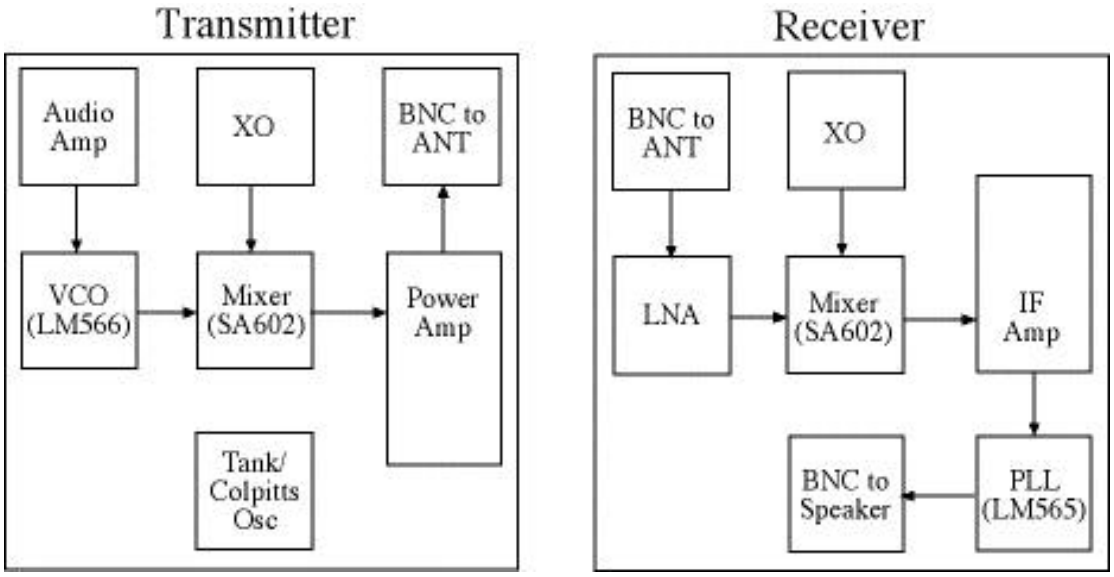
A Quick Circuit Orientation and Lab Schedule.

This quarter you will be building a FM radio, operating at 24MHz. Below is a block diagram of the transmit and receive circuits you will be building.



Don't worry if none of these blocks make sense to you. That's the whole point of the class. This is just the map to help you understand how all the parts are connected.

As you can probably guess, there are several ways to build each block. In this class, we do not care if you choose one topology over another. Each team will have to make own engineering trade-offs as they design and build their circuits.

Usually the labs will center around the characterization of a particular block. While it is often the easiest to simply take our designs as the basis for each block, it is not necessary. You may replace any section with a design of your choice and we encourage such experimentation. In the case of the power amplifier, we actually insist that you do the research to design your own circuit.

With that said, on the next two pages are a week by week, blow by blow account of how we're going to investigate the circuits above:

Lab Schedule

- **Week 1: No lab! HSPICE tutorial.**

- **Week 2: Back to Basics**
  This week, we'll ask you to build a comparator circuit, an amplifier circuit, and an *LC Tank*. We'll use these three circuits to give you an understanding of the experimental hang-ups that can occur in lab.

- **Week 3: Amplitude Modulation(AM) Signals**
  It's all about AM signals: what they look like, how to generate them, and how to decode them. Granted, the final project is an FM radio, but it turns out that AM and FM radios share many concepts and even circuitry. For example, the *Four-Quad Multiplier* is common to both schemes. In this lab, we'll investigate how they are used to generate AM signals. We'll also find out how this is a useful chip for FM modulation and demodulation. Eventually you'll install one on both boards.

- **Week 4: The Generation of Frequency Modulation(FM) signals.**
  This time around, we'll learn about the creation of FM signals. We'll investigate *Voltage Controlled Oscillators* (VCO's), crystal oscillators and discrete based oscillator circuits in order to understand how we go about creating an FM signal. This week and next, we'll also install a few of the minor blocks that will make your circuits portable for the upcoming experiments. By the end of this lab, you'll be able to create FM signals which the Spectrum Analyzer will be able to decode for you.

- **Week 5: The Reception of FM Signals**
  This week we'll focus on the demodulation of FM signals. At the heart of this process is a device known as the *Phase Locked Loop* (PLL). Once installed, your circuits will be good enough to transmit and receive a signal approximately 1-2 feet. Not that impressive, but that's because we're just getting started.

- **Week 6: The Intermediate Frequency(IF) Amp and Filter**
  In this lab, we'll explore the merits of amplification at an *Intermediate Frequency*. You'll implement a fairly straightforward IF amp which will improve your receiver performance by orders of magnitude. We'll also take a brief look at filter design and how it can help to extend the useful range of your receiver. With your transmitter from week 5, you'll be transmitting and receiving signals from across the room.

- **Week 7: The Power Amplifier**
  You will be in charge of designing a power amplifier. We simply give you the specs and turn you loose. After you install the amplifier, you should be able to transmit a signal across campus.

- **Week 8: System Integration, Refinement and Chracterization**
  There's no lab this week. Your task to is look over your circuit and fine tune it. A time to go back and fix anything that you didn't fix earlier in the labs. And its your last chance to measure your overall system performance. A word of warning: do not count this week as a break. What sounds like a lot of extra time and 'filler' will seem precious few hours in the lab as you wrestle with the toughest part of design–integration!

- **Week 9: Dead Week. Saturday Demo Day**
  Traditionally, on the last day of Dead Week, we hold Demo Day. We set up a transmitter and have students walk around with their receivers to see how far they can go and still hear our base station. The current record is from Packard to EV. Look for more information about Demo Day later in the quarter.

- **Week 10: Finals Week. No Final.**