**Northeastern University Department of Chemical Engineering**

**Course Syllabus Spring 2022**

**See class schedule:**

**Course number and name:**

CHME 3315/3316 **Chemical Engineering Design 1 Lab and Recitation**

**Credits and contact hours (4 credit hours)**

* **Recitation**: Tuesdays 3:25–5:05pm
  + Shillman Hall: Room 305
* **Lab**: Thursdays 12:30–4:00pm, or Friday 8-11:30am, or 1:35-5:05pm
  + Mugar Life Science Building:Room 007 and Room 100 MZ

**Instructor & Teaching Assistants:**

* Instructors:
  + **Prof. Tracy Carter, PhD,** [**t.carter@northeastern.edu**](mailto:t.carter@northeastern.edu)
* Office Hours:  Tuesdays 4:30-5:00pm, Fridays 7:30-8:00am and 11:30-12:00pm in person, by Zoom or by appointment.
* Teaching Assistants (TAs):

**Textbooks  (author, title, publisher, edition, and year):**

Munson, B. R., Huebsch, W. W., Okiishi, T. H., and Rothmayer, A. P., *“Fundamentals of Fluid Mechanics”*, 7th Edition, Wiley, 2013.

Geankoplis, C. J., Hersel, A. A., and Lepek, D. H., *“Transport Processes and Separation Process Principles”* 5th Edition, Prentice Hall, 2018.

McCabe, W. L., Smith, J.C., and Harriott, P., *“Unit Operations of Chemical Engineering”* 7th Edition, McGraw-Hill, 2004.

**Specific course information:** reviewed in lab class sessions and recitation classes.

**Brief description of the content of the course (catalog description):**

Offers students an opportunity to obtain hands-on laboratory experience and to develop safety, teamwork, problem-solving, organizational, technical writing, and oral presentation skills. Focuses on fundamental momentum transport principles and skills to develop and design engineering solutions through experiments in the context of the current fields of chemical engineering. Emphasizes the hazards associated with those chemical engineering experiments.

**Prerequisites or co-requisites**

Prereq. ENGL 1111 or ENGL 1102. Pre-req. CHME 2310.  & Co.Req.Tech. Writing

Indicate whether a required, elective, or selected elective (as per Table 10) course in the program: Required

**Course outcomes:**

ABET Student Outcomes (SO’s 1-7) which map from the Course Outcomes listed below are shown in parentheses

* Identify problems and needs, then design and conduct engineering experiments, to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, OR sustainability. This will be assessed through the technical design of experiments for the proposals, presentations and reports. The experimental design must be supported by analysis of the literature. (SO 2, 6)
* Use the techniques and skills with engineering tools and equipment necessary for chemical engineering practice. This will be assessed through writing technically accurate experimental procedures and methods, and through the submission of proposals, presentations and reports. These abilities must be supported by the design and performance of safe and effective experiments. (SO 1, 2, 4, 6)
* Identify and mitigate the hazards associated with engineering processes. This will be assessed through completing certifications for Hazardous Waste, Fundamentals of Laboratory Safety, writing technically accurate experimental procedures and methods, and through the submission of safety check-in and checkout sheets in the proposals, presentations and reports. These abilities must be supported by the design and performance of safe and effective experiments. (SO 2)
* Apply knowledge of mathematics, science, and engineering to analyze and interpret data and information to solve engineering problems within the field of transport phenomena with an emphasis on fluid flow. This will be assessed through the technical content of proposals, presentations and reports. Technical content must be supported by literature references, sample calculations, and statistical analysis in order to explain what the data/information means. (SO 1, 6)
* Communicate effectively through written and oral presentations. This will be assessed through the formatting and communication content in the proposal, presentation, and reports. Written and oral communications must include writing that is professionally formatted and organized with technically specific language. (SO 3)
* Contribute to a project as part of a team. This will be assessed through the team charter and feedback, meeting deadlines, class attendance and participation. Teams should identify the roles and responsibilities of each team member and assess each other’s performance. (SO 5)

**Brief list of topics to be covered**

* Safety
* Teamwork
* Technical Writing
* Statistics
* Presentations
* Uncertainty in calibration
* Pumps, vacuum, valves, fittings, pipe
* Computational calculations and mixing
* Materials

**Grading**

Your final laboratory grade will be based on:

* Five Group Proposals (20 points each, total 100 points)
* Module 1 Individual Report (50 points)
* Module 2 Group Presentation (50 points)
* Module 3 Group Presentation (100 points)
* Module 4 Group Formal Report (100 points)
* Module 5 Design Group Presentation (100 points)
* Module 5 Design Group Formal Proposal (200 points)
* Mid-Semester Individual Reflection (100 points)
* Final Individual Reflection (200 points)

Grades are posted on Canvas.

Grades are assessed on a point basis as follows: 1000-940:A, 930-900:A-, 890-870: B+, 860-840:B, 830-800:B-, 790-770:C+, 760-740:C, 730-700:C-,690-670:D+, 660-640:D, 630-600:D-, 590 or below: F.

**Policies**

* Attendance (virtual-with instructor permission or in person) is **mandatory** for all laboratory classes: Please do not schedule any co-op interviews or other conflicts during the days of a laboratory or presentation. Absences due to sports, conferences, medical or family emergencies must be formally documented by e-mail prior to the class.  **Undocumented absences will decrease your overall grade by 5% per missed class, and undocumented tardiness will decrease your overall grade by 1% per 30 minutes per class.**
* **Safety Rules must be followed at all** times**.**
* **All assignments must be submitted through Canvas by 9:00 am on the due date,** unless otherwise specified. If you are having difficulty with Canvas, you may submit by e-mail to [your](mailto:s.bencherif@neu.edu) instructor before 9:00 am.
* **Late work will NOT be accepted under any condition, this is a policy for all sections of Design Lab 1 and 2.**
* Student disagreements with grading on any assignment should be made in writing within 24 hours and given to the instructor. The instructor will respond in writing within a week.
* Instructors will do their best to respond to emails within 24 hours, 48 hours on weekends.

***Northeastern University prohibits discrimination or harassment on the basis of race, color, religion, religious creed, genetic information, sex, gender identity, sexual orientation, age, national origin, ancestry, veteran or disability status. All forms of discrimination or harassment within the University community are unacceptable and will be sanctioned appropriately. Further, University policy and applicable law prohibit retaliation against those who, in good faith, bring or cooperate in the investigation of complaints of discrimination or harassment.***

* Per Northeastern University policies, eating and drinking are not allowed in classrooms, in hallways, in the library, in the COVID-19 testing centers, or in teaching labs or studios. For additional details on the policy, please review the [policy on locations for safe eating and drinking (Links to an external site.)](https://news.northeastern.edu/coronavirus/reopening/policy-on-locations-for-healthy-and-safe-eating-and-drinking-on-campus/) on the university’s COVID-19 Reopening website.

**Recording of Classes**

Classes will be recorded to enable all students to review material covered in synchronous classes.  Please contact me if you have any concerns.

**Academic Integrity**

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors. Go to [http://www.northeastern.edu/osccr/academic-integrity-policy/ (Links to an external site.)](https://nam12.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.northeastern.edu%2Fosccr%2Facademic-integrity-policy%2F&data=04%7C01%7Ct.carter%40northeastern.edu%7C6c53e4f934d947ee772808d8b41db2db%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637457386997148842%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=PQvJLZ%2BlqBOkx2WnhiX6Ecypxv2e7xMOwzpFZ2YI%2BxA%3D&reserved=0)  to access the full academic integrity policy.

**Student Accommodations**

Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university.  To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability. For more information, visit [http://www.northeastern.edu/drc/getting-started-with-the-drc/ (Links to an external site.)](https://nam12.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.northeastern.edu%2Fdrc%2Fgetting-started-with-the-drc%2F&data=04%7C01%7Ct.carter%40northeastern.edu%7C6c53e4f934d947ee772808d8b41db2db%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637457386997153809%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=YcURQIZBhZ30k8vxkK5lcdcsXmsx377SdeNxZVYD96g%3D&reserved=0).

**Diversity and Inclusion**

Northeastern University is committed to equal opportunity, affirmative action, diversity and social justice while building a climate of inclusion on and beyond campus.  In the classroom, members of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration and an awareness of global perspectives on social justice. It is my intention that students from all backgrounds and perspectives will be well served by this course, and that the diversity that students bring to this class will be viewed as an asset. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, socioeconomic background, family education level, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. Your suggestions are encouraged and appreciated.

Please visit [http://www.northeastern.edu/oidi/ (Links to an external site.)](https://nam12.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.northeastern.edu%2Foidi%2F&data=04%7C01%7Ct.carter%40northeastern.edu%7C6c53e4f934d947ee772808d8b41db2db%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637457386997158785%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=GoQCkgGxheYt1vGLhDtkhNsz78HtQDiABgggZY2N6ro%3D&reserved=0) for complete information on Diversity and Inclusion.

**TITLE IX**

Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance. Northeastern’s Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, transgender students, faculty and staff. In case of an emergency, please call 911. Please visit [www.northeastern.edu/titleix (Links to an external site.)](https://nam12.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.northeastern.edu%2Ftitleix&data=04%7C01%7Ct.carter%40northeastern.edu%7C6c53e4f934d947ee772808d8b41db2db%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637457386997163763%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=9iCl7b%2FDBy%2BqNIXmnSS1wlYquGAb3ruSJirkwlKFkz8%3D&reserved=0)  for a complete list of reporting options and resources both on- and off-campus.

Schedule: CHME 3315 DRAFT Fall 2022

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| Week | Class Date | Topic | Assignment | Due |
| 1 | 9/9 | Lab orientation/**Module 5**: Design 1 introduction | Individual design ...purpose  EH&S certifications | 9/14 |
| 2 | 9/16 | **Module 1**: Design an experiment that illustrates fluid properties | Team proposal | 9/21 |
| 3 | 9/23 | **Module 1**: Run an experiment that illustrates fluid properties | Team report | 9/30 |
| 4 | 9/30 | **Module 2:** Design an experiment that illustrates fluid motion | Team proposal | 10/5 |
| 5 | 10/7 | **Module 2**: Run an experiment that illustrates fluid motion | Team presentation | 10/14 |
| 6 | 10/14 | **Module 5:** Design project pitch (Team Pitch) | Team design pitch | 10/14 |
| 7 | 10/21 | **Module 3:** Design an experiment to calibrate instruments | Team proposal | 10/26 |
| 8 | 10/28 | **Module 3:** Run an experiment to calibrate instruments | Team presentation  Individual Mid-term reflection | 11/4 |
| 9 | 11/4 | **Module 4:** Design an experiment to evaluate a fluid model/design for scale-up | Review presentation Team proposal | 11/9 |
| 10 | 11/11 | **Veteran’s Day** |  |  |
| 11 | 11/18 | **Module 4:** Run an experiment to evaluate a fluid model/design for scale-up (last lab class) | Team report | 11/30 |
| 12 | 11/25 | **Thanksgiving Recess** |  |  |
| 13 | 12/2 | **Module 5:** Team Design Project consult. | Team:  1st Draft formal design proposal  1st Draft proposal slides | 12/9 |
| 14 | 12/9 | **Module 5:** Team Design Project Presentations | Team design formal proposal, presentation, and reflection | 12/12 |
| 15 | 12/16 | **Final Exams Period:** 12/9 to 12/16  Faculty Grades Due 12/19 at 9:00 am |  |  |

CHME3316 14720 Recitation for CHME 3315 All Sections FALL 2022

**Revised Schedule (10 May 2022) Tuesdays 1:35 – 3:15 PM 253 RI**

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| Week | Class Date | Recitation Topic |
| 1 | September 6 | NO CLASS |
| 2 | September 13 | Course Expectations, Safety Check List, Team Charter, Gantt Chart (Instructor: Prof. Carter) |
| 3 | September 20 | Scientific writing  (Instructor: Prof. Carter) |
| 4 | September 27 | Applied statistics for laboratory (Instructor: Prof. Carter) |
| 5 | October 4 | Presentation skills, data visualization  (Instructor: Prof. Carter) |
| 6 | October 11 | Intro to equipment used in fluid dynamics  (Instructor: Prof. Price) |
| 7 | October 18 | Safety case studies and impact (Instructor: Prof. Price) |
| 8 | October 25 | Uncertainty & calibration, line fitting (Instructor: Prof. Price) |
| 9 | November 1 | Mixing and computational analysis (Instructor: Prof. Price)  Fluidized beds  (Instructor: Prof. Pfluger & Mr. D’Acierno) |
| 10 | November 8 | Design Equations  Pump Systems  (Instructor: Prof. Pfluger & Mr. Knudsen) |
| 11 | November 15 | Design Project consult  (All Instructors and TA’s) |
| 12 | November 22 | Design Project consult  (All Instructors and TA’s) |
| 13 | November 29 | Design Project consult  (All Instructors and TA’s) |
| 14 | December 6 | Design Project consult  (All Instructors and TA’s) |