

EE120 Lab – Matlab Review

You return from Thanksgiving Furlough and it's a flurry of end-of-semester work until your first Finals Week, then Christmas Furlough. Back again you barely have time to enter the rhythm of the semester before Resurrection Week, then before you know it is Summer Furlough and you return to take Circuits II in the fall. And one of the early labs on First Order Circuits requires you to use your EE120 skills. (These are actual skills you will use in Lab 3 of EE223, among others).

- 1) Using techniques you will learn in Circuits II you determine that the theoretical solution for voltage across a capacitor in a circuit you are given should be

$$v_c(t) = 9 e^{-t/2} \text{ V, for } 0 \leq t \leq 10.$$

Here V stands for the unit Volts, and t is time measured in seconds. If you've forgotten how to plot a function, review the bottom of the second page of Chapter 3. **Plot this as a line plot, title it "Theoretical solution", and label the axes. Embed in a Word document.**

- 2) Armed with the above theoretically-determined solution you work out in the prelab, you start your experimental lab work. You measure the following values

t	0	1	2	3	4	5	6	7	8	9	10
$v_c(t)$	9.2	5.7	3.5	2	1.3	0.8	0.4	0.25	0.15	0.11	0.05

Plot these as triangular data points (not as a line), title it "Experimental values", and label the axes.

- 3) Write a short Matlab function that uses two vectors, t and v_c , of the experimentally-measured data shown in the data table above, and computes the % error from the theoretically-derived solution you determined in Problem 1. List these results. You will have as many % errors as you have measurements. **Show the code and the result in your Word document.**

$$\text{Percent Error} = \frac{\text{Experimental} - \text{Theoretical}}{\text{Theoretical}} \times 100\%$$

- 4) Write a short Matlab function that overlays the theoretical plot you calculated in Problem 1 with the experimental data that is listed in Problem 2. Specifically, this function should create a plot with a single axis that shows both the theoretical data as a line plot and the experimental data as a scatter plot. Title and label the axes of the plot, and create a legend that describes the two data sets. **Show the code and the results in your Word document.**