Course number and name:
CHEN 4316: Chemical Process Design II TR 9:30 – 10:45 am in EC 275

Catalog description, including prerequisites:
The application of chemical engineering principles to a sequence of design problems utilizing computer software such as ASPEN Plus, or HYSYS and Pro II. Prerequisites are CHEN 3315, CHEN 3371, and CHEN 3310.

General education requirements:
This is a required course for chemical engineering majors.

Name of instructor and contact information:
Dr. Matthew Alexander, PE, BCEE, Associate Professor
Office: EC 314; phone: 593-4219
Email: Matthew.Alexander@tamuk.edu
Office hours in EC 314: 9:00 am to 12:00 pm MW, 1:00 pm to 3:00 pm TR, or by appt.

Required textbook:
Analysis, Synthesis and Design of Chemical Processes, 4th Ed. by Richard Turton, Richard Baillie, Wallace Whiting, Joseph Shaeiwitz, and Debangsu Bhattacharyya. We will concentrate on Chaps 1-6, 11-14, 25 and 26 from this text in this course.

Suggested readings and resources:
Additional reading materials will be available on reserve at the library or handed out in class:

Useful website locations for study and/or research materials:
http://www.cepmagazine.org/ This is the monthly Chemical Engineering Progress magazine AICHe members get.
http://www.che.com makes available the current issue of Chemical Engineering magazine.
Back issues are available at this site only to subscribers.
The U.S. Patent and Trademark Office search site,
http://patft.uspto.gov/netahtml/PTO/search-adv.htm, will be useful for the segment on patents.

Course learning objectives:
Students in this course will be able to:
1. Work in small teams to solve chemical engineering design problems.
2. Use process simulation software to model chemical processes.
3. Use these models to make decisions about process optimization.
4. Incorporate process safety principles and evaluations into chemical process design.
5. Understand the legal and ethical concepts of intellectual property and professional registration as they pertain to the practice of chemical engineering.

At the end of the course, the student will be able to think through a chemical synthesis and purification process, simulate that process using Aspen Plus, and suggest reasonable ways to integrate energy recovery in the process. As usual in the art of engineering, economic, safety, and environmental considerations will provide the basis for decisions about how to accomplish goals.

**Student learner outcomes for ABET:**

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 and safety, manufacturability, and sustain ability.
d. An ability to function on multidisciplinary or chemical engineering teams.
e. Ability to identify, formulate, and solve engineering problems.
g. An ability to communicate effectively.
i. Recognition of the need for, and an ability to engage in, life-long learning.
k. An ability to use the techniques, skills, and modern engineering tools for engineering practice.

**Topical Course Outline / Schedule:**

<table>
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<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading / Other</th>
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<tbody>
<tr>
<td>1</td>
<td>Conceptualize and represent chemical processes (PCD, BFD, PFD, P&amp;ID)</td>
<td>Chaps 1 &amp; 2</td>
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<tr>
<td>2</td>
<td>Introduction to Aspen Plus properties and simulation environments</td>
<td>Chap 13</td>
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<tr>
<td>3</td>
<td>Basic process simulation--blocks and run</td>
<td>Group Project #1 Report &amp; Presentations</td>
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<td>4</td>
<td>Thermodynamic property method selection and thermodynamic analyses</td>
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<tr>
<td>5</td>
<td>Principal equipment sizing &amp; capital cost analysis, CapCost software</td>
<td>Chaps 7 &amp; 9, App A, Exam #1</td>
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<tr>
<td>6 &amp; 7</td>
<td>Aspen Plus—simulations with process recycle, design specs, optimization, simulation convergence</td>
<td>Chap 13; Group Project #2 Report</td>
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<tr>
<td>8</td>
<td>Process conditions / heuristics</td>
<td>Chap 6 &amp; 11;</td>
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<tr>
<td>9</td>
<td>Aspen Plus finer details of process synthesis</td>
<td>Chap 12</td>
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<tr>
<td>10 &amp; 11</td>
<td>Chemical process safety, HAZOPS</td>
<td>Group Project #3 Report</td>
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<tr>
<td>12</td>
<td>Professional engineer registration</td>
<td>Chap 25, Exam #2</td>
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<tr>
<td>13</td>
<td>Patent literature, intellectual property</td>
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<tr>
<td>14</td>
<td>Identification of topic for CHEN 4317 SrD</td>
<td>Group Project #4 Report &amp; Presentations</td>
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Disclaimer: the schedule is subject to change. Any changes will be announced during regular class periods.

**Method(s) of evaluation and grading procedures:**
### Item Points

<table>
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<tr>
<th>Item</th>
<th>Points</th>
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<tr>
<td>Periodic homework assignments based upon class lecture material and textbook</td>
<td>200</td>
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<tr>
<td>Quizzes (a max of 3) on the class lecture material, to be interspersed throughout the course.</td>
<td>100</td>
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<tr>
<td>Group projects: Two projects on chemical process description and conceptualization and two projects oriented more towards process simulation. All projects performed as 4-person groups.</td>
<td>400</td>
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<tr>
<td>Two exams covering class lecture material. 150 points for each exam</td>
<td>300</td>
</tr>
<tr>
<td>Comprehensive final exam</td>
<td>200</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>1200</strong></td>
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Grades will be based on a percentage of the total possible points:

A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; F = <60%.

**a. Homework:** Problem sets will generally be assigned during one of the class periods and typically due two class days hence at the start of class. Late homework will not be accepted without a valid excuse. The homework is an important part of this course. You must show all your work to receive credit for each problem. Answers must be provided with proper units, and assumptions made to solve the problem must be clearly stated. To improve your understanding of the course material, it is suggested that you solve additional problems that were not assigned for homework. By doing so, you will become more comfortable with the material and develop a higher proficiency in problem solving.

**b. Exams:** Two exams will be scheduled during the fall semester, and will be given during the regular class meeting time. The exams will principally test the student on the course lecture material and homework material covered since the last exam. If a student is unable to attend the exam period, he/she must arrange directly with the instructor an alternate exam time at least 2 days prior to the announced exam time in order to be allowed to take the exam. There will be no make-up exams except for a university-excused absence.

**c. Quizzes:** Up to three quizzes will be administered (unscheduled) during the fall semester, and will be given during the regular class meeting time. These quizzes will principally test students on recent lecture material; students will be given only 20 to 30 minutes to complete each quiz.

**d. Group Projects:** Groups will consist of 4 persons. Projects will be a mix of library research on chemical processes and/or simulations performed with Aspen Plus, including evaluation of design alternatives to minimize NPV of the costs, a report submitted as a Word file. Two of the projects will also require a group PowerPoint presentation of the results for each project. Grading will be equally divided between the engineering aspect (Aspen, utility costs, equipment sizing and costing, economics spreadsheet) and the report/presentation (Style, grammar, referencing, etc.).
Course folder: A course folder must be submitted by each student at the end of the final exam. These will be reviewed and assigned a grade. Original material is required. The material indicated below should be placed into a flexible folder (no ring binders) and organized into several sections: (1) Lecture notes, including handouts; (2) Homeworks; (3) Exams; (4) Other reference material. You may also include additional derivations or solved problems in the appropriate sections.

Course policies (attendance, excused absences, etc.)
Successful performance in this class requires that you attend class. Make-ups for missed exams and quizzes are granted only for excused (official university) absences. You will be dropped from the course after absence from 5 classes without an official university excuse. No late assignments will be accepted. Graduating seniors who need to schedule an early final should inform the instructor early in the semester. Students should turn off their cell phones during class. It is the policy of the TAMUK College of Engineering that no electronic devices are permitted in course examinations without the permission of the instructor.

Disability statement:
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disability. If you believe you have a disability requiring an accommodation please contact the Disability Resource Center (DRC) as early as possible in the term at (361) 593-2904. DRC is located in the Life Service and Wellness building at 1210 Retama Drive. Please notify Dr. Alexander as soon as possible that you will be requiring such accommodations.

Classroom conduct expectations:
Students are expected to assume individual responsibility for maintaining a productive learning environment and conduct themselves with the highest regard for respect and consideration of others. Ongoing or single behaviors considered distracting will be addressed by the faculty member initially, but if the behavior becomes excessive and the student refuses to respond to the faculty member’s efforts, the issue will be referred to the Dean of Students. In the case of serious disruptive behavior in a classroom, the instructor will first request compliance from the student and if the student fails to comply, the instructor has the authority to ask the student to leave the classroom. The student is expected to comply with the instructor’s request and may subsequently contest this action using procedures established by the department. If the student fails to leave after being directed to do so, assistance may be obtained from other university personnel, including the University Police Department. The incident shall be handled as an academic misconduct matter using established departmental procedures for academic misconduct to determine if the student should be allowed to return to the classroom. Students are referred to the Student Code of Conduct section of the Student Handbook (http://www.tamuk.edu/dean/dean_files/studenthandbook.pdf).

Academic misconduct statement:
You are expected to practice academic honesty in every aspect of this course and all other courses. Make sure you are familiar with your Student Handbook, especially the section on
academic misconduct. Students who engage in academic misconduct are subject to university disciplinary procedures.

**Forms of academic dishonesty:**

1) Cheating: deception in which a student misrepresents that he/she has mastered information on an academic exercise that he/she has not mastered; giving or receiving aid unauthorized by the instructor on assignments or examinations.

2) Academic misconduct: tampering with grades or taking part in obtaining or distributing any part of a scheduled test.

3) Fabrication: use of invented information or falsified research.

4) Plagiarism: unacknowledged quotation and/or paraphrase of someone else’s words, ideas, or data as one’s own in work submitted for credit. Failure to identify information or essays from the Internet and submitting them as one’s own work also constitutes plagiarism. Please be aware that the University subscribes to the Turnitin plagiarism detection service. Your paper may be submitted to this service at the discretion of the instructor.

**Nonacademic misconduct:**

The university respects the rights of instructors to teach and students to learn. Maintenance of these rights requires campus conditions that do not impede their exercise. Campus behavior that interferes with either

1) The instructor’s ability to conduct the class

2) The inability of other students to profit from the instructional program, or

3) Campus behavior that interferes with the rights of others will not be tolerated. An individual engaging in such disruptive behavior may be subject to disciplinary action. Such incidents will be adjudicated by the Dean of Students under nonacademic procedures.

**Sexual misconduct:**

Sexual harassment of students and employees at Texas A&M University-Kingsville is unacceptable and will not be tolerated. Any member of the university community violating this policy will be subject to disciplinary action.