



INSTITUTO  
SUPERIOR  
TÉCNICO

**MECÂNICA E ONDAS**  
**Licenciaturas LEE + LEGI**  
Ano lectivo 2011/2012, 2º semestre

**2º Teste**

**Sexta-feira, 18 de Maio de 2012, 15h00 – 16h30, Sala 065**

**Elasticidade:**

$$F = -kx, \quad U = \frac{1}{2}kx^2$$

$$\frac{mv^2}{2} + \frac{kx^2}{2} = \frac{kA^2}{2}$$

**Movimento harmónico:**

$$T = 2\pi\sqrt{\frac{m}{k}}, \quad T = 2\pi\sqrt{\frac{m}{k_{equiv}}}$$

$$T = 2\pi\sqrt{\frac{\ell}{g}}, \quad T = 2\pi\sqrt{\frac{m\ell}{F}}$$

$$T = 2\pi\sqrt{\frac{I_{CM} + ma^2}{mga}}$$

**Ondas elásticas:**

$$\psi(x,t) = F(x \pm vt)$$

$$\frac{\partial^2 \psi}{\partial x^2} = \frac{1}{v^2} \frac{\partial^2 \psi}{\partial t^2}$$

$$v = \sqrt{\frac{E}{\rho}}, \quad v = \sqrt{\frac{F}{(m/\ell)}}$$

**Ondas harmónicas:**

$$\psi(x,t) = A \sin(kx \pm \omega t)$$

$$k = \frac{2\pi}{\lambda}, \quad \lambda = \frac{v}{f}, \quad v = \frac{\omega}{k}$$

$$\psi(x,t) = 2A \sin kx \cos \omega t$$

$$I = \frac{1}{2} Z \omega^2 A^2$$

**Fenómenos ondulatórios:**

$$\frac{\sin \theta_1}{p_1} = \frac{\sin \theta_2}{p_2}$$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$I = I_1 + I_2 + 2\sqrt{I_1 I_2} \cos \delta$$

$$I = I_0 \left( \frac{\sin \frac{N\delta}{2}}{\sin \frac{\delta}{2}} \right)^2, \quad \delta = \frac{2\pi}{\lambda} a \sin \theta$$

$$I = I_{\max} \left( \frac{\sin u}{u} \right)^2, \quad u = \frac{\pi}{\lambda} b \sin \theta$$