

CHEMICAL ENGINEERING SENIOR LABORATORY

CHEG 4139

Temperature Control Lab

Data Collection

Test Codes Section (10 points):

Write 1 sentence describing all the test codes. Be specific. Use numbers in your descriptions.

Remake the PID Graphs in Excel, for Temperature and Q using the data provided from the code.

Model Section (5 points):

Please describe what is happening in each of the 6 graphs.

Model 1 Heater (5 points):

Run both the Model and Arduino code. Screenshot the model code graph and remake the temperature graph from the Arduino code.

Model 2 Heater (5 points):

Run both Model and Arduino code. From the Model code, answer: Why is T2 expected to increase before Q2? Remake both the Temperature Graphs and the Heaters Graph and answer: How did the predicted T2 match the actual T2 before Q2 was turned on?

Regression Section (5 points):

Run the Scipy Source code and answer: What values did your code get for Kp, tau p, and theta p? And what do those values represent?

Regression 1 Heater (5 points):

Write down your Kp, tau p, and theta p values for both codes.

Regression 2 Heater (10 points):

Graph the T1 T2 Q1 Q2 sample data code in Excel.

Control Section (5 points):

Post a screenshot of the sample graph.

Control 1 Heater (5 points):

Remake the graphs for temperature and set point and answer: What do the other data points represent? What are each of the 4 graphs showing?

Control 2 Heater (5 points):

Remake the 2 graphs in Excel. Take a screenshot of the code and explain what this code is supposed to do.

Final Questions (15 points):

Answer these questions:

Is radiative heat transfer significant?

What disturbances affect the system?

What physics-based parameters are uncertain and can be adjusted to match data?

Last Day Assignment (25 points):

For your final day, please run an experiment using the test_PID code. **What happens to the PID Controller when you change certain values?** Write down a prediction, sketch what this new graph might look like, and then run the code. Compare your predictions to the results. **Was your prediction accurate? What value did you change? How did that affect the PID controller?** If there is no noticeable effect, try and make changes until there is. **At what point do the changes become noticeable? Each lab member should make a change to the PID code.**

Rubric (X / 100)

Points per section

Full points:

Student demonstrates understanding of the material when answering the question.

Students write an acceptable amount for each open-ended question and description (At least 1 paragraph for descriptions and open-ended questions, at least 1 page for code write up).

Graphs were remade in accordance with the HuskyCT acceptable figures tutorial.

Students include all aspects of the questions: screenshots, values, graphs, written segments.

Half points:

Students briefly describe code but leave out details that would help describe its function.

Students write less than expected.

Graphs were remade but lacking certain aspects that would make them acceptable.

Students only submit part of the section.

No points:

Students do not submit anything for the section.

The graphs were just screenshots and not remade. (Some sections ask for a screenshot; those are the only acceptable screenshots to have).