

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

**Spring 2016 – Thursday – Section 106  
6:00 – 9:05 p.m.**

**Dr. Ashish Borgaonkar  
Mr. Brian Wartell**

**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.

**Textbook(s)/Materials Required:**

1. *Hydraulics Laboratory Manual*, by J.R. Schuring and W.P. Shu, 2010.
2. *Fluid Mechanics with Engineering Applications*, Finnemore and Franzini, 10<sup>th</sup> Edition, McGraw-Hill.

**Laboratory Assignments:** Lab assignments will be given weekly and lab reports must be handed in by 6:00 p.m. 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 and Lab Problems = 90%; Attendance & Class Participation = 10%

**Contact Information:**

Dr. Ashish Borgaonkar; Office: Colton Hall, **Room 311**; Office Hours: **Tues. 5:00-6:00 p.m.**  
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### COURSE OUTLINE

Week Beginning	Topics	Assignment	Report*
Jan. 19	General Orientation and Lab Safety; Manometer Principles (6)	Safety Procedures	LP
Jan. 25	Continuity and Flow Measurement (3)	Lab 4	LP
Feb. 1	Viscosity of Liquids (6)	Lab 1	LR
Feb. 8	Weir Flow (6)	Lab 9	LP
Feb. 15	Hydrostatics: Archimedes Principle of Buoyancy (4)	Lab 3	LR
Feb. 22	Bernoulli's Principle and Equation: <ul style="list-style-type: none"> <li>▪ Torricelli and Bernoulli Tank Exp. (6)</li> <li>▪ Venturi Apparatus (1)</li> </ul>	Lab 5	LP
Feb. 29	Pipe Phenomena <ul style="list-style-type: none"> <li>▪ Friction Loss and Minor Losses (Class Exp.)</li> </ul>	Lab 7	LR
Mar. 7	Hydraulic Jump, Translatory Waves & Water Hammer <ul style="list-style-type: none"> <li>▪ Flow Visualization Chamber (Class demo)</li> <li>▪ C4 Flume (1)</li> <li>▪ F1-10 Bench (1)</li> </ul>	Lab 8	LP
Mar. 21	Manning's Equation (1)	Handout	GR
Mar. 28	Centrifugal Pump Network (1) Student-Designed Hydraulics Experiment Introduction	Lab 10 Lab 13	LP GR
To Be Announced	Stream Gaging – Field Exercise (6) (This will be held at Memorial Park in Nutley on a Saturday)	Lab 12	LP
Apr. 4	Student-Designed Hydraulics Experiment (cont.)	Lab 13	GR
Apr. 11	Student-Designed Hydraulics Experiment (cont.)	Lab 13	GR
Apr. 18	Student-Designed Hydraulics Presentation	Lab 13	GR
May 6-12	<b>FINAL EXAM PERIOD</b> (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.