ENGR 101 Tutorial Week 1: The Science and Technology of Sound

In this tutorial we will explore the physics of sound, learn a bit about the human ear, and how our sound technology is designed to work with the human ear.

You will need to make some sketches for this tutorial. The easiest way to do this is to sketch on paper, take a photo, upload the photo and insert into this document.

Two Kinds of Waves

When a wave passes through a medium, the medium wiggles. We will discuss two kinds of waves. Make sketches to show what happens in the medium in each case.

Transverse waves

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Longitudinal or compressional waves

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Sound is a wave. What kind of wave is it?

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Make a sketch connecting the mathematical sine wave to what is actually happening in the air.

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We will do a demonstration showing that the air is wiggling longitudinally when sound is present. Describe the demonstration very briefly.

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Explain briefly how a speaker works.

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How can we show sound moves through air and does not carry air with it?

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Wave parameters

As seen on the Wave Demonstrator, describe what each of the wave parameters means and how they affect the sound. Sketches will be helpful. You should include wavelength, frequency, period, and amplitude. Also write a formula for the speed of a wave in terms of the other parameters. Note the speed formula works for all waves, not just sound.

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Human hearing

What is the frequency range for human hearing (nominally)?

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Describe two technologies that make use of the usual decline of high frequency hearing with age.

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Superposition

When two sound waves are present at the same time, what happens?

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Challenge

Give a mathematical description of a wave.

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Find the amplitude, frequency, period, wavelength, and speed and direction of the following wave.

$$y = 7sin(0.1x - 0.5\,t)$$

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