

Spring 2021

CHE 495-002: Chemical Engineering Lab I

Rees Rankin

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Rankin, Rees, "CHE 495-002: Chemical Engineering Lab I" (2021). *Chemical and Materials Engineering Syllabi*. 162.

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CHE 495-002, SPRING 2021, 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 12:30 TO 15:20

Tiernan Hall, 007B (in the basement) for in person experiment
[WEBEX for while you are not *in* the lab](#)

FRIDAYS 08:10 TO 10:05

[WEBEX for groups that ran during the preceding Monday](#)

INSTRUCTOR AND TA TEAM

LEAD INSTRUCTOR



Rees Rankin, Ph.D. rees.b.rankin@njit.edu <https://njit.webex.com/meet/rbr4>

Office Hours (WEBEX)

Wednesday: 12:00 TO 14:00 [WEBEX LINK](#)

Thursday: 12:00 TO 14:00 [WEBEX LINK](#)

HEAD TA



Shawn Yetman

shawn.yetman@njit.edu

STUDENT TA'S



Fengqiao Li

f1266@njit.edu



Yu Hsuan Cheng

yc576@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.

ATTENDENCE

POLICY

Attendance (synchronous and in person when required) is Mandatory! If you need to miss class, 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. As the class will be held in synchronous converged learning, it means that on the days you are not physically in the lab, you will be on WebEx. During WebEx, your camera must be on at all times. Attendance may be taken. Professional behavior is expected!

CONVERGED MODE STATEMENT(S)

OBJECTIVES

Our course for Spring 2021 is listed as a synchronous converged mode class with required physical attendance to perform the laboratory experiments. The specific course schedule/calendar (on a following page) was designed to get all students as much hands-on time in the lab as possible equally, while minimizing possible "exposure" hours, maximizing social distancing, and maximizing individual/group WebEx instruction time equally. We all know that this is not identical to "normal times" operation of the course, and we appreciate your patience, understanding, and flexibility in working with us in this mode. If the Department, University, or other operating government agency above the Instructor's "paygrade" dictate we must change operation due to COVID, then we can and must follow these requirements.

You will be required to follow all 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

Four experiments will be assigned to each group. All reports and presentations are to be group efforts and submissions. Electronic submissions are encouraged so long as they 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}.

- Scholarly Paper #1 18 or 22 %
- Oral presentation (management) #1 18 or 22 %
- Scholarly Paper #2 18 or 22 %
- Oral presentation (management) #2 18 or 22 %
- Final Oral Presentation (peers) 20%

* NOTE: whichever of your 2 scholarly papers is graded higher, will count more to your final grade (22%), while the other will count less to your final grade (18%). The same practice applies to your normal Oral presentations. Your Final Course Percentage will be the weighted average according to the listing above.

**** NOTE: Drafts of written reports (Scholarly Paper) and oral presentations– due by 1 week after experiment is completed (see schedule) along with Excel Sheets of Data/Calculations. These will be returned with comments and a mock grade & 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.**

GRADES (LETTER SCALE)

90 to 100: A	68 to 72: C+
85 to 90: A-	65 to 68: C
80 to 85: B+	62 to 65: C-
76 to 80: B	59 to 62: D+
72 to 76: B-	50 to 59: D
	< 50 : F

Note: Due to the generous Grade Letter Scale combined with the “best for you” weighting of your reports and presentations, there is no further rounding or curving of Grades for this course. If your final average is an 89.9913, that is an A-, not an A.

ASSIGNMENT RUBRICS

Each assignment of the 5 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 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

Links given above for course section meetings and office hours. Links will also be maintained directly on Canvas site for the course

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, or Mathcad. 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

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

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”

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 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:

“The mission of Diversity and Inclusion is to initiate and support activities that promote cultural competency among students of the NJIT Community. We are committed to raising self-awareness, mutual understanding, knowledge, and respect for others. Our approach is relational in that we believe in growth-fostering relationships, therefore we commit to providing a welcoming place for all. We pledge to offer a safe space and outlet for dialogue; we commit to provide mentorship and support; as well as engage students to become advocates for issues of injustice in our multicultural world.”

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

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

“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 Student Services, the Office of Compliance and Community Relations, or Office of General Counsel and Employment Policy Relations."

<https://www.njit.edu/diversityprograms/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>