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:

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)

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¹ Lowercase letters in parentheses refer to ABET outcomes under Criterion 3 (see Appendix).
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<tr>
<th><strong>ABET Outcome, Criterion 3</strong></th>
<th><strong>Program-Specific Outcomes</strong></th>
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| (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 multidisciplinary 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 |