CHEE 4366 (Required)

Biomolecular Engineering Fundamentals

Catalog Data: Cr. 3. (3-0). Prerequisites: CHEE 3466 and credit for or concurrent enrollment in CHEE 4367. Analysis and design fundamentals for biomolecules and biomolecular processes. introductory biochemistry, microbiology, protein engineering, applications of enzymes and enzyme kinetics; detection and purification of biological molecules.

Textbooks:

Molecular Biotechnology (4th Edition) by Bernard L. Glick, Jack J. Pasternak and Cheryl L. Patten (ASM Press, 2010).

Biochemistry (2nd edition) by Donald Voet and Judith G. Voet (Wiley, 1995)

Prerequisites by Topic:

1. Knowledge of basic principles of chemistry, atomic and molecular structure, states of matter, equilibrium, kinetics, biophysical chemistry and organic chemistry.
2. Knowledge of calculus of functions of several variables including derivatives, integrals, partial derivatives and common relations found in calculus.
3. Elementary numerical analysis, computer programming and computing.
4. Material and energy balances on reactive and non-reactive processes, fluid flow, mass and heat transport.
5. Basic understanding of chemical reaction engineering.

Topics: Each class is 80 minutes, two classes per week. A list of topics and homework assignments covered is available on blackboard

Expected Student Outcomes:

Demonstrate knowledge of the main classes of biochemical molecules and living organisms. (**a, e**)[4]

Demonstrate understanding of the methodologies for engineering biochemical molecules and living organisms. (**a, c, e**)

Demonstrate knowledge of enzyme kinetics and methods for monitoring and purification of organisms and biomolecules. (**a, c, e**)

Demonstrate understanding of the societal and moral issues associated with the rapid advance of biochemical technology. (**d, f, h, j**)

Use the web and/or other resources to research a contemporary topic in biochemical technology, and present their findings to colleagues in a clear and convincing way. (**g, i, j,k**)

[4] Lowercase letters in parentheses refer to ABET outcomes under Criterion 3 (see Appendix).

Appendix

ABET Outcome, Criterion 3	Program-Specific Outcomes
(a) an ability to apply knowledge of mathematics, science and engineering.	• Use chemistry and physics concepts to set up and solve chemical engineering problems • Use mathematical tools to solve chemical engineering problems
(b) an ability to design and conduct experiments as well as to analyze and interpret data.	• Select appropriate experimental equipment and techniques necessary to solve a given problem • Evaluate and interpret experimental results using statistical tools and chemical engineering concepts
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health & safety, manufacturability, and sustainability.	• Apply material and energy balance concepts to design a unit operation • Define objectives and perform the design of an integrated chemical process under realistic constraints
(d) an ability to function on multi-disciplinary teams.	• Define roles and responsibilities to align with capabilities of team members and fulfill project requirements • Develop and carry out a project plan through team work
(e) an ability to identify, formulate and solve engineering problems.	• Translate an engineering problem into a mathematical model or other suitable abstraction • Use mathematical model or other suitable abstraction to solve an engineering problem and interpret results
(f) an understanding of professional and ethical responsibility.	• Demonstrate knowledge of professional code of ethics. • Identify ethical issues and make decisions for a chemical engineering problem.
(g) an ability to communicate effectively.	• Make presentations that are factual and tailored to the audience • Can communicate in writing to non-technical and technical audiences
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	• Understand the impact of chemical engineering solutions in a global, economic, environmental, and societal context.
(i) a recognition of the need for and an ability to engage in life-long learning.	• Recognize the importance of advanced education and development opportunities • Identify, retrieve, and organize information necessary to solve open-ended problems
(j) a knowledge of contemporary issues.	• Know the interplay between current technical and societal issues • Know the recent history, current status, and future trends of chemical engineering
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	• Use modern software to solve chemical engineering problems • Understand how to operate equipment relevant to chemical engineering systems