SRI VENKATESWARA UNIVERSITY :: TIRUPATI

FIRST YEAR B.Sc. PHYSICS (NON MATHEMATICS)

FIRST SEMESTER

Revised Syllabus Under CBCS W.E.F. 2020-21

STRUCTURE

Year	***Semester***	***Course***	***Title of the Course***	***Marks***	***No. of Hrs/Week***	***No. of Credits***
I	I	I	Mechanics, Waves and Oscillations	100	4	03
			Practical Course- I	50	2	02

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FIRST SEMESTER

Revised Syllabus Under CBCS W.E.F. 2020-21

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 the Newton's laws of motion and the law of conservation of linear momentum and its application to rocket motion, the concepts of concepts of impact parameter, scattering cross section and Distinguish between elastic and inelastic collisions.*
- *Formulate the rotational kinematic relations, learn the working principle of gyroscope and its applications and explain the precessional motion of a freely rotating symmetric top.*
- *Analyse 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.*
- *State the postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence.*
- *Understand the phenomena 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.*
- *State the laws of transverse vibrations in a stretched string and their verification using a sonometer and learn the formation of harmonics and overtones in a stretched string.*

- *Acquire knowledge onUltrasonic waves, their production and detection and their applications in different fields*

UNIT-I:

1. Mechanics of Particles (06 hrs)

Review of Newton's Laws of Motion, Conservation of linear momentum, Collisions, Elastic and inelastic collisions, Collisions in one and two dimension, Rocket propulsion, Impact parameter, Scattering cross-section, Rutherford scattering (No derivation- Qualitative ideas only)

2.Mechanics of Rigid body: (06hrs)

Rigid body, Rotational kinematic relations, Rotational kinetic energy and moment of inertia,Angular momentum, Torque, Relation between torque and angular momentum, Conservation of angular momentum, Illustrations, Gyroscopic motion (No derivation - Qualitative ideas only), Precession of the equinoxes.

UNIT-II:

3. Central forces: (12hrs)

Central force-Definition& examples, General Characteristics of Central forces, Conservative nature of central forces, Planetary motion-Kepler's laws (Statements & Explanation), Deduction of Newton's law of gravitation from Kepler's law, Geostationary Satellite Motion, Uses of communication satellites,Basic idea of Global Positioning System (GPS) and their applications.

UNIT-III:

4. Relativistic Mechanics (12 hrs)

Inertial and Non-inertial reference frames-Galilean relativity; Special theory of relativity- Statements of the two basic postulates- (Elementary treatment and application only) Lorentz transformation equations (No derivations); length contraction; time dilation; addition of velocities;Einstein's mass –energy equation

UNIT-IV:

5. Undamped, Damped and Forced Oscillations (12hrs)

Simple harmonic motion, Characteristics of SHM, Equation of otion and solution, Combination of Simple harmonic motions along a line and perpendicular to each other- Lissajous figures& uses, Damped vibrations: Explanation and examples, Distinction between damped and undamped vibrations, Forced vibrations: Explanation and examples, Resonance,examples – Sharp resonance and Flat resonance, Sharpness of resonance, Q-factor, Volume Resonator- Determination of frequency of a given tuning fork.

UNIT-V:

6. Wave motion :(06hrs)

Progressive waves-Equation of a progressive wave, Velocity of transverse waves in elastic media, Standing waves, overtones and harmonics, Sonometer-Verification of laws of transverse vibrations in a stretched string, Phenomenon of beats (qualitative ideas only).

7. Ultrasonics :(06hrs)

Ultrasonics, properties, production of ultrasonics by piezoelectric and magnetostriction methods, detection of ultrasonics, Applications of ultrasonic waves.

REFERENCE BOOKS:

- BSc Physics, Vol.1 -Telugu Academy, Hyderabad
- Physics for Biology and Premedical Students –D.N. Burns & SGG Mac Donald
- Unified Physics Vol.I- Mechanics,Waves and Oscillations; Jai PrakashNath&Co.Ltd., Meerut.
- Properties of Matter - D.S. Mathur, S.Chand& Co, New Delhi ,11thEdn., 2000
- Properties of Matter - Brijlal&Subrmanyam, S.Chand&Co. 1982
- Waves and Oscillations- S. Badami, V. Balasubramanian and K. Rama Reddy, Orient Longman.
- Waves and Oscillations- N. Subramaniyam and Brijlal, Vikas Publishing House Private Limited.

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.*
- *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.

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.

12. Coupled oscillators

13. Verification of laws of vibrations of stretched string –Sonometer

14. Determination of frequency of a bar –Melde's experiment.

15. Study of a damped oscillation using the torsional pendulum immersed in liquid-decay constant and damping correction of the amplitude.

RECOMMENDED CO-CURRICULAR ACTIVITIES:

MEASURABLE

- Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
- Student seminars (on topics of the syllabus and related aspects (individual activity))
- Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
- Field studies (individual observations and recordings as per syllabus content and related areas (Individual or team activity)
- Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

GENERAL

- Group Discussion
- Visit to Research Stations, Science Museum Centres to understand the basic principles of mechanics with live examples.
- Visit to and related industries
- Study the rate of flow of water in water works department in local municipality.

RECOMMENDED ASSESSMENT METHODS

Some of the following suggested assessment methodologies could be adopted;

- The oral and written examinations (Scheduled and surprise tests)
- Practical assignments and laboratory reports
- Individual and group project reports
- Efficient delivery using seminar presentations
- Viva voce interviews.

BOS Chairman

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B.Sc PHYSICS

[For Non - Mathematics Combination]

Model Question Paper

Time: 3 hrs Max. Marks: 75

SECTION–A

(Short Answer Type Questions)

Answer any five out of the following eight questions 5x5=25

1. Write a note on scattering cross-section.
2. Explain Gyroscope motion.
3. What are the characteristics of central forces.
4. What is length contraction and obtain an expression for it
5. Distinguish between Galilean and Lorentz transformations.
6. What is sharpness of resonance.
7. Explain about overtones and harmonics
8. Write any five applications of ultrasonic waves

SECTION-B

(Essay type questions)

Answer All questions with internal choice from each Unit 5x10=50

9. a).Derive expressions for final velocities of two bodies after a one dimensional elastic collision between them.

   Or

   b).Define angular momentum and torque. Obtain a relation between them

10. a).What is a central force and give two examples. Show that the central forces are conservative.

    Or

    b). State Kepler's laws of planetary motion. Deduce Newton's law of gravitation from Kepler's law

11.a).What is a frame of reference? Distinguish between inertial and non-inertial frames.

Or

b).State postulates of special theory of relativity. Derive Einstein's mass energy relation

12.a).What is simple harmonic motion and derive an equation of motion of a simple harmonic oscillator.

Or

b).What are damped vibrations and give examples. Distinguish between damped and undamped vibrations.

13.a).What are transverse waves? Derive an expression for its velocity along a stretched string.

Or

b).What are Ultrasonics? Derive any method of production of Ultrasonics.

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