



S.V. University 4-Year Honours Degree Programme

Model Syllabus for Physics (Minor) in consonance with Curriculum framework w.e.f. AY 2026-27

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	III	1	Mechanics and Properties of Matter	3	3
			Mechanics and Properties of Matter-Practical	2	1

SEMESTER-III

COURSE 1: MECHANICS AND PROPERTIES OF MATTER

Theory

Credits: 3

3 hrs/week

COURSE OBJECTIVE:

The course on Mechanics and Properties of Matter aims to provide students with a fundamental understanding of the behavior of physical systems, both in terms of mechanical motion and in terms of the properties of matter.

LEARNING OUTCOMES:

1. Students will be able to apply the laws of motion, solve equations of motion for variable mass systems.
2. Students will be able to define central forces and provide examples, understand the characteristics and conservative nature of central forces, to derive equations of motion under central forces.
3. Students will be able to define and relate elastic constants, interpret stress-strain relationships, and analyze bending in beams.
4. Students will be able to apply the basic principles of fluid dynamics including Bernoulli's theorem, viscosity, and surface tension in practical contexts.
5. Students will be able to differentiate between Galilean relativity and the concept of absolute frames, comprehend the postulates of the special theory of relativity, apply Lorentz transformations, understand and solve problems.

UNIT-I MECHANICS OF PARTICLES

(9 hrs)

Newton's Laws of motion, motion of variable mass system, Equation of motion of a rocket. Conservation of energy and momentum, collisions in two and three dimensions, concept of impact parameter, scattering cross-section, Rutherford scattering-derivation

UNIT-II CENTRAL FORCES

(9 hrs)

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, conservative force as a negative gradient of potential energy, equations of motion under a central force, derivation of Kepler's laws, motion of satellites, Geo-stationary satellites

UNIT III: ELASTICITY AND BENDING OF BEAMS

(9 hrs)

Stress and strain, Hooke's Law, Elastic moduli – Young's, bulk, and shear modulus, Poisson's ratio – Physical meaning, bending of beams – Types, point and distributed load, Cantilever and uniform bending – Qualitative treatment, Torsional pendulum – working principle and uses.

UNIT IV: FLUID MECHANICS

(9 hrs)

Fluids: Properties and classification, Streamline vs. turbulent flow, Reynolds number, Bernoulli's theorem – Statement, simple derivation and applications (Venturimeter, airplane lift), Equation of continuity – Concept, Viscosity – Poiseuille's law (statement and qualitative explanation), Surface tension – Examples and qualitative ideas

UNIT V: SPECIAL THEORY OF RELATIVITY

(9 hrs)

Galilean relativity, absolute frames, Michelson-Morley experiment, negative result, postulates of special theory of relativity, Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation

REFERENCE BOOKS:

1. BSc Physics -Telugu Akademy, Hyderabad
2. Mechanics - D.S. Mathur, Sulthan Chand & Co, New Delhi
3. Mechanics - J.C. Upadhyaya, Ramprasad & Co., Agra
4. Properties of Matter - D.S. Mathur, S. Chand & Co, New Delhi ,11th Edn., 2000
5. Physics Vol. I - Resnick-Halliday-Krane ,Wiley, 2001
6. Properties of Matter – Brijlal & Subrmanyam, S. Chand & Co. 1982
7. Mechanics-EM Purcell, Mc Graw Hill
8. University Physics-FW Sears, MW Zemansky & HD Young, Narosa Publications, Delhi
9. College Physics-I. T. Bhima sankaram and G. Prasad. Himalaya Publishing House.
10. Mechanics, S. G. Venkata chalapathy, Margham Publication, 2003.
11. Fluid Mechanics – Frank M. White, McGraw Hill.
12. Textbook of Fluid Dynamics – M. D. Raisinghania, S. Chand & Co.

SEMESTER-III

COURSE 1: MECHANICS AND PROPERTIES OF MATTER

Practical

Credits: 1

2 hrs/week

COURSE OBJECTIVE:

To develop practical skills in the use of laboratory equipment and experimental techniques for measuring properties of matter and analyzing mechanical systems.

LEARNING OUTCOMES:

1. Mastery of experimental techniques: Students should become proficient in using laboratory equipment and experimental techniques to measure properties of matter and analyze mechanical systems.
2. Application of theory to practice: Students should be able to apply theoretical concepts learned in lectures to real-world situations, and understand the limitations of theoretical models.
3. Accurate recording and analysis of data: Students should be able to accurately record and analyze experimental data, including understanding the significance of error analysis and statistical methods.
4. Critical thinking and problem solving: Students should be able to identify sources of error, troubleshoot experimental problems, and develop critical thinking skills in experimental design and analysis.
5. Understanding of physical principles: Students should develop an understanding of the physical principles governing mechanical systems and the properties of matter, including elasticity, viscosity, and thermal expansion.

Minimum of 6 experiments to be done and recorded

1. Young's modulus by uniform bending
2. Young's modulus by non-uniform bending
3. Rigidity modulus using torsional pendulum
4. Viscosity of liquid by Poiseuille's method
5. Surface tension by capillary rise method
6. Flywheel – Determination of moment of inertia
7. Viscosity of liquid by Searle's viscometer method
8. Bifilar suspension – moment of inertia of a rectangular body
9. Radius of capillary tube by Hg thread method
10. Optional Simulation-based activity: Time dilation or projectile simulation.

STUDENT ACTIVITIES

Unit I: Mechanics of Particles

Activity: Collision Experiments

Students can set up simple collision experiments using marbles, carts, or other objects. They can measure the initial and final velocities, masses, and analyze the momentum conservation. By varying the conditions (e.g., masses, initial velocities), they can observe the effects on the collision outcomes.

Unit II: Central Forces

Activity: Pendulum Motion Students can investigate the motion of a simple pendulum by varying its length and measuring the time period. They can analyze the relationship between the period and the length, and discuss the concept of centripetal force and its role in circular motion.

Unit III: Elasticity and Bending of Beams

Activity: Beam Bending Experiment

Use rulers or meter sticks on supports to apply loads and measure deflection. This hands-on demo helps visualize how elasticity and loading affect real-world structures.

Unit IV: Fluid Mechanics

Activity: Water Jet Speed Measurement

Students can measure the range and height of a water jet to relate fluid velocity with pressure (Bernoulli principle). They can also explore streamlines using ink in water.

Unit V: Special Theory of Relativity

Activity: Time Measurement Students can perform a time measurement experiment using simple devices like water clocks or sand timers. They can compare the measured time between two events at different relative speeds and discuss the concept of time dilation

Prepared by:

Dr. G. Suresh Babu
Member, BOS
Lecturer in Physics
GDC, Puttur
Tirupati Dist. A.P.

Dr. C. Bapanayya
Member, BOS
Lecturer in Physics
SVA GDC(M) Srikalahasti
Tirupati Dist. A.P

Dr. A. Sujala Swapna Smitha
Member, BOS
Lecturer in Physics
GDC, Puttur
Tirupati Dist. A.P

Dr. C. Sai Vandana
Member, BOS
Lecturer in Physics
GDC(W) Srikalahasti
Tirupati Dist. A.P

Dr. E. Rekha
Member, BOS
Lecturer in Physics
SWR GDC(W) Kalikiri
Annamayya Dist. A.P


Dr. M. Surya Sekhar Reddy
Chairperson, BOS
Lecturer in Physics
GDC(W) Madanapalle
Annamayya Dist. A.P.

4- Year UG Honours MINOR

Syllabus

(2026-27)

Semester-III

Model Question Paper

Time : 3hrs

Marks:75

Part-A

Answer any Five Questions. Each Question carries 3 Marks.

5x3=15

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Answer the following questions. Each question carries 12 Marks

5x12=60

11. a) Unit-I
(Or)
b) Unit-I

12. a) Unit-II
(Or)
b) Unit-II

13. a) Unit-III
(Or)
b) Unit-III

14. a) Unit-IV
(Or)
b) Unit-IV

15. a) Unit-V
(Or)
b) Unit-V