B.Sc. PHYSICS SYLLABUS UNDER CBCS

For Mathematics Combinations

[2020-21 Batch onwards]

I Year B.Sc.-Physics:I Semester

Course I: MECHANICS, WAVES AND OSCILLATIONS

Work load:60 hrs per semester   **4 hrs/week**

Course outcomes:

On successful completion of this course, the students will be able to:

➤ *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.*

➤ *Apply the rotational kinematic relations, the principle and working of gyroscope and itapplicationsand the precessional motion of a freely rotating symmetric top.*

➤ *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.*

➤ *Understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence.*

➤ *Examinephenomena of simple harmonic motionand the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator.*

➤ *Appreciate the formulation of the problem of coupled oscillations and solve them to obtain normal modes of oscillation and their frequencies in simple mechanical systems.*

➤ *Figure outthe formation of harmonics and overtones in a stretched string and acquire the knowledge on Ultrasonic waves, their production and detection and their applications in different fields.*

RAYALASEEMA UNIVERSITY -KURNOOL
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Work load:60 hrs per semester   **4 hrs/week**

UNIT-I:

1. Mechanics of Particles   (5 hrs)

Review of Newton's Laws of Motion, Motion of variable mass system, Motion of a rocket, Multistage rocket, Concept of impact parameter, scattering cross-section, Rutherford scattering-Derivation.

2. Mechanics of Rigid bodies   (7 hrs)

Rigid body, rotational kinematic relations, Equation of motion for a rotating body, Angular momentum and Moment of inertia tensor, Euler equations, Precession of a spinning top, Gyroscope, Precession of atom and nucleus in magnetic field, Precession of the equinoxes

Unit-II:

3. Motion in a Central Force Field   (12hrs)

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, Equation of motion under a central force, Kepler's laws of planetary motion-Proofs, Motion of satellites, Basic idea of Global Positioning System (GPS), weightlessness-(concept only).

UNIT-III:

4. Relativistic Mechanics   (12hrs)

Galilean relativity, absolute frames, Michelson-Morley experiment, negative result, Postulates of Special theory of relativity, Lorentz transformation, time dilation, length contraction, variation of mass with velocity, Einstein's mass-energy relation.

Unit-IV:

5.Undamped, Damped and Forced oscillations: (07 hrs)

Simple harmonic oscillator and solution of the differential equation, Damped harmonic oscillator- differential equation-solution, Logarithmic decrement, Relaxation time and Quality factor, Forced harmonic oscillator –differential equations and solution, Amplitude Resonance. Energy considerations in undamped, damped and forced oscillations.

6. Coupled oscillations: (05 hrs)

Coupled oscillators-Introduction, Two coupled oscillators and wave equation, Normal coordinates and Normal modes- N-coupled oscillators and wave equation.

Unit-V:

7. Vibrating Strings: (07 hrs)

Transverse wave propagation along a stretched string, General solution of wave equation-simple harmonic solution, Modes of vibration of stretched string clamped at ends, Overtones and Harmonics, Melde's strings-simple idea on transverse and longitudinal modes.
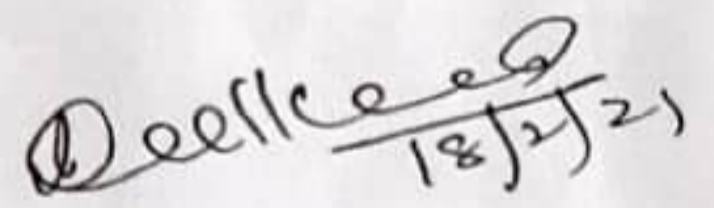
8. Ultrasonics: (05 hrs)

Ultrasonics, General Properties of ultrasonic waves, Production of ultrasonics by piezoelectric and magnetostriction methods, Detection of ultrasonics, Applications of ultrasonic waves.
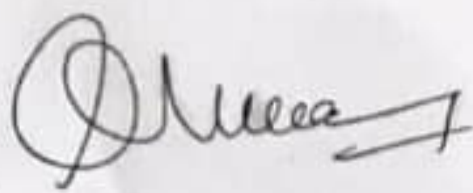
REFERENCE BOOKS:

- ❖ B. Sc. Physics, Vol.1, Telugu Academy, Hyderabad
- ❖ Fundamentals of Physics Vol. I - Resnick, Halliday, Krane ,Wiley India 2007
- ❖ College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
- ❖ University Physics-FW Sears, MW Zemansky& HD Young,Narosa Publications, Delhi
- ❖ Mechanics, S.G.Venkatachalapathy, Margham Publication, 2003.
- ❖ Waves and Oscillations. N. Subramanyam and Brijlal, VikasPulications.
- ❖ Unified Physics - Waves and Oscillations, Jai PrakashNath&Co.Ltd.
- ❖ Waves & Oscillations. S.Badami, V. Balasubramanian and K.R. Reddy, Orient Longman.
- ❖ The Physics of Waves and Oscillations, N.K.Bajaj, Tata McGraw Hill
- ❖ Science and Technology of Ultrasonics- Baldevraj, Narosa, New Delhi,2004

1. *(signature)* 18/2/21

(Dr. R.Suneetha)

Note:

For II semester syllabus will be submitted within a week

2. *(signature)*

(Dr.D.Ramakrishna Reddy)

3.

(Sri.P.Murali Mohan)

Practical Course 1: Mechanics, Waves and Oscillations

Work load: 30 hrs per semester   **2 hrs/week**

Course outcomes (Practicals):

On successful completion of this practical course, the student will be able to;

➤ Perform experiments on Properties of matter such as the determination of moduli of elasticity *viz.*, Young's modulus, Rigidity modulus of certain materials; Surface tension of water , Coefficient of viscosity of a liquid , Moment of inertia of some regular bodies by different methods and compare the experimental values with the standard values.

➤ Know how to determine the acceleration due to gravity at a place using Compound pendulum and Simple pendulum.

➤ Notice the difference between flat resonance and sharp resonance in case of volume resonator and sonometer experiments respectively.

➤ Verify the laws of transverse vibrations in a stretched string using sonometer and comment on the relation between frequency, length and tension of a stretched string under vibration.

➤ Demonstrate the formation of stationary waves on a string in Melde's string experiment.

➤ Observe the motion of coupled oscillators and normal modes.

Minimum of 6 experiments to be done and recorded:

1. Young's modulus of the material of a bar (scale) by uniform bending
2. Young's modulus of the material a bar (scale) by non- uniform bending
3. Surface tension of a liquid by capillary rise method
4. Viscosity of liquid by the flow method (Poiseuille's method)
5. Bifilar suspension –Moment of inertia of a regular rectangular body.
6. Fly-wheel -Determination of moment of inertia
7. Rigidity modulus of material of a wire-Dynamic method (Torsional pendulum)
8. Volume resonator experiment
9. Determination of 'g' by compound/bar pendulum
10. Simple pendulum- normal distribution of errors-estimation of time period and the error of the mean by statistical analysis
11. Determination of the force constant of a spring by static and dynamic method.