CHBE 4510 Syllabus

Process and Product Design and Economics, Section A, 2 credit hours

Fall 2026

Instructor Information

Instructor: Matthew Realff, Yonathan Thio

General Course Information

Description

Basic principles of chemical process and product design including heuristic design approaches, heat exchanger network design, optimization, and economic evaluation.

Course Learning Outcomes

By the end of this course, a student should be able to:

1) Be knowledgeable about the kinds of design decisions that challenge process design teams.
2) Understand the key steps in carrying out the design of a chemical process.
3) Be aware of the many kinds of environmental issues and safety considerations in process design.
4) Appreciate the importance of maintaining high ethical principles in process design.
5) Understand process simulators and be able to use them in process creation, equipment sizing and costing, profitability analysis, and optimization.
6) Understand the importance of selecting reaction paths that do not involve toxic or hazardous chemicals, and when unavoidable, to reduce their presence by shortening residence times and reducing storage.
7) Be able to distribute the chemicals, when designing a process flowsheet, to account for the presence of inert species, to purge species that would otherwise accumulate to unacceptable levels, to achieve high selectivity to the desired products, and to accomplish reactions and separations in the same vessel when possible.

8) Be able to apply heuristics in selecting chemical reactors or reactor trains, and in selecting separation processes to separate liquids, vapors, vapor- liquid mixtures, and vapor-liquid-solid mixtures.
9) Be familiar with the most widely used industrial separations and their basis for separation.
10) Understand how distillation columns are sequenced and how to apply heuristics to narrow the search for a near optimal sequence.
11) Be able to determine the second law efficiency of a process and pinpoint the major areas of inefficiency (lost work).
12) Understand the concepts and application of heat and power integration to minimize energy requirements for chemical process plants.

Required Course Materials

Seider, Lewin, Seader, Widagdo, Gani, Ng, Product and Process Design Principles, 4th edition, Wiley, 2017.

Grading Policy:

In this course the following graded assessments and assignments are used to determine the course grade:

Projects (2 parts)	30%
Homework	10%
Team evaluations	10%
Midterm Exam	20%
Final Exam	30%

The letter grade cutoffs in this class are 90%+ for A, 80%+ for B, 70%+ for C, 60%+ for D, based on the overall score based on the relative weights above. These cutoff points may be lowered (resulting in a higher grade for some students) but will never be increased.

Course Policies

Attendance and/or Participation

Your academic success will depend strongly on the level of engagement with the course material. Actively participating in all lectures and taking advantage of other learning opportunities offered (e.g. assignments, office hours) is critical for successful attainment of the learning outcomes. The Georgia Tech Catalog describes policies around "approved Institute activities" (e.g., field trips and athletic events) and accommodations around religious observances.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Cases of suspected cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Core IMPACTS

Not applicable for this course.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.