Department of Civil and Environmental Engineering CE
320A – Hydraulics Laboratory

Fall 2025 – Sections 001/101/105
Lab Coordinator – Dr. Ashish Borgaonkar (ashish.borgaonkar@njit.edu)
Lab Instructors: Professors Ashish Borgaonkar, Piotr Wiszowaty, and Brian Shiels

Introduction: Welcome to the CEE Hydraulics Laboratory. This is the place where you will "put to the test" the theory that you are learning in the classroom. The Hydraulics Laboratory course (CE 320A) is designed to complement the lecture portions of the three water-oriented courses: Fluid Mechanics (CE 320), Water Resources (CE 321), and Hydraulics Engineering (CE 322). The specific objectives of this course are to provide the student with an opportunity to:

1. Explore the fundamental principles of fluid mechanics through experimentation;
2. Demonstrate and analyze key hydraulic phenomena using hands-on physical devices and computer modeling;
3. Investigate engineering design principles for pipe networks, open channel systems, and ground water regimes;
4. Develop skills for analyzing experimental data and working in teams;
5. Learn to design a custom hydraulics experiment.

Fortunately, many real world hydraulic phenomena can be easily simulated at a reduced laboratory scale. This is due to the fact that fluids adhere quite closely to the principles of *engineering similitude*. Thus, the experiments in the CEE Hydraulics Laboratory provide an excellent opportunity for you to visualize and analyze the very same hydraulic phenomena that you are studying in class and will apply as practicing engineers.

Prerequisites: CE 320 is pre-requisite or co-requisite.

Lab Manual (Print Copy Required):
Hydraulics Laboratory Manual – Experiments with Applications, by John Schuring, Ashish Borgaonkar, and Brian Shiels, 2023, Kendal Hunt Publishing (ISBN: 9798385100972) (Weblink: https://he.kendallhunt.com/product/hydraulics-laboratory-manual-experimentsapplications)
Reference Textbook (Same as the assigned text for CE320: Fluid Mechanics):
Hibbeler, Fluid Mechanics, 2nd Edition, Pearson. (print copy is not required)

Laboratory Assignments: Lab assignments will be given weekly and lab reports must be handed in or uploaded before the start time of the following class, unless otherwise announced. Late assignments will not be accepted. Some lab reports will be written and submitted individually by the student. In completing individual reports, students in the same group will share data, although all analyses and written text must be the student's own work.* Several group-written reports will be assigned during the semester. For some experiments, an abbreviated assignment in a "lab problem" format will be used.

***Honor Code:** Students are advised that the NJIT Honor Code will be upheld in this course, and any violations will be brought to the immediate attention of the Dean of Students.

Grading Basis: Lab Reports, Lab Problems, and Presentations = 95%;
Attendance & Class Participation = 5%
Contact Information: Prof. Ashish Borgaonkar (Section 001) ashish.borgaonkar@njit.edu Prof. Piotr Wiszowaty (Section 101) - pw38@njit.edu; Prof. Brian Shiels (Section 105) - bjs24@njit.edu

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COURSE OUTLINE

Week	Topics	Assignment	Report*
1	General Orientation and Lab Safety; Manometer Principles **(6)**	Safety Procedures, Lab 1	LP
2	Continuity and Flow Measurement **(3)**	Lab 2	LP
3	Viscosity of Liquids **(6)**	Lab 3	LR
4	Weir Flow **(6)**	Lab 11	LP
5	Hydrostatics: Archimedes Principle of Buoyancy **(4)**	Lab 5	LR
6	Bernoulli's Principle and Equation: • Torricelli and Bernoulli Tank Exp. **(6)** • Venturi Apparatus **(1)**	Lab 6	LP
7	Pipe Phenomena • Friction Loss and Minor Losses (Class Exp.)	Lab 9	LR
8	Hydraulic Jump, Translatory Waves & Water Hammer • Flow Visualization Chamber (Class demo) • C4 Flume **(1)** • F1-10 Bench (**1**)	Lab 13	LP
9	Manning's Equation **(1)**	Handout, Lab 10	GR
10	Centrifugal Pump Network **(1)** Student-Designed Hydraulics Experiment Introduction	Lab 14 Lab 17	LP GR
11	Stream Gaging – Field Exercise (6) (This will be held at Memorial Park in Nutley on a Saturday)	Lab 12	LP
12	Student-Designed Hydraulics Experiment (cont.)	Lab 17	GR
13	Student-Designed Hydraulics Experiment (cont.)	Lab 17	GR
14	Student-Designed Hydraulics Presentation	Lab 17	GR
15	**FINAL EXAM PERIOD** (no final in this course)		

*Legend of Report Type:
LR = Individual lab report
LP = Individual lab problem
GR = Group lab report

Note: Students will be consulted on any substantial changes to the course syllabus. Changes will be discussed and announced in advance.

AI statement: The use of artificial intelligence (AI) is permitted in this course only when explicitly stated in assignments. If students use AI for any course-related work, they must cite it according to the guidelines provided on the **NJIT Library AI Citation page**. If you have any questions about AI use in this course, please contact the course instructor before submitting any assignments. In cases where AI use is not allowed, students are expected to complete work without AI assistance to develop their skills in this subject area.

CEE Mission, Program Educational Objectives and Student Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarships among our faculty and students
- to promote service to the engineering profession and society

Program Educational Objectives

Our **Program Educational Objectives** are reflected in the achievements of our recent alumni:

1. **Engineering Practice:** Alumni will successfully engage in the ethical practice of civil engineering within industry, government, and private practice, working towards safe, practical, resilient and sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.
2. **Professional Growth:** Alumni will advance their technical and interpersonal skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as academia, business, and law through further education.
3. **Service:** Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Student Outcomes

Our **Student Outcomes** are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusion
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

   Updated 8/2025