Course 3: Oscillations and Waves
Course code: BSCPH103 Credit: 3

BLOCK 1 Simple Harmonic Motion:
Unit –1: Simple Harmonic Motion I: Basic Characteristics of Simple Harmonic Motion, Oscillations of a Spring-Mass System; Differential Equation of SHM and its Solution
Unit–4: Superposition of harmonic oscillations: LC circuit, principle of superposition, Superposition of two collinear harmonic oscillations of same/different frequencies, Oscillations in two dimensions
Unit–5: Superposition of two mutually perpendicular harmonic oscillations: Superposition of two mutually perpendicular harmonic oscillations of the same/different frequencies; Lissajous Figures.

BLOCK 2: Damped and Forced Oscillations:
Unit–6: Damped Oscillations: Differential equation of a damped oscillator and its solutions, heavy damping, critical damping, weak damping; characterising weak damping: logarithmic decrement; relaxation time, quality factor
Example of a weakly damped system - LCR circuit; differential equation of an undamped oscillator and its solution;
Unit–7: Forced Oscillations and Resonance: differential equation of a weakly damped forced harmonic oscillator and its solutions, steady state solution, resonance. Examples of forced vibrations and resonance, power absorbed by a forced oscillator, quality factor

BLOCK 3: Basic Concepts of Wave Motion:
Unit–8: Wave Motion: Formation of a Wave; Graphical Representation of Wave Motion, Relation between Wave Velocity, Frequency and Wavelength; Mathematical Description of Wave Motion:
Unit–9: Phase, Energy and Intensity of wave: Transported Phase and Phase Difference, Phase Velocity, Energy Transported by Progressive Waves, Intensity and the Inverse Square Law;
Unit–10: One-dimensional Wave Equation: One-dimensional Wave Equation Waves on a Stretched String, Waves in a Field, Waves in a Uniform Rod; Waves in Two and Three Dimensions;
Unit–11: The Doppler Effect: Source in Motion and Observer Stationary, Source Stationary and Observer in Motion, Source and Observer both in Motion; Shock Waves.
Unit –12: Principle of Superposition and types of waves: Principle of Superposition of Waves; Stationary Waves, Properties of stationary waves, Velocity of a Particle at any Point in a Stationary Wave, Harmonics in Stationary Waves.