Laboratory Exercises

1. Op-amp applications - build several opamp circuits (2 weeks)
2. Practical OpAmp limitations and their correction (2 weeks)
   (a) op amp input/output impedance, gain measurement
   (b) input offset voltage and current correction
   (c) gain-bandwidth product measurement
   (d) frequency compensation
3. amplifier design using op amps (1 week)
4. filter design and testing (2-3 weeks)
5. current-feedback op amps (2 weeks)
6. Final project design (5-6 weeks)

Examples of Projects

The following are from MIT's 6.101 Analog Circuits Lab projects.

- Theremin (an electronic instrument that produces sounds based on how far the user's hands are from a
- pair of metal rods)
- Audio mixer, effects engine, Dolby decoder, and multichannel power amplifiers
- Beat detector and note finder
- FM modulated transmission over a power line
- Laser link audio transmitter and reciever
- 400W class D full range audio amplifier
- High fidelity audio power amplifier with preamp
- Sound level meter
- Audio octave or third-octave band equalizer
- Pink/white noise generator
- Sine square triangle sawtooth function generator

- Audio Real Time analyzer
- AM receiver and/or transmitter
- Carrier current FM Radio transmitter/receiver
- Analog Tape recorder record-play electronics
- Infrared audio transmitter/receiver
- Analog computer [!]
- Capacitance, Inductance, Resistance, Temperature, Beta, IDSS, VP meter
- Audio mixer/equalizer
- Voice scrambler
- Automatic Battery charger
- Music Keyboard synthesizer
- Noise cancelling headphones
- Audio distortion analyzer [THD, IM]
- Mod Box
- Dolby Pro-Logic Movie sound decoder
- Audio compressor/expander
- Commercial Squelcher [analyzes audio waveform of commercials to mute audio during same, and/or uses
- 20 Hz signal broadcast by some satellite channels to mute commercials

Analog Communications

Design and testing of analog communications circuits, such as:

- Amplitude modulation (AM) using discrete multiplier circuits and fully integrated implementations. - Frequency Modulation (FM) based on discrete and integrated modulator circuits such as voltage-controlled oscillators (VCOs). - Phase-Lock Loop (PLL) techniques, characterization of key parameters and their applications, e.g., in modems.

Instrumentation

Phase-lock detectors and lock-in amplifiers: design, testing and characterization Precision instrumentation: design and testing of a high precision instrument to measure some variable, such as temperature, capacitance, humidity, etc.

Analog front-end for a micro-computer instrumentation system

Power electronics