**ECE 3522: Stochastic Processes in Signals and Systems**

# Computer Assignment (CA) No. 10: Hypothesis Testing

This assignment is designed to introduce you to hypothesis testing. You will essentially build a computer simulation of Example 9.9 in the textbook:

**Example 9.9:** The mean lifetime E[X] of the light bulbs produced by Lighting Systems Corporation is 1570 hours with a standard deviation of 120 hours. The president of the company claims that a new production process has led to an increase in the mean lifetimes of the light bulbs. If Joe tested 100 light bulbs made from the new production process and found that their mean lifetime is 1600 hours, test the hypothesis that E[X] is not equal to 1570 hours.

The tasks to be accomplished are:

1. Create a function that generates *n* Gaussian distributed random variables:

*X = gen\_grv(mean, stdev, n)*

1. Compute the mean of *X*, **.
2. Create a function that tests whether the difference between the true mean and the estimated mean are statistically significant:

*status = check\_significance(mean1, mean2, stdev, n, confidence)*

1. Create a function that determines the value of N for the difference between two means to be statistically significant:

*N = determine\_significance(mean1, mean2, stdev, confidence)*

Now, put this all together by doing the following:

1. Generate *n* random numbers with a mean of 1600 hours and a stdev of 120 hours for *n = 10, 100, 1000*.
2. Using your tools above, determine if the difference in the mean is significant for confidence levels of 0.8, 0.9, 0.95, 0.99, 0.999.
3. Determine the minimum value of *n* for which these differences would be statistically significant.
4. Repeat no. 2 for a standard deviation of 240 hours.
5. Find the maximum value of the variance for which the difference in the mean is significant for [*n = 10, 100, 1000*] and [*confidence = 0.8, 0.9, 0.95, 0.99, 0.999*].