Department of Chemical Engineering, City College of New York
Syllabus, Fall 2022
ChE 43200 Chemical Reaction Engineering

Designation
Undergraduate required core course

Course Description
Reaction kinetics, order of reaction, theory of absolute reaction rates. Reactor analysis and design, homogeneous batch, flow, and semibatch reactors. Catalysis, reactions of heterogeneous systems, heat- and mass-transfer effects. Examples from chemical and petrochemical industries. Prerequisites: ChE 34200, ChE 33000. 3 hr/wk. 3 cr. hr.

Instructor of Record
Juan D. Jimenez, Adjunct Assistant Professor, Department of Chemical Engineering, Steinman T335, Goldhaber Fellow, Brookhaven National Laboratory, Chemistry Division, jjimenez1@bnl.gov

Course Teaching Assistants
Rahul Pandare, rpandar000@citymail.cuny.edu

Class Times
Tues, Thurs 11:00am-12:15pm

Class Location
Marshak MR4

Office Hours
Prof. Jimenez: TBD during first day if class

Final Examination
as scheduled by Registrar's office

Course Textbook
The Engineering of Chemical Reactions, **2nd Edition**, By Lanny Schmidt, 2005, Oxford University Press. Hardcopy and electronic versions of the text are both appropriate so long as they are the second edition.

CCNY Bookstore Link:
http://ccny.textbookx.com/institutional/index.php?action=browse#books/3338670/

Course Objectives
1) Apply ideal reactor models to predict conversion, reactor conditions, and reactor sizes
2) Develop material balances for ideal chemical reactors
3) Analyze kinetic data and determine rate laws
4) Design and assess ideal reactors based on rate laws
5) Analyze the performance of reactors in which multiple reactions are occurring
6) Develop energy balances for ideal chemical reactors
7) Be able to identify non-idealities in a reactor and take them into account in the design of a reactor
8) Identify potential safety issues in the field of reaction engineering and the factors that cause them
9) Identify mechanistic steps and transport processes in a heterogeneous catalyzed reactions and design reactors based on a single limiting step or process
10) Utilize kinetic principles in the analysis of enzymatic reactions

Topics Covered

Reactions and Reaction Rates, Design of Ideal Isothermal Reactors, Chemical Kinetics, Selectivity and Optimization Kinetics of Homogeneous Reactions, Analysis of Kinetic Data, Multiple Reactions, Equilibrium Reactions, Energy Balance in Reactor Sizing, Non-ideal Reactors/Residence Time Considerations, Heterogeneous Catalysis, Enzymatic Reactions, Applications to Chemical Engineering Problems. *Additional topics may be added dependent upon class performance and time*

Relationship of Course to Program Outcomes

(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

(3) an ability to communicate effectively with a range of audiences

(5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

Attendance

Please arrive or login to class prior to the start to settle in and address any technical challenges. Important announcements and engagements are often made at the beginning of the class periods. Students are responsible for all material covered in class and assigned outside of class. Missed examinations or assignments may only be made up with a valid documented excuse (pre-planned with instructor approval or medical emergency). Students with pre-planned valid absences must make arrangements with the instructor prior to the absence to be given opportunity for makeup.

Blackboard & Email

Blackboard will be used to post announcements, assignments, course notes and other materials. You are responsible for the material posted on Blackboard, so please check it regularly. Emails related to the course periodically will be sent. Those emails will be generated using the Blackboard system, which utilizes the Citymail email addresses. Lack of checking email or Blackboard is not a valid excuse for missed information about the class.

Assignments

Homework will be given throughout the semester. There will be three exams including the final. Group projects will be assigned throughout the semester to work on gaining a better understanding of reaction engineering, while developing presentation and writing skills. All work should be submitted in a professional manner, clearly legible, work shown and clearly marked with the final answer. Sloppy and/or unorganized submissions will result in grades commensurate with their condition. Please remember to include your name on all submissions. "Anonymous" submissions cannot be assigned a grade.

Homework Recitation

Recitations for homework assignment will be coordinated with Rahul the week before homework is due to cover any standing questions or comments on the assignments.

Class Participation

The participation portion of the grade will be broken down into participation in class through asking questions and doing problems during group work times, completing surveys on Blackboard, etc. Participation can also be lost for excessively distracting behavior during class. Participation cannot be made up with excused absences or by other means.

Attention During Class

There are many possible distractions while participating in a virtual or in person class. Please try to avoid checking email, texting, watching videos, or doing other non-course activities during the class. Our goal is to have as much course material as possible retained and this is very difficult to do while multi-tasking.

Cell Phones, Cameras and Other Disturbances

Please turn your cell phone off or to vibrate during class. Unauthorized recordings of class are prohibited. No photography, video or audio recording will be permitted during class. Please only use electronics for course purposes during class. Internet surfing, text-messaging, gaming, twittering, etc., etc., is both rude and distracting to me and your classmates. Your attention is appreciated. Excessive distractions will impact class participation grades. Cell phones, smart watches, earbuds/headphones and other electronics will not be permitted to be out during examinations, those found out can result in failure on the exam. I recognize that cell phones, and smart watches have replaced traditional watches for many of you, so will thereby post a live clock (if possible) for your reference during exams if the classroom does not have a functioning clock. If posting a live clock is not possible, announcements on the time left will be made.

Course Grade Breakdown

15% Homework and Assignments; 35% Mid-Term Exams; 25% Final Exam, 20% Group Projects; 5% Class Participation

Grading Policy

Late homeworks will be accepted up to 24 hours after due date and time (i.e. 8:30am next day if the assignment was due at 8:30am) with a 10% penalty for the entire assignment. Assignments received 24-48 hours after due date and time will be accepted with a 25% penalty for the entire assignment. After that, homeworks will not be accepted, as we will start to present solutions at this point. Late bonus homeworks will not be accepted. Missed examinations may only be made up with a valid documented excuse (please mark your calendars for the exams now). Regrade requests should be made in writing within 24 hours from when the assignment was returned to the entire class. Some homework will be graded for submission and some for solution correctness. Which questions are graded for correctness will be selected at random. Homework will be reviewed during the recitation sessions.

Grading Scale

A ≥ 93	87 > B ≥ 83	77 > C ≥ 73	F < 63
93 > A- ≥ 90	83 > B- ≥ 80	73 > C- ≥ 70	
90 > B+ ≥ 87	80 > C+ ≥ 77	70 > D ≥ 63	

Appropriate scaling of the final course averages will be done if necessary at the discretion of the instructor. Your grade will never be lower than that given on the above scale.

AccessAbility Center/Disability Services

If you require special accommodations due to a documented learning or physical disability, please notify me in writing and appropriate measures will be taken with the AccesssAbility Center/Student Disability Services. To get your needs documented, please contact the AccessAbility Center at disabilityservices@ccny.cuny.edu for assistance. https://www.ccny.cuny.edu/accessability

Academic Integrity

Academic integrity is expected and required. Collaboration by any means is forbidden during examinations. You may work together on homework assignments, but each student must turn in a unique assignment and be responsible for the information submitted. Plagiarism, including taking the thoughts or words of others or using data without citing the source is forbidden. In-text citations should be used for acknowledging the thoughts of others. Quotations plus in-text citations should be used for acknowledging the words of others. Writing assignments should illustrate an understanding of the material, not simply a rewording of other sources. The CUNY policy on academic integrity will be followed: http://www2.cuny.edu/wp-content/uploads/sites/4/page-assets/about/administration/offices/legal-affairs/policies-procedures/Academic-Integrity-Policy.pdf. Any students found to be in violation of academic integrity policy at a minimum will receive a zero on the assignment and be reported to the chair of the department. A maximum penalty can result in expulsion from the university, as decided by the academic judicial system.

Any numbers used in homeworks, tests, etc. that are taken from a table, graph or another source are to be referenced by a short note.

Exam Conduct: Academic integrity standards are expected to be upheld during the exam including, but not limited to, working alone, not referencing materials outside of the exam when the exam is listed as closed materials, and not sharing with others.

Copyright and Confidentiality

Course materials will be available to class participants on Blackboard. These materials are shared with the explicit request to not share outside of the current class cohort. The participants in the class (instructors, guest speakers, and students) have not provided permission for public dissemination of the material. Please be respectful of each other and our privacy.

Slides and course materials themselves are the property of the presenter and not to be disseminated without prior written consent.

Statement on Health

Please, take care of yourself! Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress. All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful. If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. **Student Health Services (SHS)** is here to help:

call 212-650-8222 and visit their website at https://www.ccny.cuny.edu/shs. Consider reaching out to a friend, faculty or family member you trust for assistance getting connected to the support that can help.

If you or someone you know is feeling suicidal or in danger of self-harm, call someone immediately, day or night: **SAMHSA Disaster Distress Helpline:** 1-800-985-5990

24/7, 365-day-a-year crisis counseling and support to people experiencing emotional distress related to natural or human-caused disasters: **NYS Office of Mental Health Emotional Support Line:** 1-844-863-9314

Recommendations on How to Do Well in Course

1. Attend class and complete all assignments. You are responsible for what goes on in class, the textbook and assignments. Being there and being active makes sure you are up-to-date on the material and activities of the class.
2. Turn in all assignments. You learn by doing assignments.
3. Solve problems (homework, text examples, in-class problems, etc.). Actually doing it, not copying it, or reading a solution is the way you will actually learn it. Re-solve and review solutions to problems. Understand every step of the solution.
4. Review the text and notes. Read the book. Re-read sections that seemed difficult.
5. Form a study group. Find a collaborative environment where all participants participate equally and the main focus of the group is to study.
6. Come to office hours and recitations.
7. Ask questions.
8. Check and double-check unit conversions.
9. Setup problems using the requested format in class.
10. Communication is key. If you are having a problem, let's address it before it escalates.

Person Who Prepared this Description/Date of Preparation

Juan D. Jimenez, 8/19/2022

Appendix: Tentative List of Classes (as of 8/24/22)

Class #	Day	Date	Comments
1	Thursday	8/25/2022	first day of classes
2	Tuesday	8/30/2022	
3	Thursday	9/1/2022	
4	Tuesday	9/6/2022	
5	Thursday	9/8/2022	
6	Tuesday	9/13/2022	
7	Thursday	9/15/2022	
8	Tuesday	9/20/2022	
9	Thursday	9/22/2022	
	Tuesday	9/27/2022	No CCNY Classes
	Thursday	9/29/2022	No Class-Monday Schedule
	Tuesday	10/4/2022	No CCNY Classes
10	Thursday	10/6/2022	Exam 1*
11	Tuesday	10/11/2022	
12	Thursday	10/13/2022	
13	Tuesday	10/18/2022	
14	Thursday	10/20/2022	
15	Tuesday	10/25/2022	
16	Thursday	10/27/2022	
17	Tuesday	11/1/2022	
18	Thursday	11/3/2022	
19	Tuesday	11/8/2022	
20	Thursday	11/10/2022	Practice test review
21	Tuesday	11/15/2022	TEACH – chp 13
22	Thursday	11/17/2022	TEACH - review
23	Tuesday	11/22/2022	EXAM 2 – Chp 4,5,6,7(not full 7)
	Thursday	11/24/2022	No CCNY classes-Thanksgiving
24	Tuesday	11/29/2022	
25	Thursday	12/1/2022	
26	Tuesday	12/6/2022	present
27	Thursday	12/8/2022	present
28	Tuesday	12/13/2022	Last day of class
			Final Exam TBD – chp 8,12,10,13

Group presentation
15 mins presentation

Class is held in MR4, 11-12:15
*Exam dates are flexible within 1 or 2 class sessions at most