UNIVERSITY OF CALIFORNIA, SANTA CRUZ
BOARD OF STUDIES IN ELECTRICAL AND COMPUTER ENGINEERING

ECE-118(218): INTRODUCTION TO MECHATRONICS

LAB 1 – SIGNAL CONDITIONING AND FILTERING

OVERVIEW:

In this lab you will design and prototype a track wire sensor and a beacon detector of your own design for use in your final project. This lab is intended to acquaint you with the behavior of operational amplifiers and comparators, and their use in detecting and filtering signals. You will gain experience using a proto-board to experiment with circuits and to build physical circuits from a schematic.

COMMENTS:

This is a long lab. You have some extra time to do it, but for many of you this will be the first time actually building a real analog filter. This is a place where neatness definitely counts. Many problems come from stray wires and accidentally pulling wires out when changing things around.

Always check power and ground. Almost all of your problems are there. Ensure you have good power with the right voltage on it, and that ground is hooked up where you expect.

Incremental development and debugging is your friend here. Build a single block, test input to output to make sure it does what you think, then do the next block, only then hook them together and again check end to end. Make sure what you build matches your schematics (we won't be able to help you if you don't have what you have built documented).

This lab is both harder and longer than Lab 0, so budget your time accordingly (we have also given you four more days to complete it). Do the reading; do it diligently. The filter section of this lab is going to take you a while; it will be frustrating and you will spend a large amount of time doing hardware debugging with an o-scope. Being neat and methodical here will save you untold hours. The more time you prepare, the less time you will flounder in the lab.

We will be around to help, but the more you have prepared, the easier it will be.

PRELAB:

Choose a partner to do the lab with, and join a group together in the "Lab 1 # XXX" category on CANVAS. For instructions on how to do this, see the ECE118_LabSubmission document on the website. If you have not chosen a partner by Saturday, we will randomly assign one to you (most likely on Sunday). Note that Piazza is an excellent way to find partners.

After you have read the whole lab and before starting to complete the lab, answer the following questions:

1. What are the values of resistors with the following color codes:
   a. red red red
   b. brown black red
   c. yellow violet orange
   d. brown black green
   e. brown black black
   f. green black yellow