

Introduction to Chemical and Biological Process Analysis

ChemBE 540.202 — Fall 2016

- Instructor:** Professor Jeffrey J. Gray, jgray@jhu.edu, 410-516-5313, @jeffreyjgray
Preferred pronouns: he/him/his
- Graduate TAs:** Nicolas Perez Gonzalez, nrperez@jhu.edu
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- Office Hours:** Gray: WF 4-5 p.m., or by appointment, Maryland 208
Perez, Shekhar, Stanley: Sundays 11 a.m.-noon (location TBD)
Lewis: F 2-3 p.m. (location TBD)
Solomon: Th 1-2 p.m. (location TBD)
- Lectures:** MWF 3-4 p.m., Hackerman B17
- Recitation sections:** Peer-Led Team Learning (PILOT)
Section 1: Th 2:30-4:20 p.m., Krieger 309, Solomon
Section 3,4: Th 4:30-6:20 p.m., Croft B32 / Hackerman 306, Lewis, Shekhar
Section 5,6: W 5-7 p.m., Croft B32 / Krieger 309, Perez, Stanley
Section 6 *recommended for first-year students*
- Course Websites:** <http://piazza.com/jhu/fall2016/en54020201fa16/home>:
Announcements, assignments, and class discussion
<http://blackboard.jhu.edu>: Grades
- Hashtag:** #ChemBE202
- Required Texts:** *Introduction to Chemical Processes: Principles, Analysis, Synthesis*
Regina M. Murphy, McGraw-Hill 2005, ISBN 0072849606, ~\$175
An errata is available on Piazza
- Required Software:** *Excel*, *MATLAB* (request free license from software@jhu.edu)
Required Device: iClicker2 (<http://iclicker.com>, ~\$50)
- Supplementary Texts:** (on reserve at the MSEL)
- Elementary Principles of Chemical Processes*, Fourth Edition
Richard M. Felder and Ronald W. Rousseau, Wiley 2015
- Essential MATLAB for Engineers and Scientists*, Fifth Edition
Brian D. Hahn & Daniel T. Valentine, Newnes 2013 (~\$40)

Overview: Chemical and Biomolecular Engineers analyze and design processes, both to understand biological processes and to design synthetic processes to manufacture goods for society. In this class, you will learn to model, analyze, evaluate and design chemical and biochemical engineering processes. This course will introduce concepts in material and energy balances, thermodynamics, and reactor and separations design, and will include both steady-state and non-steady state systems. These concepts constitute the fundamentals for all courses in the Department of Chemical and Biomolecular Engineering. Furthermore, this course will emphasize the skills and behavioral traits needed to be successful in the ChemBE curriculum.

Course Topics:

1. Chemical Processes – Converting Raw Materials to Useful Products
2. Material Balances and Process Flow Calculations
3. Tools of the Trade – Reactors and Separators
4. Energy Balances – Effective Use of a Limited Resource

Prerequisites:

030.101 Introductory Chemistry I (OR 030.103)
171.101 General Physics I (OR 171.107)

And at least one of the following:

030.102 Introductory Chemistry II
030.103 Applied Chemical Equilibrium and Reactivity
110.109 Calculus II
171.102 General Physics II

Assessment: Course grades will be determined from an assessment of submitted homework assignments, exams, a project, and from participation in the Peer-Led Team Learning exercises. Grades will be determined from an *absolute* scale: 97% = A+, 93% = A, 90% = A-; 80% = B-; 70% = C- etc. I reserve the right to shift these percentages down (but not up). For example, if a particular exam is more difficult than I originally planned, an A- may be achieved with an 88. It is not advisable to rely on a grade shift, however.

Your course grade will be computed as follows:

PILOT	5%
Class participation	5%
Homework	20%
Project	15%
<u>Exams</u>	<u>55%</u>
Total	100%

Class Participation and iClickers: I will use a variety of individual and small-group active learning exercises and problem solving in class, therefore you are expected to participate. You need an iClicker2 to submit answers in class. In addition, I will frequently call on students for answers and examples. Thinking time will be provided, but answers of “I don’t know” are not allowed. Additionally, you are encouraged to ask questions during lecture. During problem-solving time, you are expected to make as much progress as you can, formulating and reformulating the problem, sketching the system, trying equations, etc. If you finish early, you can compare your work with your peers.

Your class participation grade will be determined by your response record recorded by the iClicker system. You are permitted to miss three lectures without penalty, after that each missed lecture will result in a 1/3-grade drop in your participation score (3.34%).

Piazza: We will use Piazza for class discussion. The system is catered to getting you help fast and efficiently from classmates, the TAs, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email *team@piazza.com*. Homework collaboration rules as discussed below also apply to Internet based forums. I reserve the right to award bonus points for exceptional participation on Piazza.

Find our class page at <https://piazza.com/jhu/fall2016/chembe202/home>

PILOT: PILOT is a loose acronym for Peer-Led Team Learning. It consists of supervised, structure, small-group learning in weekly meetings with a group of other students and a peer leader (specifically trained for PILOT) who facilitates different and exciting ways to learn and practice material. You will work together to solve problems specifically designed by the facilitators for maximum understanding of relevant course material. PILOT will meet during the two-hour recitation sections. Some PILOT sections will also include short computer tool tutorials.

PILOT is a required portion of the class for the following reasons:

1. The best way to learn to solve engineering problems is to practice solving engineering problems!
2. You will learn different methods of learning complex material.
3. You will learn to more clearly articulate your ideas, which helps cement your understanding.
4. You’ll learn how to know your answer to a problem is right—without looking in the back of the book!
5. The more you help your peers, the stronger your mastery of the material becomes.
6. Scientific and engineering professions are team oriented. Future employers, medical admissions committees and graduate schools expect their applicants to have a proven record in teamwork and collaboration.
7. You will make new friends! You may even form a strong and cohesive team to adventure together through the ChemBE program, and even beyond into your careers.

It is essential to have strong participation in the PILOT teams. Therefore, you are required to attend, and 5% of your course grade will be awarded based on your attendance and level of participation. You are allowed two absences during the semester; after that, your PILOT grade will decrease a full grade for every session missed.

Homework: Weekly homework assignments will be posted to Piazza, typically on Mondays. Homework will usually be due each Monday, to be submitted during the afternoon class. They will be returned in sections. Solutions will be posted on Piazza.

Problems will be worth varying amounts of points (typically 4 points for a Warm-Up, 6 points for Drills and Skills, 8 points for a Scrimmage, and 12 points for a Game Day problem). Each week, scores of all problems assigned will be added and the result scaled to 100 points. The average of the weekly scores will become the "HW Grade" to be factored into the course grade as described above.

You are encouraged to work in groups on the homework, however you should complete each homework assignment yourself and turn in your own work. You are allowed to use the Internet in your problem solving process, but **you are forbidden to view or copy problem solutions from any source**. This includes 'student hub' websites like Chegg.com. Students caught using Chegg or other similar online sources of homework solutions will be referred to the Ethics Board.

Homework should be prepared in a professional manner. You should think of homework as a technical report that you are presenting to your boss. This often means that a final copy should be prepared from your working scratch documents.

- Homework must be legible.
- Homework must be prepared on paper with clean edges, i.e., no paper torn from spiral notebooks.
- Engineer's paper is recommended for hand-calculations.
- Homework must be stapled at the upper left hand corner (no clips or other substitutes).
- Plots must be created with software such as Excel or MATLAB.
- Computer spreadsheets should be formatted neatly and printed; when MATLAB programs are used for solutions, submit clean and commented script files.
- Your submitted homework should be a neatly copied final solution, rather than a loose collection of scrap paper with all your explorations of unfruitful solution pathways.
- When your homework was solved with a group of collaborators, you must list the full names of all collaborators present on the top of the first page of your homework.
- When other sources are used to help solve your homework, you must reference those sources with complete citations (textbook table/figure number, journal citation, reference book with page number and edition, web page author with URL and access date, etc.). As a rule of thumb, give sufficient information so that it would be easy for someone else to duplicate your work including finding the needed outside information.
- Graders retain the right to refuse and/or penalize any homework not conforming to these professional standards.

Policy for Late Homework: Each student is given two coupons that may be used to extend a homework due date. Coupons with your name must be attached to the homework. Only two coupons are allowed per person.

Collaboration on homework: Homework is provided as practice of your problem solving skills, and exam problems will primarily test skills developed through the homework. Therefore, you are expected to develop your individual problem solving skills. However, problem solving requires deep and creative thought, and human brains often work better when juiced with discussion. In fact, a true test of whether one understands something is the ability to explain it to others.

Therefore, you may consult with your colleagues if you have difficulty with a problem, and you may also act as a consultant. For example, legitimate consulting questions might be, “How do I convert lb-mol to g-mol?” or “Does this process flow diagram look correct to you?” However, copying of another person’s homework (“I don’t understand problem 3.1, can I see yours?”) or giving a colleague a copy of your results are strictly forbidden. Violations will be dealt with in accordance to the university’s policies on academic ethics. If you consult another member of the class on a particular homework assignment, you must list the name of that person (or persons) under your name at the top of your homework. The number of consultants will not alter your homework grade. Even when you work in a group, your own solution should be in your own words and each Excel spreadsheet and Matlab script should be written by you individually.

Collaborative homework assignment: In preparation for working as a team on the project, one homework (likely homework 8) will be completed and submitted as a team. We will assign the groups of three to four students each. Your group will submit one assignment together. To encourage equal participation and ensure fair grading, you will be asked to assess the individual contribution of each team member.

Project: The project will give you an opportunity to design a chemical process, including flowsheeting, specification of process equipment, estimating raw material and energy costs, and capital investment. You will work in groups of four people, assigned mid-semester. Each group will submit their final project as a team at the end of the semester.

Exams: Two midterm exams will be given in an extended class period (3-5 p.m.) or in the evening, (e.g. 6-8 p.m.) to allow ample time for completion. Your course grade for Exams will be computed by a weighted average of the two midterm exams and the final exam, with the lowest grade of the three exams counting half as much as the other two exams.

Regrades: Any regrade requests (exam or homework) must be submitted in writing within one week of the return of the exam or assignment. Homework regrades will be performed by the grader, with review by the professor. Exam regrades will be performed by Prof. Gray. In the event of a regrade, the entire submission (not just the item of contention) is subject to regrading, at the discretion of the reviewer.

The Learning Den: The Learning Den (tutoring@jhu.edu) offers free small group tutoring in Gilman Hall. Schedule information is found at <http://academic-support.jhu.edu/learning-den-tutoring/schedule>. To reserve your seat:

- 1) Sign up online to reserve your seat up to 14 days in advance at <http://tutoring.jhu.edu> (Your User ID and password is your 6-character Hopkins ID; the two fields are identical)
- 2) Drop-in to tutoring sessions by going to The Learning Den check-in desk in the Hutzler Room in Gilman Hall. First come, first serve.
- 3) Call 410-516-8216 and ask to speak with Mrs. Sarah Gubara if you encounter any issues

Academic Integrity: The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. In addition, the specific ethics guidelines for this course are:

1. Sometimes solutions to assigned homework problems are posted online. You are forbidden to copy or even view these materials in completing your own homework. Report illegally posted solutions to Prof. Gray by email.
2. You may collaborate with other students in this course, but only on homework and the project as detailed above. If you have questions about this policy, ask the instructor.
3. On every homework assignment, you will sign the following pledge: "I attest that I have completed this assignment without unauthorized assistance from any person, materials or device. All consultants, collaborators, and sources are cited. [Signed and dated]"
4. On every exam, you will sign the following pledge: "I attest that I have completed this exam without unauthorized assistance from any person, materials or device. [Signed and dated]"

Report any violations of academic integrity to the instructor. Please see the website <http://e-catalog.jhu.edu/undergrad-students/student-life-policies/#UAEB> for more information about the Hopkins Ethics Board.

The university will punish cheaters with failure on an assignment, failure in a course, permanent transcript notation, suspension, and/or expulsion. Offenses may be reported to medical, law or other professional or graduate schools when a cheater applies.

Disability Accommodation: Any student with a disability who may need accommodations in this class must obtain an accommodation letter from Student Disability Services, 385 Garland Hall, (410) 516-4720, studentdisabilityservices@jhu.edu.

Special Dates and Times:

F	Sep 2	First day of class
M	Sep 5	Labor Day, no class
M	Oct 3	Exam I, 3-5 p.m.
Th	Oct 20	Make-up class for Fall Break: Follow <i>Thursday</i> schedule (PILOT)
F	Oct 21	Fall break, no class
M	Nov 7	Exam II, 3-5 p.m.
M-F	Nov 21-25	Thanksgiving week, no class
F	Dec 9	Last day of class
Th	Dec 15	Exam III (Final), 9 a.m. – noon



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