January	20	Monday	Martin Luther King, Jr. Day
January	21	Tuesday	First Day of Classes
January	25	Saturday	Saturday Classes Begin
January	27	Monday	Last Day to Add/Drop a Class
January	27	Monday	Last Day for 100% Refund, Full or Partial Withdrawal
January	28	Tuesday	W Grades Posted for Course Withdrawals
February	3	Monday	Last Day for 90% Refund, Full or Partial Withdrawal, No Refund for Partial Withdrawal after this date
February	17	Monday	Last Day for 50% Refund, Full Withdrawal
March	10	Monday	Last Day for 25% Refund, Full Withdrawal
March	16	Sunday	Spring Recess Begins - No Classes Scheduled - University Open
March	22	Saturday	Spring Recess Ends
April	3	Thursday	Wellness Day
April	7	Monday	Last Day to Withdraw
April	18	Friday	Good Friday - No Classes Scheduled - University Closed
April	20	Sunday	Easter Sunday - No Classes Scheduled - University Closed
May	6	Tuesday	Thursday Classes Meet
May	7	Wednesday	Friday Classes Meet
May	8	Thursday	Reading Day 1
May	9	Friday	Reading Day 2
May	10	Saturday	Final Exams Begin
May	16	Friday	Final Exams End
May	18	Sunday	Final Grades Due
TBA			Commencement

CHE 750: Environmental Catalysis
Spring 2025

Course Time/Location: Monday 6-8:50pm Tiernan 114
Instructor: Xianqin Wang
Lecture Materials will be uploaded to Canvas.

Office Hours: Monday 4:00-5:00pm Tiernan 360

If you can not make it to the office hours, you can ask questions by email (xianqin@njit.edu). I will try to answer all your questions by every Friday evening if I cannot respond you right away due to other activities.

Prerequisite(s): Have basic knowledge on Kinetics and Reactor Design, and Transport Phenomena.

Required Materials: The materials covered are mainly from the following text books (you are not required to buy all the books. But it is better to have one of them)

1. (**CAPC**) Ronald M. Heck, Robert J. Farrauto, Suresh T. Gulati, **Catalytic Air Pollution Control, Third Edition**, ISBN:9780470275030 |Online ISBN:9781118397749
2. (**ITFS**) Ulf Hanefeld (Editor), Leon Lefferts (Editor) **Catalysis: An Integrated Textbook for Students**, ISBN: 978-3-527-34159-7 February 2018 384 Pages
3. (**PPHC**) John Meurig Thomas, W. John Thomas; **Principles and Practice of Heterogeneous Catalysis, 2nd Edition**, ISBN: 978-3-527-31458-4, Feb 2015, 768 pages
4. **(RPAT) Catalysis for a Sustainable Environment: Reactions, Processes and Applied Technologies**
   Editor(s): Professor Armando J.L. Pombeiro, Dr. Manas Sutradhar, Professor Elisabete C.B.A Alegria, First published:2 January 2024
   Print ISBN:9781119870524 |Online ISBN:9781119870647
   |DOI:10.1002/9781119870647
5. Elements of Chemical Reaction Engineering, 7th Edition, Published by Pearson 2025, H Scott Fogler, Bryan R. Goldsmith, Eranda Nikolla, Nirala Singh

Course Description: This course is to introduce students (including MS and PhDs) to the fundamentals of catalysis in abating pollutant emissions and developing future environmentally friendly energy technologies. A review of catalysis fundamentals, including catalyst preparation methods and characterization techniques, and the correlation between structural properties and catalyst activities, will be covered. Density functional theory (DFT) will also be briefly introduced. For Several popular environmental processes including mobile and stationary pollution abatement technologies will be discussed, including automobile catalytic converters, diesel truck emission control, and catalytic abatement of chemical plant emissions. In addition, the use of catalysis for "green" alternative energy processes will also be reviewed including fuel cell systems, bio-fuel production, bio-fuel refining, and CO2 sequestration. each technology, the discussion will cover both the chemistry occurring on the catalyst surface as well as the engineering involved in the overall process.

Course Outcomes (CO): By the end of the course students should be able to:

1. Explain catalysis chemistry and catalytic reactor engineering
2. Understand the modern catalytic pollution abatement and emerging "green" catalytic processes;
3. Know different kinds of catalytic materials and their structural properties
4. Know different kinds of catalyst characterization techniques and data analysis from each technique
5. Understand structural and activity correlations

Assignments:

Homework:

HW work assignments and exam problems will be posted in Canvas. Please submit your assignments to Canvas before due time.

Group/ Individual Project:

You can work alone or form 2-3-person group for the project. Each group will design a creative system or unit using catalytic systems. The project should include a description of the design (draw pictures if necessary) **(written report)**, and be presented to the whole class. **The files must to be sent to the instructor one day before the presentation.**

Written report: 15-20 page (single space, excluding references) technical paper on approved topic catalytic systems or reactions with overview, presentation of present status and issues, analysis of your designed system for the future, and references. All pages must be formatted to fit on 8-1/2 by 11-inch paper with no smaller than 12 point font and one-inch margins on every side.

Oral presentation: 25 minute formal oral presentation of the topic selected for the term paper plus 5 minutes of Q&A. **The files must be sent to the instructor one day before the presentation.**

Grading:

Homework: 20% (200 pts) (either individual assignment or open discussion)
Group design project: (group/individual effort)
Written report: 20% (200 pts)
Oral presentation: 20% (200 pts)
Midterm exam 20% (200 pts) (individual effort)
Final exam: 20% (200 pts) (individual effort)

Letter grades will be awarded for the following totals:

A	850 - 000 pts
B+	800 - 849 "
B	750 - 799 "
C+	700 - 749 "
C	650 - 699 "

F less than 650 "

NJIT HONOR CODE: The NJIT honor code is being upheld on all issues related to the course. Students are expected to be familiar with the code and conduct themselves accordingly.

Group activities policy: Each student will be asked at the end of the semester to confidentially rate his/her performance/effort as well as that of all his/her groupmates. This rating will reflect the performance when the members were actually present. The completed evaluation form has to be submitted to Canvas. Evaluation forms are due on **reading day. Submissions of forms after the due date but before the final exam will result in a 75% reduction of credit that the student would have received if the form was submitted timely.**

Date	week	Tentative topics
1/20/2025	week1	Martin Luther King, Jr. Day
1/27/2025	week2	Introduction
2/3/2025	week3	Catalyst Materials and Preparation
2/10/2025	week4	Catalyst Characterization and Deactivation
2/17/2025	week5	Catalyst electronic structure and activity correlation
2/24/2025	week6	Reactor Design for Environmental Catalysis
3/3/2025	week7	Automotive Catalyst
3/10/2025	week8	Mid-term exam
3/17/2025	week9	Spring Break
3/24/2025	week10	Diesel Engine Emission Control
3/31/2025	week11	Volatile organic compounds (VOCs control)
4/7/2025	week12	Gasoline, hydrotreating
4/14/2025	week13	Other pollution control
4/21/2025	week14	Fuel Cells and Battery Technology
4/28/2025	week15	Biofuels
5/5/2025	week16	Project prentation, report due
		Final exam week

HWs will be posted on Canvas.

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

NJIT Honor Code: The NJIT honor code is being upheld on all issues related to the course. Students are expected to be familiar with the code and conduct themselves accordingly. Any violations will be brought to the immediate attention of the Dean of Students.

CRITICAL NOTES TO STUDENTS FOR EXAMS

1. **SHOW ALL WORK, do not skip anything!!!** Write down all fundamental equations, numerical values/units of all variables and parameters. Show all intermediate calculations by plugging numbers into the equations. Show results of intermediate calculations. You will lose a lot of points if your equations are missing. **You will get minimal score, mostly 0, for each step regardless whether your answer is correct or not if the calculations and numbers leading to the answer are missing.**

2. **If the values of parameters, variables, and intermediate calculations are missing or incorrect, yet your intermediate calculations and/or final answer are correct, first you will get minimal partial scores, close to 0 points per step, and additionally your paper will be flagged for misconduct investigation.**

University statement on academic integrity:

- ***"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:*** **http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf**.

  Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. ***Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.*** *If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at* dos@njit.edu*"*

Policies and Expectations about Exams/Grades

• The course letter grade will be assigned and rounded automatically by Excel (no emotions attached). The assigned letter grade is FINAL without subject to negotiation!
• Any excuses used to drop missed assignments or exams must first be documented with the Dean of Students.
• Students have to plan, study and do well in exams/assignments if they want to get a good grade in this class. Instructor will NOT change letter grades to accommodate any special circumstances (unless excused by the Dean of Students). The student will get the letter grade he/she deserves.
• Students can dispute the assignment and exam scores within a week following the announcement of the score. Students cannot dispute their prior exams or assignments after one week or at the end of the semester! Furthermore, upon requesting grade review the student accepts the possibility of instructor both removing points, as well as giving points, in case grading mistakes are found.
• Student handwriting must be legible in order to receive points.
• The graded exams must be returned within a week to be saved for the department course assessment initiative.
• Students will get 0 for not showing up to exams, or any other course activity.
If a student misses an exam due to extreme circumstances (such as a medical problem or a death in the family), he/she needs to notify the instructor via email before the beginning of the exam, and provide proof of the circumstance to the Dean of Student's office. Only in this case of official approval from the Dean of Student's office, may a make-up be given. When a student invokes extenuating circumstances for any reason (late withdrawal from a course, request for a make-up exam, request for an Incomplete grade) the student will be sent to the Dean of Students Office.
The Dean of Students will be making the determination of whether extenuating circumstances exist or not and will be notifying the instructor accordingly. Instructors will never request or accept medical or other documents from students; such documents need to be submitted by the student to the Dean of Students. Except for cases determined by law, an instructor is not required to accommodate student requests even when extenuating circumstances are certified by the Dean of Students; however, all efforts should be made to ensure a student-friendly environment.
• Extra credit may be assigned during the semester, at the discretion of the instructor. There will be no make-ups, extra credit, or any additional projects/assignments given beyond the semester's completion.
• Students may NOT seek help from someone outside of the class on any of the in class exercises, homework assignments, tests or projects.
• Students may NOT use course materials from the previous semesters, unless such materials have been explicitly shared with them by the instructor.
• Students may NOT post course materials to external resources, such as Chegg.com and others.
• Students may NOT share course materials with other students or persons, even after course completion. Doing so may result in penalties for the grade that has already been earned.
• If multiple students turn in identical (or very similar) projects, this is considered to be a violation and the case will be turned over to the Dean of Students for further examination.
• If you need accommodations due to a disability please contact the Associate Director of Disability Support Services, Fenster Hall Room 260 to discuss your specific needs. A Letter of Accommodation Eligibility from the Disability Support Services office authorizing your accommodations will be required.

• NJIT policy requires that all the exams must be proctored, regardless of delivery mode, in order to increase academic integrity. Note that this does not apply to essay or authentic based assessments.
• Class Recordings: Class sessions may be recorded by the instructor. These recordings shall only be used as an educational resource and are not to be distributed or used outside of this class. Information on how to access recorded lectures will be made available by your instructor. Any recordings that contain identifiable information about students will not be used beyond this semester.
Class Recording Etiquette: Students are expected to respect their fellow students' privacy and freedom to learn without disruption. Students are not allowed to capture or reproduce anyone's name, image, or voice without permission. They must be polite and respectful in the online chat. Informal chat is okay, but typing is restricted to things that one would say out loud in front of the entire class. Students must always conduct themselves on their webcam video as they would in person in a classroom.