To: ENRG 132 project teams
From: Frank O. Simpson, President, First-Order Systems, Inc.
Date: March 20, 2017
Re: Data Analysis

First-Order Systems, Inc.
An Engineering Company

First-Order Systems, Inc. (FOS) is a world-leading engineering and technology company specializing in instrumentation to measure physical phenomena including temperature, velocity, acceleration, stress, and many others. Our customers know us for our quality designs of reliable sensors, offered at affordable prices. We create value by constantly offering our customers the very best measurement options at industry-leading prices.

Our design group has been working on five new thermocouple designs for the past 6 months. They have fabricated these thermocouples and are in the testing phase right now. For each of the 5 new thermocouple designs, they have conducted 20 tests. Each test is either the classic thermocouple calibration experiment where the thermocouple is initially held in ice water and then abruptly moved to boiling water, or the reverse where the thermocouple is initially held in boiling water and then abruptly moved to ice water. I believe you have seen (or soon will see) this experiment in action in your ENGR 132 class. Based upon these 100 tests, our goal is to characterize the performance of the thermocouples and begin crafting our sales literature for them. But we are facing an important challenge, and we need your help.

A key member of our Quality Assurance (QA) team has been called away suddenly on active military duty (she is a Reservist), and we need your help to continue the QA assessment of these thermocouple designs. We will supply to you the time histories from each of the experiments we have conducted, and our request to you is this:

- Construct an algorithm (and implement it in MATLAB) to analyze the time history data we will provide to you. Then, create a detailed description of your analysis of the dataset provided, including clear and easy-to-understand graphics that summarize the data.
- Provide an error analysis that characterizes the accuracy of your approach to determining time constant and other performance characteristics of the system.
- Draft a recommendation about what FOS can honestly and ethically claim to its customers about the performance of the new designs.

Our domestic and overseas manufacturing partners would like to start full-scale production of these thermocouples on May 9, 2017, so we need your final technical brief for this project by April 28, 2017. We have worked with your ENGR 132 instructors to develop a milestone schedule that will help you pace your progress toward your final deliverable, and these milestones are detailed in the project documents available to you through your class website.

FOS thanks you for your help and we look forward to the results of your analysis. I will periodically be in touch with you with project updates from our side, as well as specific expectations about how you should complete your milestones.