CUNY CITY COLLEGE OF NEW YORK
DEPARTMENT OF CIVIL ENGINEERING

CE365 Hydraulic Engineering

Credits/Contact Hours:
3crds, 5 hrs/week in two 1-hour lectures, one 2.0-hour lab-lecture-probSolv, and one 1-hour lab

Coordinator:
Prof Piasecki, PhD
Office: Steinmann ST102
Tel: 212 650 83421
Email: mpiasecki@ccny.cuny.edu

Textbooks:
1. *Fundamentals of Hydraulic Engineering Systems*, Houghtalen, Akan, Hwang, 5th Ed., Prentice Hall
2. *Computer Applications in Hydraulic Engineering*, Bentley Publishers, 8th Ed..

Description:
In this class you will learn about application of fluid mechanic principles to water infrastructure such as pipes and open channels. We will use real world situations in which we need to incorporate real phenomena, for example the effect of friction and also the fact that water does not flow uniformly as assumed to this point because in real life it is three-dimensional flow that affects our one-dimensional analysis environment. In particular we will address pipe flow, parallel pipes, applications of pumps and also water distribution networks. While this is pressurized flow we will also look into free surface flows which we encounter in streams, channels, and canals. Finally, we will look into some basic principles of overland flow that occurs after rainfall events and that we know as runoff, interception, and percolation (into the underlying groundwater layers). These topics are accompanied by a number of wet-lab experiments so you get a better understanding how some of the phenomena develop and we can measure their impact or influence on flow. 5 hr/wk; two 1.0-hour lecture; one 3.0-hour Lab, 3 cr.

Prerequisites:
CE264 Data Analysis
CE350 Fluid Mechanics

Instructor this Term:
Spring 2022
Prof Michael Piasecki, PhD
Office: Steinmann ST102
Tel: 212 650 83421
Email: mpiasecki@ccny.cuny.edu
Email lab TA: Janet Acquah jacquh000@citymail.cuny.edu

Class Meeting Place and Office Hours:

Classroom:	Lecture	Baskerville Hall 210	
	ProbSol	Shepard 374	
	Lab	Steinman C1A	
Meeting times:	Lecture	T/Th	09:30am – 10:20pm
	ProbSol	Th	02:00pm – 03:30pm every two weeks, alternating with Lab
	Lab	Th	02:00pm – 04:50pm every two weeks, due 14 days from assignment
Office Hours:	In-person	T	tbd pm – 2:30pm

Course WebSite:
http://michaelpiasecki.org
… and then follow the "Courses" tab

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Assessment Tools: (In addition to the End of Course survey)

1.	Lab assignments (7)	21% (~3% each)
2.	Quizzes/exams (2)	22% (10% each)
3.	Project	24%
4.	Cumulative Final Exam	33%
5.	Homework (~10 assigned)	0% (assigned for voluntary consideration)

Course Learning Outcomes: By the end of this class, the student should be able to:

1. Understand the application of conservation and momentum principles to pipe flow []
2. Understand the need for incorporating friction into real world flows []
3. Understand approaches to quantify friction impact on pipe flow and open channel flow []
4. Understand the use of parallel and pipes in series for water networks []
5. Understand how a pump is selected and matches to system requirements []
6. Understand how pumps operate when in parallel and when in series []
7. Understand what governs free surface flow and how friction impacts the flow []
8. Understand the influence of control devices on flow and flow regimes []
9. Understand basic characteristics of rainfall and what pathways are used for drainage []
10. Understand the use of hydrographs and how interpret them vis-à-vis hyetographs []
11. Application of lab experiments to support theoretical considerations []

Topics:

1.	Piping Systems, parallel and in series	1 lecture
2.	Pipe Flow Friction and Minor losses	2 lectures
3.	Pipe Network Systems	2 lectures
4.	Components of Pipe Networks	2 lectures
5.	Pumps: types of pumps	1 lecture
6.	Pumps: characteristics, dim-less numbers for design	2 lectures
7.	Pumps in parallel and series	2 lectures
8.	Open Channel Flow: energy consideration, and Froude number	2 lectures
9.	Momentum equation in OCF	2 lectures
10.	Friction and uniform flow in open channels	2 lectures
11.	Flow control devices in open channels	2 lectures
12.	Hydrologic Principles: rainfall characteristics, initial abstraction	2 lectures
13.	Computing hydrographs, Peak runoff computations, RDF graphs	1 lecture
14.	Surface runoff computations	1 lecture

Estimated ABET Professional Content:

Engineering sciences 2 cr or 67%, Engineering design 1 cr or 33%

Attendance and Late Submission Policy:

Attendance to Class lectures will not be tracked; we assume that you as an individual will know best whether or not to attend class lectures. Lab session attendance, however, will be recorded. Lab report submissions are due one week after you participated in the lab session. Deadline is 12:00noon on that Wednesday. Lab reports are to be submitted via email ONLY to the TAs. Late submission of lab reports is strongly discouraged and will result in point deductions. Every day late will result in another 20% deduction, i.e. 5 days late means you will not receive any credit.

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Calculator Policy: Students may ONLY use a Texas Instruments 30XIIS calculator during exams (including mid terms) in this course. This calculator is on NCEES' approved list for calculators that may be used during the FE and PE licensing exams. There will NO exceptions.

Academic Integrity Policy:

For a class this size it is imperative that you coordinate your group work. While discussion of topics among yourself is permissible, I expect that the group works on their own and that it hands in its own unique work. Additional requirements for academic integrity are outlined in the following document:
http://www.cuny.edu/about/administration/offices/la/Academic_Integrity_Policy.pdf

Disability Policy:

In compliance with CCNY policy and equal access laws, appropriate accommodations are administered by the AccessAbility Center. Students who register with AccessAbility, and are entitled to specific accommodations, must request a letter from AccessAbility to present to the Professor that states what their accommodations are. If specific accommodations are required for a test, students must present an "Exam Administration Request Form" from AccessAbility, at least one week prior to the rest date in order to receive their accommodations.

COVID19 Policies:

Students reporting a severe illness will be reported to the college, and per college policy, will not be permitted to return to campus until they receive a negative COVID test result from a CUNY test center. For more information on college policies please visit:
https://www.ccny.cuny.edu/return-campus

There is also a guidance on how to act when there is classroom exposure. Please see the following guidelines: COVID-19 Classroom policy

Missed Exam Policies:

Students who have an unavoidable and serious emergency or severe illness that prevents them from attending a required class period, or submitting an assignment, exam, project, etc. on the day it was due, will not be penalized provided that they provide official documentation that excuses them. The documentation may be reviewed by Dean Beharry, and must justify the student's absence for the required class period or their inability to submit work on the day it was due.

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Class Schedule:

Class #		***In class textbook topics***
#1	02/01	Introduction to Class, Syllabus, Grading, Lab, Expectations,
#2	02/03	Chapter 3.1 – 3.7 Pipe Friction
#3	02/08	Chapter 3.1 – 3.7 Pipe Friction
#4	02/10	Chapter 3.8 – 3.11 Pipe Minor Losses
	02/15	***No Class => College Closed***
#5	02/17	Chapter 3.12 Pipes in Parallel and Series
#6	02/22	Chapter 3.12 Pipes in Parallel and Series
#7	02/24	Chapter 4.1 – 4.3 Branching Pipe Systems
#8	03/01	Chapter 4.4 Pipe Networks
#9	03/03	Chapter 4.4. Pipe Network Demand
#10	03/08	**Quizz #1**
#11	03/10	Chapter 5.1 – 5.4 Pump types
#12	03/15	Chapter 5.5 – 5.6 Pumps in Series and Parallel
#13	03/17	Chapter 5.7 – 5.9 Pump Operation
#14	03/22	Chapter 5.10 Pump Characteristics and dim-less numbers
#15	03/24	**Quizz #2**
	03/29	***No Class => College Closed***
	03/31	***No Class => College Closed***
#16	04/05	Chapter 6 Open Channel Flow
#17	04/07	Chapter 6.1 – 6.2 Classification and Uniform Flow
#18	04/12	Chapter 6.3 – 6.4 Energy Principles and Conjugate Depth
#19	04/14	Chapter 6.3 – 6.4 Energy Principle Cont'ed
#20	04/19	Chapter 6.3 – 6.4 Froude Numbers and Flow Regimes
#21	04/21	Chapter 6.5 Momentum Principle and Hydraulic Jumps
#22	04/26	Chapter 6.6 &.7 &.8 Gradually Varied Flow
#23	04/28	Chapter 8.5 Hydraulic Structures: Weirs
#24	05/03	Chapter 11.1 – 11.3 Basic Hydrologic Concepts
#25	05/05	Chapter 11.2 Design Storm
#26	05/10	Chapter 11.3 Excess Rainfall: SCS Procedure
#27	05/12	Chapter 11.4 Design Runoff: Unit Hydrograph
#28	05/17	Chapter 11.6 Rainfall Runoff: Rational Method
	05/--/19	**Final Exam**

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Laboratory Schedule:

Experiment #		***Lab Experiment/topic***	***Groups***	***Location***
#1	02/03	Hydrostatic Pressure		online
#2	02/10	Fluid Friction and Minor Losses in Pipes		online
#2	02/17	Fluid Friction and Minor Losses in Pipes		online
#3	02/24	Bernoulli Principle		online
#3	03/03	Bernoulli Principle		online
#4	03/10	Pumps in Series and Parallel		online
#4	03/17	Pumps in Series and Parallel		online
#7	03/24	Outfall Diffuser		online
	03/31	***Spring Recess***		
#7	04/07	Outfall Diffuser		online
#5	04/14	Sharp-crested Weirs		online
#5	04/21	Sharp-crested Weirs		online
#9	04/28	Design Probelm		online
#9	05/05	Design Probelm		
	05/12	***No Lab => Review***		online
				online