

University at Buffalo
Department of Chemical and Biological Engineering

CE 329 Chemical Reaction Engineering
Syllabus, Fall 2015

Class meeting times and locations: MWF 10:00 - 10:50AM, Alumni 97

Instructor: Dr. Carl Lund, 505 Furnas Hall

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Instructor Office Hours: MWF 1:00 - 2:00PM, or by appointment, 505 Furnas Hall

Teaching Assistant: to be added

Teaching Assistant Office Hours and Location: to be added

Pre-requisites: CE 212, MTH 306, CE 304

Textbook and Other Learning Resources:

UBLearns (<https://ublearns.buffalo.edu>)

“A First Course on Kinetics and Reaction Engineering,” (<http://wwwresearch.sens.buffalo.edu/karetext>)

Course Description: Topics in the field of chemical reaction kinetics will include the origin of rate expressions for chemical reactions, the generation of kinetics data and the analysis of those data for the purpose of assessing the adequacy of rate expressions. Rate expressions for systems involving combined transport and kinetics effects will be introduced. In the field of chemical reaction engineering, the design and modeling of ideal reactors involving multiple reactions and thermal effects will be studied for both steady state and transient operation. Augmented operation the ideal reactors will also be examined. Modeling of reactors that are not ideal will be introduced.

Course Academic Content: Students are expected to

- Read assigned materials and watch assigned videos prior to each class meeting
- Attend each class meeting and participate in learning activities during class
- Complete and submit homework problems assigned for each class
- Correct and submit homework problems after their solution has been posted
- Pass three mid-term exams and the final exam

Student Learning Outcomes: Upon successful completion of this course, students should be able to

1. Design experiments to generate kinetics data using any of the three ideal reactor types, perform tests to ensure the ideal reactor model assumptions are obeyed and utilize the resulting experimental data to generate an acceptable rate expression for a chemical reaction (CBE Student Outcomes a, b, e and k)
2. Postulate a mathematical form for a rate expression empirically or on the basis of the theory of chemical reactions (CBE Student Outcomes a and e)

3. Qualitatively analyze the effect of operating parameters upon the final or outlet properties of a fluid that is reacting in one of the three ideal types of reactor (CBE Student Outcomes e and k)
4. Construct accurate analytical models of systems of one or more ideal or augmented reactors and use those models for the design, simulation or optimization of a reactor process (CBE Student Outcomes a, c, e and k)
5. Describe and formulate alternatives to the ideal reactor models (CBE Student Outcome e)
6. Analyze simple systems where chemical and physical kinetics are coupled (CBE Student Outcomes a, e and k)

Course Requirements: specific due dates and times will be posted on UBLearns

- 38 online quizzes
- 39 in-class worksheets
- 5 MATLAB files for solution of in-class problems
- 32 homework problems
- 32 corrections to homework problems
- 3 mid-term exams
- 1 comprehensive final exam

Grading Policy: In-class worksheets, homework problems and homework corrections will be graded on the basis of effort. A score of 2 points will be awarded if a reasonable attempt was made to answer/correct all questions, and a score of 1 point will be awarded if a reasonable attempt was made to answer/correct at least one question. Five homework problems will be selected at random over the course of the semester and graded on the basis of obtaining a correct answer. The MATLAB assignments will earn 20 points if, when executed, they yield the correct result and zero points otherwise. The mid-term and final exams will be graded on the basis of obtaining (or showing how to obtain) a correct answer.

The following component scores will be computed for each student:

- Total quiz score as a percentage of the maximum possible (0 to 100)
- Total in-class worksheet score as a percentage of the maximum possible (0 to 100)
- Total homework effort score as a percentage of the maximum possible (0 to 100)
- Total homework correction score as a percentage of the maximum possible (0 to 100)
- Total homework accuracy score as a percentage of the maximum possible (0 to 100) - using the 5 randomly selected homework assignments
- Total MATLAB assignment score as a percentage of the maximum possible (0 to 100)
- Total mid-term exam score as a percentage of the maximum possible (0 to 100)
- Final exam score as a percentage of the maximum possible (0 to 100)

A total score between 0 and 100 will be computed for each student by summing:

- 5% of the above quiz score
- 5% of the above in-class worksheet score

- 5% of the above homework effort score
- 5% of the above homework correction score
- 10% of the above homework accuracy score
- 10% of the above MATLAB assignment score
- 45% of the above mid-term exam score
- 15% of the above final exam score

In general, make-up exams will not be offered. If a student will miss an exam, the instructor must be notified in advance and appropriate arrangements will be made.

Exact scores required to earn specific letter grades for the course may need to be adjusted to account for difficulty of exams and other factors. It is expected that

- Students earning 90% or more of the maximum possible total score will earn an A
- Students earning 80% or more of the maximum possible total score will earn a B
- Students earning 70% or more of the maximum possible total score will earn a C
- Students earning 60% or more of the maximum possible total score will earn a D
- In no case will the grade cutoffs be higher than those listed above

If, in the fulfillment of any one course requirement, a student violates the policy on academic integrity (see below), that student's final course grade will be reduced by one full letter grade. If a student is found guilty of two violations of the policy on academic integrity the student will receive an "F" as a final grade.

A grade of 'I' will be strictly limited to the circumstances for which it is intended: namely, satisfactory work to date and legitimate inability to complete the work within the semester. See UB policy (<http://undergrad-catalog.buffalo.edu/policies/grading/explanation.shtml>).

Communications: Students are expected to use professional style in all communications, including email, with course faculty and teaching assistants. This includes the use of salutations and closings (including clear identification of the author) and correct grammar.

Academic Integrity: The University at Buffalo takes very seriously its commitment to principles of academic integrity. Please review the UB policies regarding academic integrity regularly (<http://academicintegrity.buffalo.edu/>). As an engineer, you have special ethical obligations. As per the NSPE Code of Ethics, "engineers shall avoid deceptive acts" and "shall conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession."

Accessibility Resources: If you require classroom or testing accommodations due to a disability, please contact Accessibility Resources, located at 25 Capen Hall. Accessibility Resources can be reached by phone at (716) 645-2608 or by email at stu-accessibility@buffalo.edu. Please inform the instructor as soon as possible about your needs to allow coordination of your accommodations. For additional information see <http://www.buffalo.edu/accessibility/index.php>.

Classroom Etiquette: To provide an environment that is professional and conducive to learning, it is important that all students observe the following classroom etiquette (modified from <http://undergrad-catalog.buffalo.edu/policies/course/obstruction.shtml>)

- Come to class on time. If you must enter a class late, do so quietly and do not disrupt the class by walking between the class and the instructor. Do not leave class unless it is an absolute necessity.
- Do not talk with other classmates while the instructor or another student is speaking.
- Turn off all disruptive electronics, such as cell phones, laptops, and beeper watches.
- Avoid audible and visible signs of restlessness. These are both rude and disruptive.
- Focus on class material during class time. Sleeping, talking to others, doing work for another class, reading the newspaper, checking email, exploring the internet, etc. are unacceptable and can be disruptive.
- Do not pack up notebooks, etc. in preparation to leave until the instructor has dismissed the class.