LECTURE 4

Function $f(x)$ on interval $0 \leq x \leq L$ can be represented as superposition of sine waves (normal modes)

$$f(x) = b_1 \sin \frac{\pi x}{L} + b_2 \sin \frac{2\pi x}{L} + \cdots$$

Fourier sine series

with coefficients (amplitudes) given by

$$b_n = \frac{2}{L} \int_0^L f(x) \sin \frac{n\pi x}{L} \, dx$$

Works because

$$\int_0^L \sin \frac{n\pi x}{L} \sin \frac{m\pi x}{L} \, dx = 0 \quad \text{if} \quad m \neq n$$