

Optical Immunoassay Assignment (OIA) Learning Objectives

BIOE 385 Bioinstrumentation Laboratory

Lab 1

Students should be able to:

- Use NI ELVIS function generator to output a variety of waveforms
- Use NI ELVIS variable power supplies as a source to generate DC voltages
- Use NI ELVIS to measure voltages using the oscilloscope and DMM
- Describe how triggers work and use them to stabilize signals
- Map out connections between pins in each of the sections of the protoboard
- Design and build a voltage divider given a desired transfer function
- Design, build and balance a Wheatstone bridge
- Explain how strain gages work
- Design circuits using potentiometers and describe applications where they might be useful
- Explain the time constant and how voltage changes in an RC circuit as a function of time

Lab 2

Students should be able to:

- Design and build a circuit to control the amount of light emitted from an LED
- Design and build two different circuits that detect different light intensities using a photodetector
- Use operational amplifiers to design circuits
- Calculate the gain and build circuits to amplify voltage using inverting amplifiers
- Explain the difference (and some advantages and disadvantages) between the photovoltaic and photoconductive circuits built in class

Lab 3

Students should be able to:

- Acquire data from different channels using LabView
- Modify properties of the DAQ to acquire the desired data
- Use Arithmetic and Comparison functions in LabView to manipulate signals
- Create VIs using for-loops and while-loops and describe the main differences between them
- Use waveform graphs and charts to correctly plot the acquired data (display correct labels, units, scaling, etc)
- Use a variety of controls and indicators to create an easy to use VI

Lab 4

Students should be able to:

- Explain how the circuits built in class can detect nanoshell concentration and anti-gen presence
- Justify the selection of components used in the circuits designed in lab
- Explain the relation between the LED and FDS 100 and how external factors might affect the functioning of the device by interfering with this setup
- Explain the LabView VI built to determine nanoshell concentration for a given sample
- Identify and describe the main limitations of the devices
- Calculate the accuracy and precision of each circuit and select one for a final recommendation