

# ECE 376 - Homework #7

Data Collection & Student t-Test - Due Monday, October 21st

## Data Collection (population A)

- 1) Measure one of the following with at least two data sets and 20+ data points per run:
  - The voltage across a capacitor as it discharges
  - The temperature of a cup (or can) of hot water as it cools off
  - The temperature of a can of cold water as it warms up
  - Other

Plot the resulting data vs. time.

- 2) Determine the time constant from your data using least-squares

$$V = ae^{-bt}$$

$$T = ae^{-bt} + T_{amb}$$

$$\ln(V) = \ln(a) - bt$$

$$\ln(T - T_{amb}) = \ln(a) - bt$$

- 3) Use a student t-test to determine the 90% confidence interval for your time constant (b).

## Data Collection (population B)

Change something in your experiment

- Reverse the polarity of the capacitor
  - Use a different type of capacitor (ceramic, electrolytic, etc)
  - Add a lid to your cup of water
  - Add a koozie to your cup of cold water
- 4) Take a second set of data with the change.
    - Plot the resulting data vs. time
  - 5) Determine the time constant from your data using least-squares
  - 6) Use a student t test to determine the 90% confidence interval for your time constant (b).

## Comparison of Means Test (A vs. B)

- 7) Do a comparison of means test to determine the probability that
  - The next measurement from A will have a higher value than the next measurement from B
  - Population A has a higher mean than population B