Circuit Analysis: AC

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The function generator (with oscilloscope)
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Filtering
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SHUPER SHWEET

In what context are we going to be covering them?

What am I expected to know before taking this course?

You should have taken Circuit Analysis: DC, and understand KVL, KCL, voltage dividers, and the basics of capacitors. If you do not feel comfortable analyzing simple DC circuits for voltages and currents, inform your instructor now.

Where can I go from here?

TechShop's Electronics and Electrical Engineering (EEE) curriculum is designed to the teach the fundamentals of modern low-power electronics. You are currently taking the second electrical engineering course, in which you will learn about AC signals, and will build your own AM radio. We plan to offer more intermediate and advanced electrical engineering courses in the future.

There is also a concurrent Microcontrollers path, in which you learn how to control tiny computers. These courses can be taken before, after, or in tandem with the electrical engineering courses.

Let's get started!

Review: what you should know

hey there

An overview: The fundamentals of AM radio

what the hell are we going to do?

Dr. AC, or: How I learned to stop worrying and love the sine

So far, you've been working with DC signals; that is, signals with are constant and unchanging in time. It is time now to begin to work with signals which vary with respect to time; signals which *alternate*. Unsurprisingly, these are called **AC signals**.

this other thing

The oscilloscope (with a DC signal)

You've used the DMM to measure resistance, voltage, and current; it gives you a numeric output. That's all well and good for values which are static. But what happens if you feed the DMM a signal (a voltage, for instance) which changes as time goes by? At a low change, you can see the digits changing. If the rate of change is *high*, the DMM's display won't be able to keep up. So how do we measure signals which are changing

The function generator part 1: DMM it!

uh huh

The function generator part 2: 'scoped

now we're getting somewhere!

AC audio and transducers

yarp

This circuit goes to 11: Amplification

NERRRRRRRD

Filtering

this other thing

Let's be positive: Rectification

things

Demodulations

this stuff

Calculate *all* the things!

The resonant frequency of an LC circuit is given by the following equation:

$$f_R = \frac{1}{2\pi\sqrt{LC}}$$

Pretty straightforward. We'll need to know two of the variables to be able to solve for the third. We already know the frequency band of AM radio (540kHz to 1600kHz), and

$f_{min} = \frac{1}{2\pi\sqrt{LC_{max}}}$	$f_{max} = \frac{1}{2\pi\sqrt{LC_{min}}}$
$f_{min} = \frac{1}{2\pi\sqrt{(680*10^{-6})*(180*10^{-12})}}$	$f_{max} = \frac{1}{2\pi\sqrt{(680*10^{-6})*(12*10^{-12})}}$
$f_{min} = 455kHz$	$f_{max} = 1762kHz$

This range is saddled very nicely around the AM frequency band of 540kHz to 1600kHz!

Circuit analysis is answering the WHY (analyzing and breaking down a system)
Circuit design is answering the HOW (