

CHE 495-00x, FALL 2025, SYLLABUS

OTTO H YORK DEPARTMENT OF CHEMICAL AND MATERIALS ENGINEERING @ NJIT

REES B. RANKIN

INTRODUCTION

CATALOGUE DESCRIPTION

“In this first course in chemical engineering capstone laboratory, experiments are conducted in the areas of fluid mechanics and heat transfer. Bench and pilot-scale equipment is used. Oral and written reports are prepared by the students.”

INSTRUCTOR GOALS

Through successful completion of this course, students will experience hands-on operation of lab-to-pilot scale unit operations equipment, combined with rigorous mathematical prediction and validation of observed phenomena as compared to phenomenological and otherwise typical textbook equations. Students completing this course will be challenged to not just conduct the laboratory experiment, but to fully understand what they observe and explain why it occurs. This course helps bridge the typical core course lecture material to the real world operation of chemical engineering equipment which does not always behave “ideally”.

PREREQUISITES AND/OR COREQUISITES

PREREQUISITES

ChE 370 (Heat & Mass Transfer),
Eng 352 (Technical Writing),
Math 225A (Survey of Probability & Statistics for ChEs)

COREQUISITES

None Specified

CLASS MEETING TIMES AND LOCATIONS

MONDAYS 13:00 TO 15:50

Tiernan Hall, B007B (in the basement) for in person experiments.

FRIDAY 08:30 TO 10:20

Tiernan Hall, B007B (in the basement) for in person post-experiment discussions.

INSTRUCTOR AND TA TEAM

LEAD INSTRUCTOR



Rees Rankin, Ph.D. rees.b.rankin@njit.edu

Office Hours (IN PERSON, OR VIA ZOOM BY REQUEST WHEN POSSIBLE).

Office Location : TIERNAN B007 (or possibly in TIERNAN 109/206)

Tues:

10:30 - 13:00

Wed*:

13:00-

15:00

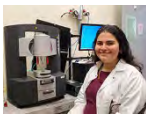
** Note that on first Wednesday of each month, there are faculty/staff department meetings I must attend from 230-400 PM. On these days I will instead offer office hours from 100-200 PM and 400-545 PM*

You can also book specific request times through my Doodle page. I will make some other time slots each week; they will not be constant. They will be based around other meetings and non-class duties I have. So for example, one week it might mean all of Monday is free. Another week it might mean Friday afternoon is free. You'll need to check regularly, but I will make as much time available as possible.

LINK TBD / WILL BE POSTED ON CANVAS ANNOUNCEMENTS

STUDENT TA'S

NO PIC AVAILABLE YET



Pooneh Gorji pg595@njit.edu

Nikki Rodriguez ncr22@njit.edu

ALTERNATE TA (if needed in emergency)



Shawn Yetman shawn.yetman@njit.edu

*Note : The instructor grades all student work except for Final Oral Presentations. The TA(s) assist with conducting the lab experiments with you (or your team) but do not contribute grading/marks to your work except for the Final Oral Presentation where they will provide Q&A following your presentation, in collaboration with the Instructor.

ATTENDANCE

POLICY

Attendance for **ALL** lab sessions OF YOUR TEAM, and all "lecture" sessions is **Mandatory!** . Attendance on "off-weeks" for your team is optional and welcome. If you need to miss class for an approved reason, let me know in advance if you can. Make sure your group knows in advance of your absence, if you can, and document all members' approval. Professional behavior is expected! Students who do not attend lab sessions (no approved absence) will be removed from their teams and required to conduct work independently.

F2F MODE STATEMENT(S)

GENERAL

Our course for FALL 2025 is listed as a Face to Face (F2F) in person class and will be run as such unless there is a change in university policy or a government mandate requiring a change. If the Department, University, or other operating government agency above the Instructor's "paygrade" dictate we must change operation due to worsening COVID or other emergency, then we can and must follow these requirements. In such an event, supplemental information to this document will be provided as needed to adapt operation of the course accordingly.

IF any exist, you will be required to follow any and all UNIVERSITY COVID safety requirements and policies in place for this course, at all times. Failure to do so may result in removal from the course.

COURSE ASSIGNMENT AND GRADE STRUCTURE (CONVERGED MODE)

ASSIGNMENT GRADE WEIGHTINGS

Five experiments will be assigned to each group. All reports and presentations are to be group efforts and submissions. Electronic submissions are required and they *must* contain handwritten/signed statements of each group member acknowledging their contribution. {Therefore, the final product must have at least 1 scanned page after being signed appended to the end of the document PDF}.

• Intro/ Day1 General Assignments	2.0%
• Professional/Soft Skill Assignments	4.0%
• Software Assignments	6.0%
• Scholarly Paper #1	12.0%
• Oral presentation (management) #1	12.0%
• Scholarly Paper #2	12.0%
• Oral presentation (management) #2	12.0%
• User choice Paper/Presentation	12.0%
• Best Paper Bonus	2.0%
• Best Presentation Bonus	2.0%
• Final Oral Presentation (peers)	24.0%

DURING FINALS

* NOTE: Drafts of written reports (Scholarly Paper) and oral presentations– due after experiment is completed (see Canvas schedule for exact due dates/times) along with Excel Sheets of Data/Calculations. These will be returned with comments & feedback within 24 hours, usually within 12 hours, so that you can meet the final version Paper/Presentation deadline. It is in your best interest to turn in the draft as soon as reasonably possible so you have more time to make revisions based on feedback.

** NOTE: The Gradebook in Canvas will initially reflect a team/group score on an assignment. After CATME metrics are submitted, individual scores may be adjusted by the CATME factor if it is not equal to 1.0. You will see a note documenting this change if such occurs.

***** NOTE: The real-time CANVAS Gradebook Course Grade will not be accurate until the end of the semester due to the asymmetric nature of the assignment weights. I will post an excel calculator you can use to verify your current grade in real time. The individual assignment grades in Canvas will of course, always be accurate.**

COURSE GAMIFICATION REWARDS SYSTEM

The Canvas LMS will provide opportunities for students (as individuals, and as teams) to provide evidence of supplemental work/achievement in various areas that will activate various rewards, incentives, and extra credit opportunities. See Canvas LMS itself for outline and information. **Participation in these course elements can ONLY help increase your learning success and grade.** It can not lower your grade in any way.

GRADES (LETTER SCALE)

90 to 100 : A	75 to <80 : C+	
85 to <90 : B+	70to <75 : C	<65 : F
80 to <85 : B	65 to <70: D	

Note: there is no further rounding or curving of Grades for this course. If your final average is an 89.9913, that is an B+, not an A.

LATE PENALTIES & EXTENSIONS

The instructor has decided to afford ALL students/groups a total of **5 Extension Days** for the semester. These come with **ZERO grade penalty and ZERO need to justify or excuse why you need the extension.** You may use all 5 days on one assignment, or 1 day each on 5 assignments, or whatever suits your teams' needs. However- to use the extension, you **must** post in Canvas on the day prior to due date for the assignment that you need to use the extension. *{In other words if due Thursday, and you want to use 2 extension days, you have to tell me that on Canvas by the end of Wednesday}*. After you have used your 5 free extension days, any unexcused late submissions will lose 20 % of the maximum document/assignment score per day late.

Each and every assignment of the various listed above will have its own **rubric in the Canvas** site explaining how it will be graded.

Read the rubric(s) carefully ; **good grades** are **rather easily achieved** in this course by:

1. Conducting the experiment correctly.
2. Analyzing the results correctly and with thorough thought.
3. **Following the Rubric** to explain your experiment in the report/presentation.

COURSE CALENDAR/SCHEDULE

CHE 495- FALL 2025*						LEARNING OUTCOMES (THEME STRIPS)						DELIVERABLES						
TENTATIVE- SUBJECT TO CHANGE						COURSE DOCUMENTS & PROGRAMS			FLUID FLOW			HEAT TRANSFER			PRELAB	DRAFT	WRITTEN	ORAL
DAY	DATE	WEEK #	SPECIAL NOTES	GENERAL ACTIVITY		CFF	IFP	PT2	CHY1	CHY2	THY							
MON	9/1/2025	1	LABOR DAY	NO CLASS														
FRI	9/5/2025			INTRO/SYLLABUS DAY	THE DEETS													
MON	9/8/2025	2		EXCEL / MATH LAB 1	GENERAL USE, VARIABLES, LINEAR SYSTEMS													
FRI	9/12/2025			EXCEL / MATH LAB 2	NON LINEAR SYSTEMS, CURVE FITTING, DIFFEQ													
MON	9/15/2025	3		ROTATION 1A		A	B	C					A, B, C					
FRI	9/19/2025			ROTATION 1B		A	B	C										
MON	9/22/2025	4		ROTATION 1B		D	E	F					D, E, F	A, B, C				
FRI	9/26/2025			ROTATION 2A		D	E	F										
MON	9/29/2025	5		ROTATION 2A		C	A	B					A, B, C	D, E, F				
FRI	10/3/2025			ROTATION 2B		C	A	B										
MON	10/6/2025	6		ROTATION 2B		F	D	E					D, E, F	A, B, C				
FRI	10/10/2025			ROTATION 3A		F	D	E										
MON	10/13/2025	7		ROTATION 3A		B	C	A					A, B, C	D, E, F				
FRI	10/17/2025			ROTATION 3B		B	C	A										
MON	10/20/2025	8		ROTATION 3B		E	F	D					D, E, F	A, B, C				
FRI	10/24/2025			ROTATION 4A		E	F	D										
MON	10/27/2025	9		ROTATION 4A					A	B	C		A, B, C	D, E, F				
FRI	10/31/2025			ROTATION 4B					A	B	C							
MON	11/3/2025	10		ROTATION 4B					D	E	F		D, E, F	A, B, C				
FRI	11/7/2025			ROTATION 5A					D	E	F							
MON	11/10/2025	11		ROTATION 5A					C	A	B		A, B, C	D, E, F				
FRI	11/14/2025			ROTATION 5B					C	A	B							
MON	11/17/2025	12		ROTATION 5B					F	D	E		D, E, F	A, B, C				
FRI	11/21/2025			ROTATION 6A					F	D	E							
MON	11/24/2025	13		ROTATION 6A					B	C	A		A, B, C	D, E, F				
WED	11/26/2025		FR CLASS	NO CLASS					B	C	A							
MON	12/1/2025	14		ROTATION 6B					E	F	D		D, E, F	A, B, C				
FRI	12/5/2025			ROTATION 6B					E	F	D							
MON	12/8/2025	15		GENERAL OPEN HELP SESSION FOR FINAL PROJECT (THE COMPARATIVE) ALL YEARS														
FRI	12/12/2025		READING DAY	NO CLASS														
MON	12/15/2025	16		FINAL PRESENTATIONS WILL BE SOMEWHERE IN THIS DATE RANGE, REGISTER AT BO														
FRI	12/19/2025																	
MON	12/22/2025	17																
FRI	12/26/2025																	

*note this is tentative and may be modified subject to instructor discretion , governing agency mandate, building construction related issues, or other reasons that require significant change to operational scope. However, if “nothing goes wrong”, this is what we will adhere to.

** note that the Final Oral Presentation Day/Time is not yet scheduled, it will be in place of a normal Final Exam. The date/time will be provided to you at the earliest convenience when it is available to the Instructor.

*** note that a Pre-laboratory assignment is due @ 10AM the day of experiment before you conduct the experiment. This can be prepared from the provided template files. The goal is to have a working excel sheet that is arranged , organized, has all needed unit conversions/factors, key equation calculations set up in advance so that as you acquire data you can easily tell me if it seems to be making sense. Other components of the pre-lab assignment will be a hazard analysis, and a plan (with justification) of what conditions you will acquire data at. This assignment does not receive a specific grade by itself, but is a part of the rubric for the actual lab report (or presentation) for that given experiment; thus, you should take it quite seriously. If you do not complete this prior to your experiment, you will not be allowed to operate the experiment.

GROUPS

ASSIGNMENT OF MEMBERS

The instructor will make groups using the CATME team builder tool. The groups will be posted to email/Canvas that evening. Group members will not be changed unless significant issues arise (such as unsanctioned behavior, etc) . ***FAILURE TO CAREFULLY* READ the instructions and questions in the survey may result in poor allocation of teammates; this is not the instructor's responsibility.***

PEER-ASSESSMENT OF MEMBER CONTRIBUTIONS

The instructor will create and provide anonymous online peer-assessment tool(s) such as CATME for group members to disclose and validate the equality of contribution of all team members. **COMPLETION OF ALL CATME SURVEYS IS MANDATORY AND FAILURE TO DO SO WILL RESULT IN A DEDUCTION OF A LETTER GRADE FROM THE STUDENT'S FINAL COURSE AVERAGE.**

CATME FACTORS *WILL BE USED* TO ADJUST INDIVIDUAL SCORES FROM THE TEAM SCORE FOR AN ASSIGNMENT. TAKE YOUR TEAMWORK RESPONSIBILITIES SERIOUSLY. TAKE THE CATME EVALUATION SERIOUSLY. (INSTRUCTOR RESERVES RIGHT TO OVERRIDE IN EVENT OF OBVIOUS ABUSE OR "FRAUD")

COURSE MATERIALS & RESOURCES

LMS

Canvas Site: <http://canvas.njit.edu> --- Please check this site and your email often (**at least once a day**). Project details, in-class work, assignments, announcements, and useful memos will be posted here. Basically, every document for the course will be provided and maintained here.

WEBEX/ZOOM (ONLINE VIDEOCONFERENCING PLATFORM)

Links given above for instructor's NJIT ZOOM/WebEx room if you choose to use it for off-schedule requested Office Hours instead of In Person meeting. Should NJIT/course be switched to remote learning due to COVID, weather, emergency, construction, or other reasons, instructions for "lab" webex links will be provided at a later time.

EMAIL

Instructor and TA emails provided above. Email is a documented and maintained communications tool where permanent records of correspondence can be kept. If you, for example, have an issue logging in to Canvas, you can email me the time, a screenshot, and a copy of your assignment; while I will still ask you to upload the work to Canvas eventually, this will serve as proof that you were not late in your assignment due to your own faults. Instructor and TA will send any announcements to the course through Canvas announcement and bulk class email list.

TEXTBOOK

There is no formal textbook for this course; separate course policy documents and manuals for each experiment will be maintained on the Canvas site. The Manuals are adapted and revised by the Instructor based on previous versions developed by Prof. Basuray and Prof. Barat. These Manuals are time-proven and contain everything you need for the experiments. Become **very** familiar with their contents before running the experiments.

MATH SOFTWARE

Math Solver: You must have access to and know how to use one math solver software package. Examples include Polymath , Matlab, Python, or Mathcad (NOT EXCEL!) Excel alone will not get you through this course. All of the software are available for download and you have student license to use. Please reach out to Shawn Yetman if you need help.

SAFETY LECTURES AND MATERIALS

A mandatory lab safety session/presentation will be provided in the first or second week of the course prior to experiments beginning. You will have an assignment to complete to validate you have viewed this content. The instructor and TA(s) will make comments on this topic prior to the start of experiments in the Introductory lecture. There will be separate policy documents on the Canvas site as well. **SAFETY FIRST! BOTH COVID AND OTHERWISE!**

LEARNING OUTCOMES & ABET RELATED

GOALS

Students will be able to:

- Operate fluid flow applications (pipe flow, packed tower), and collect quality data, including pressure drops
- Operate heat exchangers (transient (if time allows), steady state), and collect quality data, including fluid stream temperatures
- Analyze data, and apply appropriate theoretical models in fluid flow and heat transfer
- Plan an experiment and take enough data to get meaningful results
- Handle their data ethically and correctly, and appreciate the dynamic between data and models
- Present their results critically, and draw useful conclusions
- Present their results using quality plots and tables that reveal key relationships
- Analyze audiences and tailor their reporting for optimal communication
- Report their data and analyses consistent with the assigned reporting structure
- Regularly and accurately assess performance of themselves and their group/team peers in a collaborative teamwork-based environment.

OUTCOMES

This course explicitly addresses the following ABET student outcomes: 1, 3, 5, 6 and their sub-component outcomes

- 1A: Apply appropriate solution method using math/science/computing principles.
- 3A: Communicate data, ideas, analysis, results in written form.
- 3B: Communicate data, ideas, analysis, results orally considering a wider audience.
- 5A: Participate in the establishment of goals and workplan of the team.
- 5B: Contributes to the development of a collaborative team environment.
- 6A: Develop and conduct appropriate experimentation.
- 6B: Analyze and interpret data, and use engineering judgment to draw conclusions.

NJIT POLICIES

COVID

<https://www.njit.edu/pandemicrecovery/frequently-asked-questions>

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”

- DO NOT USE CHATGPT OR OTHER GENERATIVE AI WRITING ALGORITHMS TO CREATE WORK FOR THIS COURSE (EXCEPT WHERE IT MAY BE EXCEPTED IN SOFT SKILLS BONUS ASSIGNMENTS) TO CREATE CODE OR REPORTS FROM S ALTHOUGH THE NJIT DoS DOCUMENT ON ACADEMIC INTEGRITY MAY NOT YET EXPLICITLY FORBID THIS TOOL, THIS COURSE DOES.

DISABILITY/ACCOMMODATION

“NJIT is committed to providing students with documented disabilities equal access to programs and activities. If you have, or believe that you may have, a physical, medical, psychological, or learning disability that may require accommodations, please contact Student Disability Services. Information on the self-identification, documentation and accommodation process can be found on the webpage at: <http://www.njit.edu/counseling/services/disabilities.php>.”

**COVID specific: if you have a legitimate request for accommodation to not conduct the experiments in this laboratory course physically, the request must go through the Dean of Students office (DoS).*

DIVERSITY AND INCLUSION

NJIT promotes an active , respectful culture and environment for learning and work that involves welcoming all peoples , affording them equal opportunities, and including them and valuing their contributions, skills, and abilities equally, as can be read here:

“ As a minority serving institution, NJIT’s Office of Inclusive Excellence vision is to foster an understanding and appreciation of globally diverse perspectives where we cultivate a culture of acceptance of and for everyone in an educational environment grounded in research and lived experiences. This is achieved through an outcome-based approach grounded in these core values:

- Creating a sense of belonging for everyone
- Promoting student success and engagement
- Enhancing employee engagement and satisfaction
- Fostering shared responsibility and collaboration
- Developing an awareness of one another using educational tools”

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<https://www.njit.edu/diversityprograms/about-diversity-and-inclusion>

Beyond this general philosophy, the university has the following policy against discrimination of any kind :

“New Jersey Institute of Technology reaffirms its commitment to a policy of non-discrimination on the basis of race, sex, sexual orientation, age, religion, ethnic origin, handicap or veterans' status in its employment policies, educational programs and activities under university control.

Assuring a climate of equal opportunity is the direct responsibility of all levels of management. Administrative and supervisory personnel are required to comply with applicable government regulations and the affirmative action goals of the university.

Among these are Executive Orders 11246 and 11375 (Affirmative action); the Civil Rights Act of 1964, as amended; Title IX of the Education Amendments of 1972 (Sex Discrimination); Section 504 of the Rehabilitation Act of 1973; Americans with Disabilities Act (Non-discrimination on the Basis of Handicap); The New Jersey Law Against Discrimination, Title 10, Chapter 5, 10:5-1 to 10:5-28, NJ Revised Statutes, as amended; and the New Jersey Governor's Code of Fair Practices, Executive Order No. 21 (1965), as amended and Executive Order No. 39 (1991), "Prohibition in State Government of Discrimination Based on Sexual Orientation."

Any reported act of discriminatory behavior will be investigated through the Office of the Dean of Students, or Office of General Counsel and Employment Policy Relations.

Other Resources:

Title IX and Sexual Misconduct

Bias Incident Reporting

Anti-Discrimination and Anti-Discriminatory Harassment Policy (Employees)”

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<https://www.njit.edu/inclusive/university-non-discrimination-policy>

Students in this course engaged in discriminatory behaviors towards their peers, TA(s), other students, other employees, or the Instructor will be sanctioned per university policy(ies).

LABORATORY SAFETY

Beyond what is covered specifically in this course, NJIT has numerous Environmental and Safety/Health (ESH) policies and guidelines for appropriate use of laboratory space, either instructional or research. For specific details on the policies (too numerous to list here), please visit the following link. Pay particular attention to the sections on chemical labs, waste, and COVID <https://www.njit.edu/environmentalsafety/laboratory-safety>

EXCUSED ABSENCES AND RELIGIOUS OBSERVATIONS

NJIT is committed to supporting students observing religious holidays. Students must notify their instructors in writing of any conflicts between course requirements and religious observances, ideally by the end of the second week of classes and no later than two weeks before the anticipated absence. All instructors must include a reminder on the course syllabus about this notification process. All instructors are required to provide academically reasonable accommodations, allowing students to complete missed assignments, exams, quizzes, or other coursework within the term. Instructors are encouraged to consider the NJIT religious holiday calendar and exercise cultural sensitivity when scheduling assessments or major assignments. All instructors must ensure that students are not penalized for properly documented absences and maintain confidentiality regarding religious observances.

COURSE INCOMPLETES

The grade of "Incomplete" may be given under rare, documented circumstances. Instructors must provide written details of the remaining work and deadlines to the student and the Department Chair. The "Incomplete" grade must be resolved in the next regular semester to avoid automatic conversion to a failing grade. Instructors should not accept work by a student after the end of the semester following the one in which the Incomplete was issued, unless the Dean of Students certifies extenuating circumstances, the instructor is willing to process a late change of grade, and the Office of the Provost pre-authorizes such a change.