Process Modeling and Simulations CHEG 4133
Instructor: Dr. Lealon Martin, Wilson 201F, 936-261-9411 or 512-789-8677
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Operation of the Course

- **Office Hours: Wednesdays before 3:30 p.m. (by appointment)**

- **Goals**

To integrate knowledge and skills gained in the undergraduate curriculum, by applying them to process flowsheeting and simulation using Aspen Plus software. We will also introduce elementary sensitivity analysis using advanced features of Aspen Plus. By the end of this course, you should be proficient in process flowsheet development and process simulation using Aspen Plus; and you should have no problems developing a preliminary process flowsheet for your Senior Process Design project.

- **Learning Outcomes**

Process Model Simulation- Students should become familiar with computer-aided simulation of unit operations using Aspen Plus. This includes component selection, stream specification, thermodynamic property method selection, and process block specification.

Process Analysis- Students should be able to run completed, connected process simulations; identify key process operating conditions and unit operation design parameters in results and output windows; and develop proficiency in using Aspen analysis tools to improve process performance, yield, and selectivity.

- **Grading**

In computing final grades for the course, we shall use the following criteria:

Assignments	**50%**
Process Simulations	25%
Individual Memoranda/Assignments	25%
Final Project/Course Evaluation	**50%**

Grades will be assigned on a numerical scale of zero to 100 with 90-100 being the A range, 80-89 being the B range, 70-79 being the C range, 60-69 being the D range, and less than 60 being a failure.

- **Memoranda**

Good results communicated poorly are only marginally better than mediocre results communicated well. An acceptable memo is neat, brief, well-organized, and written in clear and correct English prose. You should always include the following information: Date, To/From/Subject lines, a summary of work or scope, key assumptions, a fully-labeled free body diagram, and results with analysis/brief discussion. An effective memo should be clear, concise, and informative. Assessment of clarity, organization, neatness, grammar, and style will account for 50% of the total grade assigned to an individual memo/project. Deadlines are weekly and represent an important aspect of professional practice. Hence, memos submitted after the due date will not be accepted, unless there are unusual circumstances.

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- **Final Project**

Unless otherwise instructed, all assignments, including the final project, for the course will be done **individually**. You are required to synthesize a flowsheet of a chemical process involving the conversion of one or more raw materials into one or more final product(s) and byproduct(s). You can select these materials according to your own interests. However, your overall process must consist of at least five separate and distinct unit operations. Also, the overall chemical process **must** include either a CSTR **or** a PFR unit with rate-controlled kinetics **and** a rigorous separations scheme that includes azeotropic distillation. Heat and power integration should be incorporated where appropriate or applicable. Your process should be subjected to appropriate analysis based on tools and methods (for example, design spec, calculator blocks, sensitivity analysis, and constrained/unconstrained optimization) that you will learn in this course or that you have learned in other courses. The memorandum for your final project **must** include a problem statement, design basis, results and discussion, and a converged Aspen simulation of the process. **YOU CANNOT USE ANY SENIOR DESIGN PROJECT (PAST OR CURRENT) AS PART OF YOUR PROJECT.**

Task/Assignments
Getting Started (several modules)
Installation
Building a Flowsheet
Data Input
Running a Simulation
Workshops
Simulation of an Air Compressor
Flash Separation
Introduction to Simulation with RadFrac
Design Specifications and Sizing
Heat Exchange Simulation
Production of Cyclohexane
Simulating a Distillation Column for Crude Oil
Simulating a Stripper for Waste Water Treatment
Basic and Advanced Aspen Concepts
Stream Purge
Solids Handling
Design Spec
Sensitivity Analysis
Optimization
Rate-controlled Kinetics (CSTR and PFR Design)
Heirarchical Blocks
Merging Flowsheets
Case Study Tool