

ChBE 4412 Process Dynamics and Control Laboratory (required course)

Credit: 0-3-1

Textbook: *Process Dynamics and Control*, Seborg, Edgar, Mellichamp and Doyle, 3rd Edition, Wiley, 2011
ChBE 4412 Laboratory Manuals to be downloaded from the web

Catalog Description: Laboratory experiments and projects on the dynamics and control of chemical and biological processes.

Prerequisites: CHBE 4411 Process Dynamics and Control (minimum grade of “C”) (with concurrency)

Objectives: This course reinforces concepts learned in CHBE 4411 (Process Dynamics and Control): (1) Process dynamics and various forms of mathematical models to express them, and (2) Analyze, design and tune controllers in the context of various control strategies used to control chemical and biological processes. Students perform laboratory experiments as well as computer-simulation-based projects to relate the concepts to real world processes, and also to learn team-based problem solving.

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

1. Understand and be able to use the modern hardware and instrumentation needed to implement process control.
2. Develop mathematical models of chemical and biological processes by writing unsteady-state mass and energy balances.
3. Recognize and fit various simple empirical models that are used for designing controllers.
4. Design, implement, and tune feedback controllers on real systems as well as simulated systems.
5. Work in a team to perform laboratory experiments and write technical reports

Topical Outline: Topics illustrated by laboratory experiments and simulation projects:

1. System identification, linearization, and modeling
2. Dynamics of interacting systems
3. Dynamics of measurement; noise and filtering
4. Design and tuning of PID feedback control
5. Autotuning of PID control
6. Control of processes with time delays
7. Control of highly non-linear processes
8. Control of multivariable systems

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