

SRI VENKATESWARA UNIVERSITY, TIRUPATI
B.Sc. PHYSICS II SEMESTER SYLLABUS

Paper II: Waves & Oscillations
(For Maths Combinations)

Work load: 60 hrs per semester

4 hrs/week

UNIT I (12 hrs)

1. 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', combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies. Lissajous figures.

UNIT II (12 hrs)

2. 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 (10 hrs)

3. Complex vibrations

Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw tooth wave.

UNIT IV (17 hrs)

4. Vibrating strings (8 hrs)

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, energy transport and transverse impedance.

5. Vibrations of bars (9 hrs)

Longitudinal vibrations in bars-wave equation and its general solution. Special cases i) bar fixed at both ends ii) bar fixed at the mid point iii) bar free at both ends iv) bar fixed at one end. Tuning fork.

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UNIT V (9 hrs)

6. Ultrasonics

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

TEXT BOOKS

1. B.Sc. Physics -Telugu Akademy, Hyderabad
2. Waves and Oscillations. N. Subramaniam and Brijlal *Vikas Publishing House Private Limited.*
3. Unified Physics Vol. I, Mechanics, Waves and Oscillations – *Jai Prakash Nath & Co.Ltd. Meerut.*
4. Mechanics of Particles, Waves and Oscillations. Anwar Kamal, *New Age International.*

REFERENCE BOOKS

1. Fundamentals of Physics. Halliday/Resnick/Walker, *Wiley India Edition 2007.*
2. Waves and Oscillations. S. Badami, V. Balasubramanian and K. Rama Reddy *Orient Longman.*
3. College Physics-I. T. Bhimasankaram and G. Prasad. *Himalaya Publishing House.*
4. Science and Technology of Ultrasonics- Bladdevraj, *Narosa, New Delhi, 2004.*
5. Introduction to Physics for Scientists and Engineers. F.J. Ruche. *McGraw Hill.*


Practical Paper 2: Waves & Oscillations

Work load:30 hrs per semester

2 hrs/week

Minimum of 6 experiments to be done and recorded

1. Determination of 'g' by compound/bar pendulum
2. Simple pendulum normal distribution of errors-estimation of time period and the error of the mean by statistical analysis
3. Determination of the force constant by static and dynamic method and evaluation of 'g'.
4. Determination of the elastic constants of the material of a flat spiral spring.
5. Determination of moment of inertia of a cylindrical rod -bifilar suspension
6. Coupled oscillators
7. Verification of laws of vibrations of stretched string –sonometer
8. Determination of velocity of transverse wave along a stretched string-sonometer
9. Determination of frequency of a bar –Melde's experiment.
10. Study of a damped oscillation using the torsional pendulum immersed in liquid-decay constant and damping correction of the amplitude.
11. Searls viscometer
12. Lissajous figures-CRO.


10/2/16

SRI VENKATESWARA UNIVERSITY
TIRUPATI

Model Question Paper for 2nd Semester of **FIRST YEAR-UG** degree course
from the academic year 2015-16

Name of the Subject : PHYSICS (WM)
From the academic year 2015-16

Paper No.

Paper Code:

SECTION – I

Answer any Five of the following (Marks: 5×5=25)

1. What are the characteristics of simple harmonic motion?
2. Write a note on Lissajous figures.
3. Define Quality factor. Explain its importance.
4. Explain Logarithmic decrement.
5. What are the limitations of Fourier theorem.
6. Discuss about the energy transport.
7. Explain the working of a Tuning fork.
8. Write a note on applications of ultrasonics.

SECTION – II

Answer all the questions (Marks: 10×5=50)

- 9.(a) Discuss the combination of two mutually perpendicular simple harmonic vibrations of equal frequencies.

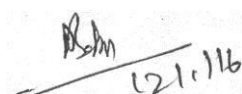
(or)

- (b) Describe an experiment with necessary theory to determine the Rigidity modulus of the material of a wire using Torsional pendulum.

- 10.(a) What are Damped oscillations? Obtain the differential equation and discuss its solution under different conditions.

(or)

- (b) What are Forced oscillations? Obtain an expression for the amplitude of forced vibration.


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11.(a) State Fourier Theorem. Analyse a triangular wave form by Fourier theorem.

(or)

(b) Explain how the Fourier coefficient, can be evaluated. Analyze a square wave by Fourier thorem.

12.(a) Obtain the equation of motion far a Transverse wave travelling along a stretched string.

A string of length 8m fixed at both ends has a tension of 49 N and a mass 0.04 Kg. Find the speed of transverse waves on this string.

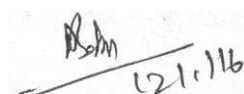
(or)

(b) Derive an expression for the velocity of longitudinal waves in a Bar. Write a note on vibrations of Bars.

13.(a) What are ultrasonics? Describe Magnetostriction method for generation of ultrasonics. Calculate the fundamental frequency of a quartz crystal of thickness 0.001 m. ($Y = 7.9 \times 10^{10} \text{ N / m}^2$ and $\rho = 2650 \text{ kg/m}^3$)

(or)

(b) Explain how do you determine the wave length of ultrasonic waves. The maximum wavelength of an ultrasonic wave produced by a Bat is 0.33 cm. Find the maximum frequency.

A handwritten signature, possibly 'R. S. M.', is written above the date '12/11/16'.