ChBE 4803  Special Topics in Chemical & Biomolecular Engineering

Credit: 2-3-3

Prerequisite(s):  Transport Phenomena II (ChBE 3210) – minimum grade “C”
Separation Processes (ChBE 3225), minimum grade of “C”
Kinetics & Reactor Design (ChBE 4300), minimum grade “C”

Catalog Description: This course introduces the concepts of pilot scale experiments, control room operation, process start-up, and shut-down. The course illustrates the application of engineering/scientific principles and physical models important in the development of methods to start-up and shut-down an operation. In addition, the students will learn about data collection/interpretation of processes important to the practice of chemical engineering.

Text: None. (All materials are available in class or on the web, or use other reference texts that have been used in previous classes or those on reserve in the library.)

Objectives: Going from bench-top experiments to a commercial unit involves a 5-8 orders of magnitude scale-up which presents a challenge in the interpretation of data and their utilization in the design. The purpose of this course is to acquaint students with experiments on a pilot scale which represents a bridge between the bench-top experiments (often found in a research laboratory) and commercial unit in a production facility. Students will become familiar with the instruments, calibration, and key control elements (e.g. valve). Students will learn to apply the principles of material and energy balances and transport processes in developing mathematical models of the underlying process and use these models to develop an effective control strategy. In addition, they will learn to develop protocols for preparing the start-up, shut-down, and standard operating practices procedures. Students will learn how to obtain, analyze, and interpret experimental data, along with how to clearly communicate their results and analyses in written and spoken form.

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

1. Work effectively in 3- or 4-person teams to cooperatively carry out a project involving problem identification, data gathering and analysis, and written and oral communication. (Program Outcomes: d, f, g, l)

2. Determine an experimental objective, understand the theory behind the experiment, and operate the relevant equipment safely. (Program Outcomes: a, b, d, e, f, g, i, k, l, m, n)

3. Analyze experimental data using standard statistical methods to establish quantitative results. (Program Outcomes: a, b, f, k, l, n)
4. Write effective technical reports for the experiments undertaken.  
   (Program Outcomes: g)

5. Develop standard operating procedures based on engineering and scientific 
   principles, with safety as paramount issue. Also prepare start-up and shut-down 
   procedures for an operation. (Program Outcomes: b, e, f, k, n)