-I

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC1 [DSC-1A]		C1T:Mechanics	Core Course-1	4	0	0	6	75
		C1P:Mechanics		0	0	4		
CC2 [DSC-2A]	TBD	DSC-2A (other Discipline)	Core Course-2				6	75
CC3 [DSC-3A]	TBD	DSC-3A (other Discipline)	Core Course-3				6	75
AECC		English	AECC (Elective)	1	1	0	2	50
<b>Semester Total</b>							<b>20</b>	<b>275</b>

**L**=Lecture, **T**=Tutorial, **P**=Practical, **CC** = Core Course, **TBD** = To be decided, **AECC**= Ability Enhancement Compulsory Course

**DSC-1** = Discipline Specific Core of Subject-1, **DSC-2** = Discipline Specific Core of Subject-2, **DSC-3** = Discipline Specific Core of Subject-3.

## Semester-I Core Course (CC)

**CC-1: Mechanics**

**Credits 06**

**C1T: Mechanics**

**Credits 04**

**Vectors:** Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter.

**Ordinary Differential Equations:** 1st order homogeneous differential equations. 2<sup>nd</sup> order homogeneous differential equations with constant coefficients.

**Laws of Motion:** Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass.

**Momentum and Energy:** Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.

**Rotational Motion:** Angular velocity and angular momentum. Torque. Conservation of angular momentum.

**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 (statement only). Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).

**Oscillations:** Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations.

**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 modulus by static torsion – Torsional pendulum-Determination of Rigidity modulus and moment of inertia -  $q$ ,  $\eta$  and  $\sigma$  by Searles method

**Special Theory of Relativity:** Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.

**C1P: Mechanics (Practical)**

**Credits 02**

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To determine the Height of a Building using a Sextant.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the Elastic Constants of a Wire by Searle's method.
7. To determine  $g$  by Bar Pendulum.

8. To determine  $g$  by Kater's Pendulum.
9. To determine  $g$  and velocity for a freely falling body using Digital Timing Technique
10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of  $g$

### **Suggested Readings:**

1. University Physics. FW Sears, MW Zemansky and HD Young 13/e., Addison- Wesley
2. Mechanics Berkeley Physics course, v.1: Charles Kittel, et. Al., Tata McGraw- Hill.
3. Physics – Resnick, Halliday & Walker 9/e, , Wiley
4. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., , Oxford University Press
5. University Physics, Ronald Lane Reese, , Thomson Brooks/Cole.
6. Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, Asia Publishing House.
7. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4<sup>th</sup> Edition, reprinted , Heinemann Educational Publishers.
8. Engineering Practical Physics, S.Panigrahi & B.Mallick, Cengage Learning India Pvt. Ltd.
9. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, Kitab Mahal, New Delhi.