CHEE 5384/6384
Petrochemical Processes

Catalog Data: Credit 3. (3-0). Prerequisites: CHEM 3332, and senior standing or consent of instructor.

An overview of technology, markets and economics of commodity petrochemical processes and industry.

Textbook:
K. Weissermel and H. -J. Arpe, *Industrial Organic Chemistry,* 2003, 4th edition, Wiley.

Prerequisites by Topic:

1. Basic knowledge of organic chemistry.
2. Basic knowledge of the principles of heat and mass transfer.
3. Basic knowledge of unit operations.

Topics: (each class is 1 hour 50 minutes, two classes per week)

1. Description of the Petrochemical Industry
    - Milestones, history, characteristics
    - Products
    - Feedstocks
    - Companies
    - Economics/markets
    - Mapping of the industry from building blocks to derivatives to products

2. Each Commodity Chemical
    - Feedstock source
    - Process technology
    - Reaction mechanism of important processes
    - Process economics
    - Vulnerabilities
    - Opportunities for innovation

3. Special Topics
    - Intellectual property
    - Polymers
    - Steam cracking
    - Economics

Expected Course Outcomes and Performance Criteria:

Demonstrate an understanding of the fundamentals of the petrochemical industry. (**a**)[1]

Demonstrate the knowledge of each of the key petrochemical products: i.e. commercial process, chemical equation, process type, where it fits in the feedstock to derivative flow chart, primary derivative(s) and any particular vulnerabilities. (**a, c**)

Demonstrate an understanding of economics and technologies that underlie the industry and that guide the changes in the industry. (**a, h, j**)

Appreciate the complex and evolving nature of the industry and how, although it is mature, there is a significant on going metamorphosis that requires constant attention and learning to stay up to date and play an active part. (**a, f, g, h**)

[1] 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