CHG 4343: Computer-Aided Design in Chemical Engineering

Project Requirements and Schedule

Code Due Date: Friday, December 1ˢᵗ, 2017 by 4 pm[1]
Technical Report Due Date: Monday, December 11ᵗʰ, 2017 by 4 pm

1   Group Formation, Meetings and Assessments

The design project will be completed in groups of five members each. Students will now have assigned themselves to project groups through the Brightspace web site; students who are without a group will be assigned to one by the Brightspace engine. Once a group has been formed, it cannot be altered in any manner.

Each group will be required to meet with the teaching assistant on two separate occasions, during which time the teaching assistant will assess the team's progress and members' contributions to work to-date. The date/time of the meetings will be finalized with each team well in advance.

1.1   Meeting 1

The first meeting is intended to allow the teaching assistant to

- gauge the team's understanding of the problem;
- confirm team members' individual contributions to the project;
- determine the team's level of organization;
- evaluate the preliminary project design.

It is expected that the team will have prepared the following documentation, which will be submitted to the designated Brightspace assignment folder **at least 24 hours** prior to the meeting:

- a signed task allocation sheet;
- a plan of action;
- a preliminary diagram of code structure;
- some initial coding.

You may also prepare a list of questions and concerns to address with the teaching assistant regarding the project and submit these with the other documents prior to the meeting.

1.2   Meeting 2

The second meeting is intended to determine whether the progress on the project is satisfactory. At this time, the team should have completed, or nearly completed, the code.

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[1] Note: Your group will NOT be allowed to edit your code after this date.

The following should be submitted to the designated Brightspace assignment folder **at least 24 hours prior to the meeting**:

- a signed task allocation sheet
- a plan of action;
- the finalized code structure in schematic diagram form;
- a majority of the coding;
- some preliminary code validation;

Any comments and suggestions from the first meeting should have been implemented and/or addressed by this second meeting. You may also prepare a list of questions and concerns to address with the teaching assistant regarding the project and submit these with the other documents prior to the meeting.

1.3 Peer and Self Assessments

At a designated time and date part way through the project, each team member will complete a peer-evaluation and self-evaluation through ITP Metrics. A second set of evaluations will be completed by each team member at the end of the project cycle.

Failure to complete these evaluations by the due date will result in an INC in the project.

2   Report Content

The team *must* complete and submit a professional engineering report to summarize their findings.

In general, the report should contain the following elements:

- Title Page
- Executive Summary
- Table of Contents
- List of Figures & Tables
- Introduction
- Background
- Design & Discussion
- Validation
- Simulation Results
- Extensions & Improvements
- Testing of Anonymous Code
- Conclusions
- References
- Appendices (as Required)

The report *must* contain the following subsections. Strict page limits will be enforced.

2.1   Introduction

Summarize the advantages of using objected-oriented design (OOD) and JAVA for designing chemical engineering process simulators.

Page Limit:1

2.2   Background

Give a brief and concise description of the problem addressed in this project. Provide the overall governing equations. Discuss any numerical methods used in solving the problem.

Page Limit: 3

2.3   Object-Oriented Design & Discussion

Describe the design methodologies chosen for the project with the rationale behind each, including

- why a particular design was chosen for the project;
- the particulars of that design (inheritance structures, polymorphism, etc.);
- the choice of classes and objects, and their interactions;
- why certain methods were placed within specific classes;
- the use of instance variables, local variables, constants, etc.

Page Limit: 10

2.4   Validation – Your Group's Code

Validation is a crucial part of this project, as it ensures that the coding was done correctly. Compare the output of your various classes and methods against solutions obtained by other means (Excel, Polymath, MATLAB, etc.). Methods and classes should be validated individually before verifying the final solution.

Your validation procedure should independently verify each significant calculation procedure in your various classes and as such will extend beyond the final solution of the design problem.

The overall validation should also include the testing of your simulator's handling of dubious input values (e.g. inadmissible input values or values at the meaningful limits of these inputs) to establish bounds of the program. It should as well provide separate testing of numerical procedures against problems with analytical solutions.

Verification of exception handling should be included, if applicable.

Page Limit: 10

2.5   Simulation Results

Briefly explore your simulator's capabilities by providing results for the computations specified in the Project Outline document, providing both tabulated and graphical results of these simulations.

Page Limit: 6

2.6   Improvements and Extensions

Briefly explore any improvements or extensions that would benefit the design. These suggestions should be relevant to the project as a whole. These should be meaningful improvements – recommendations that are trivial or that otherwise could have been easily implemented into the design should already have been incorporated into your final code.

Page Limit: 1

2.7   Validation – Anonymous Group's Code

Following submission of your own final Java code, you will be presented with source code from another, anonymous group. Your task will be to fully test and validate this code with an aim to uncover any possible flaws or errors contained within it. You will also be expected to provide any suggestions you deem needed to significantly improve upon it.

You will be evaluated on the thoroughness of your testing and the convincing nature (or not) of your conclusions regarding the validity of the anonymous code.

Page Limit: 8

2.8   Conclusions

Summarize the results of your validation (Section 2.4) and simulation results (Section 2.5), along with the key findings of your validation of the anonymous code (Section 2.7).

Page Limit: 2

2.9 Appendices

Include your full JAVA simulation code in this section, presented in a clean and readable format. Any other supporting material should be presented in a separate appendix.

Page Limit: None

3 Coding

The program code will be evaluated on the following fundamental bases:

3.1 Efficiency, Robustness and Extensibility

The code must be clean, efficient, and robust, with appropriate use of classes, objects, interfaces, instance variables, local variables, etc. It should provide a robust and extensible design through effective use of object-oriented characteristics such as encapsulation, inheritance and polymorphism.

3.2 Clarity

The code should have consistent and clear formatting with sufficient commenting such that another coder can read the code and understand it with ease. There should be comments within the code to clarify important issues, but not so verbose as to make the code unreadable.

3.3 Understanding of OOD

Through the code, the design team must demonstrate a keen understanding of the principles of object-orient design (OOD) through the effective use of data encapsulation, inheritance (single and multiple), and polymorphism. The design should seek to mimic the physical system through these object-oriented features.

4   The Report Style

All submitted reports must strictly adhere to the following requirements:

- The report should be formatted consistently throughout, and have a professional look and feel.
- Pages should be numbered, starting with the Introduction section. Anything prior to this should be numbered with Roman numerals, excluding the Title Page.
- The body text **must use** 11 point Times New Roman or 10 point Arial font with 1.25 line spacing. Headings, subheadings, and captions may be of a different font and size.
- Each figure must be numbered consistently and should appear **_after_** it is mentioned in the text.
- Any references should be appropriately cited.
- It is expected that the report will be free of any and all spelling and grammatical errors.
- In terms of written style, the report should flow smoothly from section to section and from paragraph to paragraph.
- The report should follow a logical order of progression that ultimately makes it easy and enjoyable to read.

Please consult the teaching assistant via Brightspace or during his/her office hours if you have any questions or concerns with the project.