**Department:** School of Chemical Engineering  
**Session:** Spring 2012 (2012-20)

**Proposed:**
- Subject Abbreviation: CHE
- Course Number: 45000

**Existing:**
- Subject Abbreviation: CHE

**Terms Offered:**
- Summer
- Fall
- Spring

**Campus(ES) Involved:**
- Calumet
- N. Central
- Tech Statewide
- Ft. Wayne
- W. Lafayette
- Indianapolis

**Credit Type:**
1. Fixed Credit: Cr. Hrs.
2. Variable Credit Range:
   - Minimum Cr. Hrs. (Check One): To Or
   - Maximum Cr. Hrs.
3. Equivalent Credit:
   - Yes
   - No

**Course Attributes:**
1. Pass/Not Pass Only
2. Satisfactory/Unsatisfactory Only
3. Repeatability
4. Credit by Examination
5. Resident vs. Non-Resident Tuition
6. Registration Approval Type
7. Department
8. Instructor
9. Title
10. Full Time Privilege
11. Off-Campus Experience

**Course Description (Include Requisites/Restrictions):**
Restrictions: Must be enrolled in the School of Chemical Engineering
Prerequisites: CHE 30600, 37800
Concurrent Pre Req: CHE 43500
Use of process and product synthesis methods and concepts; detailed design of unit operation equipment, the economics of chemical plants and flow sheet optimization methods. Synthesize, develop, and evaluate a preliminary design of a chemical process that meets market requirements for a specific product. Analysis of design alternatives using case studies and optimization methods.

**Course Learning Outcomes:**
1. Apply systematic strategies for synthesizing chemical process designs that involve conventional unit operations (1, 3).
2. Understand the difference between steady state and batch chemical processes and the implication on their design and operation (1, 3).
3. Know where and how to obtain information on industrial chemical processes, process operating parameters, equipment costs, cost of chemicals and materials, and associated safety and environmental hazards (6, 8, 9).
4. Understand the role of physical property estimates on process design and be able to use appropriate physical property estimation methods in unit operations design (1, 2, 3, 5).
5. Estimate the capital and operating cost of a process and to assess its profitability (1, 8).
6. Perform detailed hands-on work with tools that ultimately lead to the design of a chemical plant (1, 5).
7. Communicate project progress and final results in a professional manner orally and in written form (7).
8. Work effectively in a team to execute open-ended design projects with time-bound deliverables in a professional and ethical manner (1, 3, 4, 6, 9).

**Cross Listed Courses**

**Signatures:**
Calumet Department Head Date  
Calumet School Dean Date

Fort Wayne Department Head Date  
Fort Wayne School Dean Date
COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):
Restrictions: Must be enrolled in the School of Chemical Engineering
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COURSE OUTCOMES
1. Apply systematic strategies for synthesizing chemical process designs that involve conventional unit operations (1, 3).
2. Understand the difference between steady state and batch chemical processes and the implication on their design and operation (1, 3).
3. Know where and how to obtain information on industrial chemical processes, process operating parameters, equipment costs, cost of chemicals and materials, and associated safety and environmental hazards (5, 8).
4. Understand the role of physical property estimates on process design and be able to use appropriate physical property estimation methods in unit operations design (1, 2, 3, 5).
5. Estimate the capital and operating cost of a process and to assess its profitability (1, 8).
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8. Work effectively in a team to execute open-ended design projects with time-bound deliverables in a professional and ethical manner (1, 3, 4, 6, 9).
<table>
<thead>
<tr>
<th>Offdices &amp; Departments</th>
<th>Signatures &amp; Dates</th>
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<tbody>
<tr>
<td>Indianapolis Department Head</td>
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<td>Indianapolis School Dean</td>
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<tr>
<td>North Central Faculty Senate Chair</td>
<td>A Varner 12/7/2010</td>
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<tr>
<td>Vice Chancellor for Academic Affairs</td>
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<tr>
<td>West Lafayette Department Head</td>
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<td>West Lafayette Collegiate School</td>
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<td>West Lafayette Registrar</td>
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OFFICE OF THE REGISTRAR
To: The Faculty of the College of Engineering

From: The Faculty of the School of Chemical Engineering

Re: Change of existing CHE 45000 from 2 credit hours to 4 credit hours resulting in a change in description and requisites.

The faculty of the School of Chemical Engineering has approved the following change and submits it for your approval.

From:
CHE 45000 - Design And Analysis Of Processing Systems
Sem 2, Class 1, problem lab. 2, cr. 2
Prerequisites: CHE 44900
Corequisite: CHE 43500

Synthesize, develop, and evaluate a preliminary design of a chemical process that meets market requirements for a specific product. Analysis of design alternatives using case studies and optimization methods.

To:
CHE 45000 - Design And Analysis Of Processing Systems
Sem 2, Class 3, Lab 2, Cr. 4
Restrictions: Must be enrolled in the School of Chemical Engineering
Prerequisites: CHE 30600, 37800
Concurrent Pre-req: CHE 43500

Use of process and product synthesis methods and concepts; detailed design of unit operation equipment, the economics of chemical plants and flow sheet optimization methods. Synthesize, develop, and evaluate a preliminary design of a chemical process that meets market requirements for a specific product. Analysis of design alternatives using case studies and optimization methods.
Reason: In light of the removal of CHE 44900 and the consolidation of senior design back into one course, CHE 45000 will become 4 credit hours to incorporate all relevant material. This will allow for three lectures per week to cover material as well as 2 hours of lab per week for the actual design project.

A. Varma, Head
School of Chemical Engineering
12/5/10
CHE 450 Design And Analysis Of Processing Systems (current)

**Level:** Undergraduate  
**Course Instructors:** Professors R. Agrawal, J. Pekny, G. Reklaitis, and V. Venkatasubramanian  

**Course Outline:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Lectures</th>
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<tbody>
<tr>
<td>1. Course Introduction</td>
<td>1</td>
</tr>
<tr>
<td>2. Adv. material &amp; energy balances for process flow sheets w. recycle</td>
<td>2</td>
</tr>
<tr>
<td>3. Synthesis and design of process flow sheets</td>
<td>6</td>
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<tr>
<td>4. Advanced equipment costing</td>
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<td>5. Process flow sheet economic evaluation</td>
<td>4</td>
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<tr>
<td>6. Advanced Aspen simulation methods</td>
<td>8</td>
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<tr>
<td>7. Exams</td>
<td>3</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>28</strong></td>
</tr>
</tbody>
</table>

**Course Objectives:**  
Synthesize, develop, and evaluate a preliminary design of a chemical process that meets market requirements for a specific product.

**Course Outcomes:** (numbers in parentheses refer to related program educational objective)  
1. Apply systematic strategies for synthesizing chemical process designs that involve conventional unit operations (1, 3).  
2. Create process flow sheet through conceptualization, process synthesis, process design and assessment (1, 3, 5).  
3. Know where and how to obtain information on industrial chemical processes, process operating parameters, equipment costs, cost of chemicals and materials, and associated safety and environmental hazards (8, 9).  
4. Estimate the capital and operating cost of a process and to assess its profitability (1,8).
5. Communicate project progress and final results in a professional manner orally and in written form (7).

6. Work effectively in a team to execute open-ended design projects with time-bound deliverables in a professional and ethical manner (1, 3, 4, 6, 9).

Assessment Methods for Course Outcomes: Each of the outcomes will be assessed by giving the students the appropriate homework problems, exams, team projects, and peer evaluation
CHE 450 Design And Analysis Of Processing Systems (proposed)

Level: Undergraduate
Course Instructors: Professors R. Agrawal, J. Pekny, G. Reklaitis, and V. Venkatasesubramanian


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<td>2. Process and Product Synthesis methods, concepts and heuristics</td>
<td>6</td>
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<td>3. Adv. material &amp; energy balances for process flow sheets w. recycle</td>
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<tr>
<td>4. Design of major unit operation equipment</td>
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<tr>
<td>5. Synthesis and design of process flow sheets</td>
<td>6</td>
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<td>6. Cost accounting and capital cost estimation</td>
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Total 42

Course Objectives
To understand process and product synthesis methods and concepts; detailed design of unit operation equipment, the economics of chemical plants and flow sheet optimization methods; synthesize, develop, and evaluate a preliminary design of a chemical process that meets market requirements for a specific product.

Course Outcomes (numbers in parentheses refer to related program educational objective)
1. Apply systematic strategies for synthesizing chemical process designs that involve conventional unit operations (1, 3).
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