EE 591L – Neuromorphic Analog VLSI
Project 1 – Curve Fitting and p-n Junctions

Objective
To understand the exponential nature of p-n junctions and how to extract circuit parameters from data using curve fits (especially on exponentials).

Special Instructions for This Project
This project should be done individually. You each need to perform the following data analysis and write individual reports.

Data
The data on the class website are from a voltage sweep of a real p-n junction diode. The first column contains the voltage values, and the second column contains the corresponding current values. Real data should (almost) always be plotted as individual data points (such as circles) instead of lines.

Part 1
- Plot the data on both a linear-linear scale and also a log-linear scale. Determine the range of voltages over which the p-n junction behaves exponentially.
- Perform a curve fit on the data to determine the slope and y-intercept of the data. Assuming that these data were taken under room-temperature conditions (T = 300K), determine both I_0 and the ideality factor, n. Make sure you include the curve fit. The MATLAB functions "polyval" and "polyfit" will likely prove useful.
- How do these results agree with what was expected?
- With your extracted values, write the complete voltage-to-current equation of this p-n junction.

Part 2
Part 2 is optional and will not in any way be graded. However, I would encourage you to answer the following questions to help me better understand your backgrounds.

Therefore, if you are willing, I would like to know the following.
- Since high-school, have you taken any biology courses? If so, which ones (roughly, what have you covered)?
- Besides EE 355 or its equivalent (basic analog electronics) which is the course pre-requisite, have you taken any analog courses?
- This class covers both analog VLSI and also neural systems. Are you more interested in one of these two topics than the other? If so, which one? (If I find that the class is much more interested in one area, I could definitely slant the course material in that direction.)
- Feel free to include any other information you would like me to know.