

# MCE380: Measurements and Instrumentation Lab

Homework 1 - Spring 2010

Dr. Richter

## 1 Calibration of Fotonic Sensor

Two Matlab files (`data0127.mat` and `data020210.mat`) have been posted on the course website containing calibration data for range 2 of the Fotonic sensor. The data correspond to two sets of sensor voltage and probe-target distance taken on different dates.

1. Import the data into Matlab.
2. Prepare preliminary plots to evaluate the linearity of the two sets of data by visual means. Comment on the results.
3. Select a subrange of each data set where behavior is approximately linear and use these ranges as working data in what follows.
4. Fit one linear regression equation to each voltage vs. distance subrange. What are the sensitivities in Volts/in for each set?
5. Create a plot (a single plot showing both data sets) showing the original data points with a distinctive marker (no interpolating line) and a graph of the linear regression equations evaluated at the data points, as done in class. Matlab is highly recommended, using `polyfit` and `polyval`.
6. Now use the **whole** data ranges and try polynomial fits successively (start with order 2 and increase as necessary) until a good fit is obtained. Select the lowest order that gives a good fit and repeat part 5 using the non-linear regressions instead of the straight-lines. Use `polyfit` and `polyval`.

**NOTES: Please explain your calculations and Matlab commands in detail. Correctness of the computations AND engineering-grade graph presentation will be used to assign a grade. This is an individual assignment.**

**DATE DUE: February 10th**