

1. **Course number and name - CHBE 4520/4530**
Capstone ChBE Design/Capstone ChBE Bio-Design (required)
2. **Credits and contact hours** - 2 credit hours, 6 lab hours (0-0-6-2)
3. **Instructor's or course coordinator's name** - Dr. Matthew Realff, Dr. Yonathan Thio,
and Dr. Christian Cuba-Torres
4. **Textbook, title, author, and year**
Sieder, Seader, Lewin, and Widagdo, "Product and Process Design Principles", 3rd
Edition, Wiley, 2008.
5. **Specific course information**
 - a. **Catalog Description** – Basic principles of chemical process and product design including heuristic design approaches, heat exchanger network design, optimization, and economic evaluation. Credit not allowed for both CHBE 4510 and CHBE 4505 (or CHBE 4525).
 - b. **Prerequisites or co-requisites** – CHBE 4510 Process and Product Design and Economics (grade "C" or better); CHBE 4515 (pre-requisite with concurrency).
 - c. **Required, elective, or selected elective course** (as per Table 5-1) – Required
6. **Specific goals for the course**
 - b. **Specific outcomes of instruction:**

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

 - 1) Be knowledgeable about the kinds of design decisions that challenge process design teams.
 - 2) Carry out the key steps in the design of a chemical process.
 - 3) Be aware of the many kinds of environmental issues and safety considerations in process design.
 - 4) Appreciate the importance of maintaining high ethical principles in process design.
 - 5) Function effectively on diverse teams of mixed abilities and be able to evaluate both their own and their team members contribution to the overall process design.
 - 6) Understand process simulators and be able to use them in process design, equipment sizing and costing, profitability analysis, and optimization.
 - 7) Understand the importance of selecting reaction paths that do not involve toxic or hazardous chemicals, and when unavoidable, to reduce their presence by shortening residence times and reducing storage.
 - 8) Be able to distribute the chemicals, when designing a process flowsheet, to account for the presence of inert species, to purge species that would otherwise accumulate to unacceptable levels, to achieve high selectivity to the desired products, and to accomplish reactions and separations in the same vessel when possible.

- 9) Be able to apply heuristics in selecting chemical reactors or reactor trains, and in selecting separation processes to separate liquids, vapors, vapor-liquid mixtures, and vapor-liquid-solid mixtures.
- 10) Be familiar with the most widely used industrial separations and their basis for separation.
- 11) Understand the concepts and application of heat and power integration to minimize energy requirements for chemical process plants.

c. Connection with Student Outcomes

CHBE 4520/4530							
Course Outcomes	Student Outcomes						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Course Outcome 1	X	X	X	X	X		X
Course Outcome 2	X	X		X	X	X	X
Course Outcome 3			X	X			X
Course Outcome 4			X	X			X
Course Outcome 5			X		X		X
Course Outcome 6	X	X				X	
Course Outcome 7	X	X		X		X	
Course Outcome 8	X	X				X	
Course Outcome 9	X						
Course Outcome 10	X						
Course Outcome 11	X			X			

Student Outcomes

- (1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- (2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- (3) an ability to communicate effectively with a range of audiences
- (4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- (5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- (6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- (7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

7. Brief list of topics to be covered

Topics that are covered depend strongly on the particular nature of the project. Capstone ChBE Design leans heavily on the material taught in CHBE 4510 and preceding coursework; focus is not on new material but on practical implementation.