To: ENRG 132 project teams
From: Frank O. Simpson, President, First-Order Systems, Inc.
Date: March 19, 2018
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 represents an operating condition relevant to a new client of ours, Swiss Chocolatiers of Greater Lafayette (SCGL), who need precise temperature control of the liquid chocolate during their manufacturing processes. I believe you have seen (or soon will see) a more classic thermocouple calibration experiment in class (using 'boiling water and 'ice' water to represent the two temperature extremes) so that you get a sense for how a thermocouple responds to temperature changes. Based upon these 100 tests, our goal is to characterize the performance of the thermocouples and begin crafting our sales literature for SCGL. 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 require you to do the following three (3) things:

1. 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.

2. Provide an error analysis that characterizes the accuracy of your approach to determining time constant and other performance characteristics of the system.

3. 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, 2018, so we need your final technical brief for this project by your last class this semester, April 26 or 27, 2018.

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.