CBE 4590
PRODUCT AND PROCESS SYSTEM DESIGN PROJECTS

SPRING 2024

Instructor: Bruce M. Vrana and most CBE Faculty Members

Course Description: Design of a chemical process and/or product based on recent advances in chemical and biomolecular engineering technology. Weekly design meetings with faculty advisor and industrial consultants. Comprehensive design report and oral presentation.

Text: None (Seider et. al., *Product and Process Design Principles: Synthesis, Analysis and Evaluation*, Fourth Edition strongly recommended)

Course Outline:

The course is devoted entirely to the solution of design problems in groups of typically three or four students. Timely problems are provided primarily by consultants from the local chemical and pharmaceutical industry who meet with groups on Tuesday afternoons to assist the students throughout the Spring semester. Faculty and students also often provide problem statements.

Course Learning Objectives:

1. Enable groups of three or four seniors to work together as a team to solve individual, timely and challenging design projects, provided by industrial consultants, faculty or students, primarily during the spring semester.
2. Permit all students to become acquainted with the solution of typically 7-10 design projects being carried out by design teams in the senior class. And encourage the teams to communicate newly discovered ideas and concepts to the other teams.
3. Enable the design teams to take advantage of interacting regularly, at least 1 hour/week, with many experienced chemical engineers in industry, our *industrial consultants*, and the instructor who has 40+ years of industry experience.
4. Permit the students to apply the techniques for product and process design taught in CBE 4000 and throughout the entire chemical and biomolecular engineering curriculum. And expect the students to learn and apply real-world techniques to their projects that result from the interaction with the instructor and industrial consultants.
5. Give most of the students their first experience in solving a major open-ended problem, putting into practice many of the analytical techniques learned in their chemical and biomolecular engineering courses.

6. Enable the students to learn to use computer packages for product and process design more critically, checking results carefully to ascertain their validity and applicability.
7. Allow the students to obtain practical experience in using information resources, especially the patent literature.
8. Teach the students to seek economically attractive designs, using the methods for costing and profitability analysis taught in CBE 4000.
9. Expose the students to design strategies when working with approximate and uncertain technical information.
10. Give each design group the opportunity to write a major design report, one that will be both printed and published electronically in Scholarly Commons for posterity (see http://repository.upenn.edu/cbe_sdr/). Enable the students to present their designs orally to the chemical and biomolecular engineering faculty, our industrial consultants and fellow students.
11. Provide a learning environment to foster creative thinking; to look for the unobvious solution; to encourage the melding of their ideas and knowledge with those of faculty and consultants; to learn new technologies and techniques; to invent a creative solution.
12. Understand, recognize, and comply with the need for urgency and managing their schedule in completing the assigned project, as future careers will demand.