



**ANNAVARAM SATHYAVATHI DEVI GOVERNMENT DEGREE COLLEGE
FOR WOMEN**

(An Autonomous Institute accredited with NAC C with "B" Grade in Cycle III)
Church Square Park, Jagannaickpur, Kakinada, Andhra Pradesh

Department of Physics
SYLLABUS-AY 2024-25

S. No.	Semester	Paper	Title of the Paper
1	1	C-1	Essentials and Applications in Mathematical, Physical & Chemical Sciences (Course code: BSCM24101)
2	1	C-2	Advances in Mathematical, Physical & Chemical Sciences (Course code: BSCM24102)
3	2	C-3 & M-1	Mechanics & Properties of Matter (Course code: PHY 24201)
4	2	C-4	Waves & Oscillations (Course code : PHY 24202)
5	3	C-5 & M-2	Optics (Course code : PHY 23301)
6	3	C-6	Heat and Thermodynamics (Course code : PHY 23302)
7	3	C-7	Electronic Devices and Circuits (Course code : PHY 23303)
8	3	C-8	Analog and Digital Electronics (Course code: PHY 23304)
9	4	C-9 & M-3	Electricity, Magnetism & Electronics (Course code: PHY 23401)
10	4	C-10 & M-4	Modern Physics (Course code :PHY 23402)
11	4	C-11	Introduction to Nuclear and Particle Physics (Course code : PHY23403)
12	5	VIB	Low Temperature Physics & Refrigeration(Course code: PHY 205303-6B)
13	5	VII B	Solar Energy & Applications(Course code : PHY 205304-7B)
10	6		Long Internship

Semester 2		
Course code: PHY 24201		
Mechanics and Properties of matter		
S.No	CO	Description
1	1	Understand and apply the concepts of scalar and vector fields, calculate the gradient of a scalar field, determine the divergence and curl of a vector field.
2	2	Understand Newton's laws of motion and motion of variable mass system and its application to rocket motion and the concepts of impact parameter, scattering cross section.
3	3	Apply the rotational kinematic relations, the principle and working of gyroscope and its applications and the precessional motion of a freely rotating symmetric top.
4	4	Comprehend the general characteristics of central forces and the application of Kepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.
5	5	Understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence.
Semester 2		
Course code : PHY 24202		
Waves and Oscillations		
S.No	CO	Description
1	1	To describe the basic characteristics of waves such as frequency, wavelength, amplitude, period, and speed .Examine the phenomena of simple harmonic motion
2	2	To distinction between undamped, damped and forced oscillations and the concepts of resonance
3	3	To get the knowledge about how to construct and analysis the square waves, saw tooth waves, etc. from Fourier analysis
4	4	To Figure out the formation of harmonics and overtones in a stretched string and vibrations in bars
5	5	To acquire the knowledge on Ultrasonic waves, their production and detection and their applications in different fields.



**ANNAVARAM SATHYAVATHI DEVI GOVERNMENT DEGREE COLLEGE
FOR WOMEN**

(An Autonomous Institute accredited with NAC C with "B" Grade in Cycle III)
Church Square Park, Jagannaickpur, Kakinada, Andhra Pradesh

B.Sc. Honours Course Syllabus (Single Major) (w.e.f:2023-24A.B)

SEMESTER-II

COURSE 3: MECHANICS AND PROPERTIES OF MATTER

Course Code: PHY24201

Theory Credits: 3

3 hrs./week

UNIT-I VECTOR ANALYSIS

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), Statement and proof of Gauss and Stokes theorems.

UNIT-II MECHANICS OF PARTICLES

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-III MECHANICS OF RIGID BODIES AND CONTINUOUS MEDIA Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, Precession of a top, Gyroscope, Precession of the equinoxes. Elastic constants of isotropic solids and their relations, Poisson's ratio and expression for Poisson's ratio. Classification of beams, types of bending, point load, distributed load.

UNIT-IV CENTRAL FORCES

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.

UNIT-V SPECIAL THEORY OF RELATIVITY

Galilean relativity, Absolute frames. Michelson-Morley experiment, The 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
- 5) Properties of Matter – Brijlal & Subrmanyam, S. Chand &Co. 1982
- 6) Dynamics of Particles and Rigid bodies– Anil Rao, Cambridge Univ Press, 2006 8. Mechanics-EM Purcell, Mc Graw Hill
- 7) University Physics-FW Sears, MW Zemansky & HD Young, Narosa Publications, Delhi
- 8) College Physics-I. T. Bhima sankaram and G. Prasad. Himalaya Publishing House. 11. Mechanics, S. G. Venkata chalapathy, Margham Publication, 2003.

A.S.D. GOVERNMENT DEGREE COLLEGE FOR WOMEN (A) KAKINADA
Year: I - Semester-II
COURSE 3: MECHANICS AND PROPERTIES OF MATTER
MODEL PAPER – AY 2024-25

Course code: PHY24201

Time: 3 Hrs.

Max. Marks: 60 M

Section-A

Answer any FIVE questions - 5X4 = 20 Marks

- 1) Prove that $\text{curl}(A+B) = \text{curl } A + \text{curl } B$.
- 2) Explain about Impact parameter.
- 3) Write a short note on gyroscope.
- 4) Explain different types of bindings?
- 5) Show that the Central force is the negative gradient of its potential energy.
- 6) The mean distance of Mars from Sun is 1.524 times the distance of the earth from
- 7) Sun. Calculate the period of revolution of Mars around the Sun.
- 8) Explain Length contraction.
- 9) At what speed, the mass of an object will be double of its value at rest.

Section-B

Answer any FIVE questions - 5X8 = 40 Marks

1. A) What is divergence of a vector? State and prove Gauss divergence theorem.
OR
B) What is Curl of a vector? State and prove Stokes theorem.
2. A) Derive an expression for Rutherford's scattering cross section.
OR
B) Derive the equation of motion of Rocket under a constant gravitational field.
3. A) Derive an expression for precessional velocity of a symmetric top.
OR
B) Derive relation among Y , K and σ .
4. A) Derive first Kepler's law of planetary motion?
OR
B) What are central forces? Show that central force is conservative in nature?
5. A) Describe Michelson-Morley experiment and explain the physical significance of negative result.
OR
B) Derive Lorentz transformation equations of space and time?

Blue Print
SEMESTER-2
COURSE 3: MECHANICS AND PROPERTIES OF MATTER
AY 2024-25

Module	Essay Questions 8 marks	Short Questions 4 marks	Marks allotted
Unit-1	1+1	1 Problem	20
Unit-2	1+1	1	20
Unit-3	1+1	2	24
Unit-4	1+1	1+ 1 Problem	24
Unit-5	1+1	1+ 1 Problem	24
Total Marks	80	32	108

SEMESTER-II
COURSE 4: WAVES AND OSCILLATIONS

Course Code: PHY 24202

Theory Credits: 3

3 hrs./week

UNIT-I

Simple Harmonic oscillations Simple harmonic oscillator and solution of the differential equation-Physical characteristics of SHM, torsion pendulum-measurements of rigidity modulus, compound pendulum-measurement of 'g', Principle of superposition, beats, combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies. Lissajous figures.

UNIT-II

Damped and forced oscillations Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with un-damped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance and velocity resonance.

UNIT-III

Complex vibrations Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw tooth wave, simple problems on evolution of Fourier coefficients.

UNIT-IV

Vibrating Strings and Bars Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones and harmonics. Energy transport and transverse impedance. Longitudinal vibrations in bars-wave equation and its general solution. Special cases (i) bar fixed at both ends (ii) bar fixed at the midpoint (iii) bar fixed at one end. Tuning fork.

UNIT-V

Ultrasonics: Ultrasonics, properties of ultrasonic waves, production of Ultrasonics by piezoelectric and magneto strictive methods, detection of Ultrasonics, determination of wavelength of ultrasonic waves. Applications and uses of ultrasonic waves.

REFERENCE BOOKS:

- 1) BSc Physics Vol.1, Telugu Academy, Hyderabad.
- 2) Fundamentals of Physics. Halliday/Resnick/Walker ,Wiley India Edition 2007.
- 3) Waves & Oscillations. S.Badami, V. Balasubramanian and K.R. Reddy, Orient Longman.
- 4) College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
- 5) Science and Technology of Ultrasonics- Baldevraj, Narosa, New Delhi,2004
- 6) Introduction to Physics for Scientists and Engineers. F.J. Buche. McGraw Hill.

SEMESTER-II
COURSE 4: WAVES AND OSCILLATIONS

Practical Credits: 1

2hrs/week

Minimum of 6 experiments to be done and recorded

Experiments

- 1) Volume resonator experiment
- 2) Determination of 'g' by compound/bar pendulum
- 3) Simple pendulum normal distribution of errors-estimation of time period and the error of the mean by statistical analysis
- 4) Determination of the force constant of a spring by static and dynamic method.
- 5) Determination of the elastic constants of the material of a flat spiral spring.
- 6) Coupled oscillators
- 7) Verification of laws of vibrations of stretched string –sonometer
- 8) Determination of frequency of a bar –Melde's experiment.
- 9) Study of a damped oscillation using the torsional pendulum immersed in liquid-decay constant and damping correction of the amplitude.
- 10) Formation of Lissajous figures using CRO.