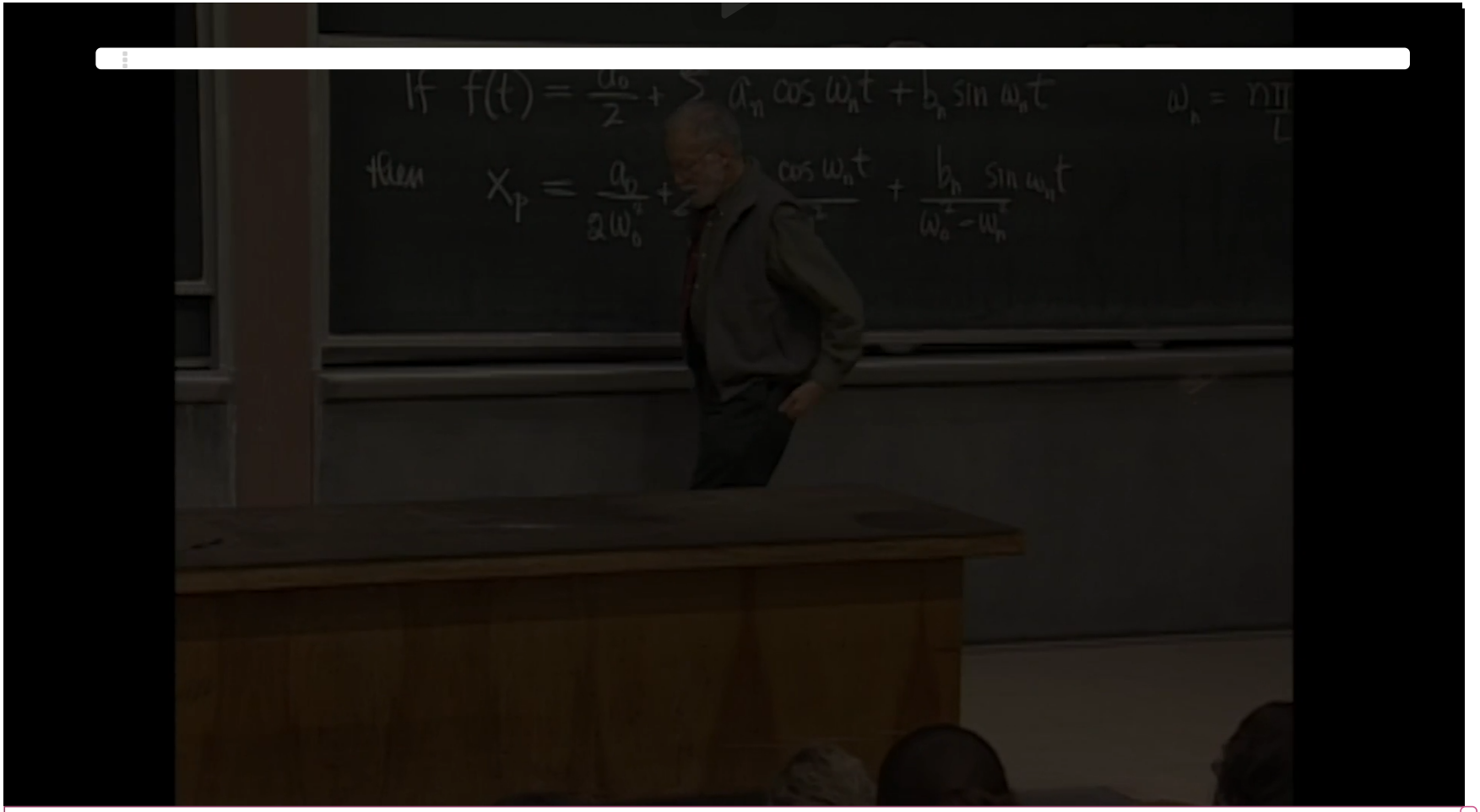
# 7. Same example, but with period 2L
## Solving ODEs with Fourier series




8:49 / 8:49 1.50x

**Video**
Download video file

**Transcripts**
Download SubRip (.srt) file
Download Text (.txt) file

We can solve the same differential equation in general for a periodic input signal of any frequency.

Solve the differential equation

$$\ddot{x} + \omega_0^2 x = f(t),$$

where $f(t)$ is $2L$-periodic, and has Fourier series

$$f(t) = \frac{a_0}{2} + \sum_{n=1}^{\infty} \left(a_n \cos(\omega_n t) + b_n \sin(\omega_n t)\right), \qquad \text{where } \omega_n = \frac{n\pi}{L}.$$

A particular solution is given by

$$\boxed{x_p(t) = \frac{a_0}{2\omega_0^2} + \sum_{n \geq 1} \frac{a_n \cos \omega_n t}{\omega_0^2 - \omega_n^2} + \frac{b_n \sin \omega_n t}{\omega_0^2 - \omega_n^2}}.$$

---

## 7. Same example, but with period 2L

**Topic:** Unit 1: Fourier Series / 7. Same example, but with period 2L

Hide Discussion

Add a Post

Show all posts by recent activity

There are no posts in this topic yet.