PHYSICS | Waves

Hooke's Law

General Aim

- Verify Hooke's law.
- Determination of acceleration of gravity (g) and effective mass of spring (M).

Method

Mass-spring extension method

Learning Objectives (ILOs)

- State Hooke's law and then verify it.
- Recall the stress-strain curve for a ductile material.
- Understand the following terms: force constant, ductile, brittle, elastic, plastic, proportional limit, elastic limit and the fracture point.

Theoretical Background/Context

Hook's relates the force (F) pulling or pushing on a spring (or other elastic material) to the amount the spring stretches or compresses land this force is directly proportional to the extension Δl

$$F = mg = k\Delta l$$

Where k is the force (or spring) constant.

When the pan with a mass m is displaced slightly from its equilibrium and then is released, it will perform simple harmonic motion with periodic time

$$T = 2\pi\sqrt{\frac{mn}{g}}$$

But when the effective mass of the spring M is taken into consideration, the periodic time will be

$$T = 2\pi\sqrt{\frac{(m+M)n}{g}}$$

Where n = g / k, is called the extension per unit mass

Principle of Work

Measuring the extension produced by different weights and period of oscillations caused by these different weights.