

ChE 4083 Chemical Engineering Plant Design

Required course for ChE program

Catalog Description: Design of chemical and petrochemical plants and process equipment. Evaluation of the economic, safety, health, and environmental aspects of a proposed project. Use of spreadsheets and state-of-the-art process simulators. Oral and written reports. Prerequisites: ChE 4063, ChE 4104.

Recent Textbook: Peters, Timmerhaus, and West, "Plant Design and Economics for Chemical Engineers", 5th ed., McGraw-Hill, 2003

Recent References: Perry's ChE Handbook, 7th ed., McGraw-Hill; Walas, "Chemical Process Equipment – Selection and Design", Butterworths, 1988; Ulrich and Vasudevan, Chemical Engineering Process Design and Economics, 2nd ed. 2004; HYSYS manual.

Set of Course Goals/Objectives: By the end of the course, students will be able to:

1. Develop and optimize a complete process flow diagram
2. Develop mass and heat balances and determine utility duties for a plant
3. Size the major equipment units using process simulation software where advantageous
4. Recommend the type and location for process controls in a plant.
5. Develop a complete cash flow analysis including FCI, major annual costs, and ROR
6. Evaluate the safety, health, and environmental aspects of a proposed project
7. Write a preliminary project definition report
8. Work effectively in teams.

Prerequisites by Topic: senior standing in ChE: must have had stoichiometry, basic and ChE thermodynamics, fluid mechanics, heat transfer, mass transfer, reactor design, and process component design.

Major Topics Covered in the Course: Teams of 3 or 4 students solve two, recent AIChE National Student Design Competition problems. Group members take turns at being group leader. The coordinators lead the class through the first problem, dividing the problem into feasibility studies, material balances, heat balances, equipment sizing, economic evaluation, and report preparation. The instructors "keep" all groups at approximately the same pace by providing detailed help when required. In the second problem, the groups are "on their own," and each group works on a recent AIChE National Student Design Competition problem and progress at their own capabilities. During the second problem, the groups continue to make weekly written progress reports. For each second design problem, the responsible group prepares a final report and also makes a final oral presentation during finals week. As an alternative to the second design problem, students can and do elect to take the current AIChE National Design Competition under contest conditions. In addition to the design report, the group presents their design to the entire class.

Class/Laboratory Schedule: two 50-minute lectures and one 3-hour computational lab session per week for 14 weeks

Professional Component: Three hours of engineering science and design