Spring 2019

CHE 460-102: Separation Processes II

Saeid Savarmand

ChE460-102 – Separation Processes II - 11015 – Spring 2018
(Tiernan Hall Lect 1; Wednesday 6:00 – 8:50 PM)

Instructor: Dr. Saeid Savarmand, Sun Chemical Corporation
Office Hours: Wednesday 5:30 – 6:00 PM, Tiernan 150.
Teaching Assistant: Will be announced once appointed by the dept.

Description: This second course in separations examines nontraditional methods and technologies such as mechanical-physical separations (Filtration, Settling & Sedimentation, and Centrifugal), fixed-bed adsorption processes, membranes, crystallization, evaporation and drying processes.

Prerequisites by Course: ChE360 - Separation Processes I

Prerequisites by Topic: Thermodynamics, Momentum/Heat/Mass Transfer, Calculus/Diff. Equations

Textbooks:

Required: Geankoplis, 4th Ed., Prentice Hall (You already have this book as it is the textbook of ChE260/CHE360).

Recommended:

McCabe, W.L., Smith, J.C. & Harriot, P., "Unit Operations of Chemical Engineering", 7th Ed., McGraw-Hill.

Seader, J.D. & Henley, E.J. "Separation Process Principles", 3rd Ed., Wiley

Course Outline:

1. Introductory remarks & Dimensional Analysis.
2. Filtration, Settling and Sedimentation separation processes
3. Centrifugal and Centrifugal Filtration processes
4. Adsorption separation processes
5. Membrane separation processes
6. Evaporation and Drying processes

Assessment/Grading:

- First mid-term exam accounting 20% (Feb. 20th)
- Second mid-term exam accounting 20% (April 3rd)
- Final exam accounting 30% (May 15th)
- Quizzes/homework accounting 15%
- A term project with presentation accounting 15%.
- Course letter grades will be as following: A = 90+; B+ = 85+; B = 75+; C+ = 70+; C = 65+; D = 60+; F < 60.

HW/Quiz Assignments:

- Once assigned, a HW is due the following week before class time unless otherwise indicated. Please use instructor's office hours for HW related questions as well as other questions/inquiries.

- Quizzes will NOT be announced. Have your book/notes as well as calculator every session.

Exams Policy: Only justifiable absence warrants a make-up test.

Classroom Policy: Eating and talking with friends are not permitted in the class. Use of cell phones, notepads, tablets and laptops is not allowed. Cell phones should be silent or preferably turned off.

NJIT Honor Code: The NJIT honor code will be followed at all times.

Attendance: Students are expected to be in the class earlier than the class starts or at least on time. Missing lectures will negatively affect your performance in this course; so, attendance is strongly recommended.

Policies and Expectations about Exams/Grades

- Students can dispute the exam scores within a week following the announcement of the scores.
- Students cannot dispute their prior exams or HWs after one week or at the end of the semester!
- After the first review of the dispute, if the score is not modified, but the student is unconvinced and asks for an additional review, then s/he assumes the possibility of instructor reviewing the whole exam paper and removing points as well as giving points.
- Students may be asked to return their graded exam papers within a week.
- No cell phones (to be turned off), Ipads, laptops, etc. can be used during the exam.
- Students get 0 for no-show to exams.
- Make-up exams (no make-up quizzes) may only be given under extreme circumstances (e.g., major close-family emergency, serious accident or acute medical problem) at the sole discretion of the instructor. Students bear the responsibility of due proof and documentation to the Dean of Students. It is the student's responsibility to inform the instructor and Dean of Students ASAP.
- Show all work, otherwise no partial credit means you cannot simply skip important intermediate steps during a calculation/derivation. You will lose significant points even if the final answer is correct.
- In exams, students are required to use high-end calculators to solve non-linear equations, perform linear regression, and spread-sheet calculations. Students are required to know how to perform these operations on their calculators and consult with the user manual and web sources for their specific calculator model.

Groups

- Term projects and group quizzes require groups of 4 or 5 students.
- Students can select their group members by communicating their group members with instructor by the end of the second session (Jan. 30th, 2018). After that, the remaining students will be assigned to random groupings and no further changes could be made.

Term Project

- Each group will choose one general topics from the following list: 1) Filtration; 2) Settling & Sedimentation; 3) Centrifugal; 4) Centrifugal Filtration; 5) Adsorption; 6) Liquid Permeation; 7) Reverse Osmosis; 8) Gas Permeation; 9) Evaporation; 10) Drying; 11) Crystallization; 12) Chromatography. Other separation processes, not mentioned here, can be used upon approval of instructor.
  Due date: Feb. 13th.
- Once a subject is chosen by a group, that subject cannot be chosen again by another group (on first-come, first-served basis).
- By March 6th, each group will provide at least 4 closely related/focused articles to the assigned general topic from peer-reviewed chemical engineering journals to instructor. Complete addresses of the articles are necessary so they could be found for review. In case any of the articles are not suitable in terms of their materials and/or relevance, students are required to provide replacing article(s).
- Each group creates a presentation with the title that comes/emerges from those closely related articles in the above step. This becomes the specific topic for the group.
- First drafts of the presentations are due on March 27th. Instructor will provide comments/feedback for final modifications.
- Final presentations are due on April 17th.
- Class presentations are on April 17th and 24th randomly. So all groups should be ready for presentation.

Term Project Grading

- The above dates (Feb. 13th, March 6th, March 27th, and April 17th) should be respected. Each date accounts for one fifth of the total 15% of the term project. The presentation (April 17th and 24th) accounts for another fifth of the total of 15%. An average of the grades related to each date and the presentation will provide the total grade. So getting a total average of 100 will provide 15% of the total course grade.
- Each one day delay reduces 10% of that section point. For example, if providing the first draft has a 2-day delay, then the maximum grade for April 17th would be 80%, and so on.
- On April 17th and 24th, students will present their works in the class and how it is delivered in front of an audience.
- The rubric of the presentation is described in the next section.
- The significant factors making up the presentation grades are:
  - “Organization of the presentation” 20%
  - “Quality of the slides” 20%
  - “Timeliness” 20%
  - “Mastery over the presenter content” 20%
  - “Treatment of mass/heat balance equations” 20%.
- It is important to engage the audience to the point that the presentation invokes questions or comments from them. It is expected a few questions or comments raised following the presentation. Questions/comments are indications of the degree of impact on the audience.

Term Project Rubric

The following sections need to be included in the presentations.

- Title, Authors, Date, Department
- Introduction / Background
  - Schematic drawing of the system/control volume
- Problem Statement
- Objectives
  - Challenges, Potential Benefits, …
- Mass/Heat/Momentum Balance Eqs.
- Transfer Eqs. (Mass, Heat, Momentum)
  - Boundary/Initial conditions
- How the equations are treated/solved?
- Outcome
  - Results
  - Solutions
  - Next Steps
- Conclusions
- References and the points taken from them along the presentation.
- Presentation time is 10 minutes.
- About 10 slides.
- Practise to make sure the presentation can be performed in a timely manner.