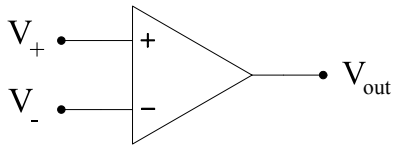
Phys 3150/5190 Project Overview

Instrumentation Amplifier

The class project is intended to give you an introduction to practical electronics construction techniques, including selecting and purchasing components, soldering, assembly, and testing.



The project you will build is a high-quality instrumentation amplifier. An instrumentation amplifier is a practical low-noise, high-gain, differential amplifier with high input impedance. Symbolically, it appears like an op amp, as shown. Like an op amp, it produces an output signal proportional to the difference between its inputs, as $V_{\text{out}} = G(V_+ - V_-)$. Here, however, the gain G is not so large and it is precisely controlled. Instrumentation amplifiers are intended for use as stand-alone circuits, not as part of a feedback circuit like an op amp. You can read more about instrumentation amplifiers in the text, pp. 421-428, or on Wikipedia.

Project Timeline

Work on the project will be divided into several phases, as outlined below. Guidance will be provided for each phase.

Phase	Due Date
Design assignment	10/10
Obtain components and test circuit on breadboard	10/24
Solder components onto prototyping board	11/12
Prepare and assemble instrument case	11/26
Complete project	12/13

Wednesday 10/24, Monday 11/12 and Monday 11/19 will be project work days, when we won't have a regular lab exercise and you can use class time to work on the project.

Grading

Your grade on the project will be based on the following categories:

Amplifier functionality	50%
Quality of assembly	10%
Exterior appearance	10%
Design assignment	10%
Intermediate and final deadlines	10%
Labels and documentation	10%

You will get to keep your project after the course is finished. This project was chosen because an instrumentation amplifier is a handy general purpose lab instrument. In combination with a standard voltmeter, it allows you to reliably measure voltages at the μV level, which can be useful for many diagnostic or data-collection problems. A commercial device with comparable specifications would cost several hundred dollars. Doing a good job on the project will therefore not just benefit your grade, but will leave you with an excellent instrument for use in future electronics work!