Physics - Waves

Topics : Computer engineering
Written on March 18, 2024

1. **Waves:**

   Waves are disturbances that propagate through a medium or space, transferring energy without transferring matter.

2. **Classification:**

   - **Mechanical Waves:** Require a medium (solid, liquid, or gas) to travel through. Examples: sound waves, water waves, seismic waves.
   - **Electromagnetic Waves:** Can propagate through a vacuum and do not require a medium. Examples: light waves, radio waves, microwaves.

3. **Key Characteristics:**

   - **Amplitude:** Maximum displacement of particles from their equilibrium position.
   - **Wavelength (λ):** Distance between two consecutive points in phase.
   - **Frequency (f):** Number of complete oscillations passing a point per second (measured in hertz, Hz).
   - **Period (T):** Time taken for one complete oscillation (T = 1/f, measured in seconds, s).
   - **Wave Speed (v):** Speed of wave propagation (v = λf).

4. **Types of Waves:**

   - **Transverse Waves:** Particle vibration perpendicular to wave direction (e.g., electromagnetic waves).
   - **Longitudinal Waves:** Particle vibration parallel to wave direction (e.g., sound waves).

5. **Wave Behavior:**

   - **Reflection:** Bouncing of waves off a boundary or obstacle.
   - **Refraction:** Bending of waves due to change in medium.
   - **Diffraction:** Bending of waves around obstacles or through openings.
   - **Interference:** Combination of waves resulting in constructive or destructive interference.

6. **Applications:**

   - Used in communication (radio waves), medical imaging (X-rays), navigation (sonar waves), and music (sound waves).