CE 322
Hydraulic Engineering

Fall 2017

Course Description

Quantifying water flow in watersheds is a crucial step in the design of environmental facilities, such as drinking water treatment plants and in delineating floodplains. This course deals with the water cycle over watersheds by addressing the motion of water masses in the atmosphere and in surface and subsurface systems. Students who successfully pass this class should be able to deal with most hydrology problems treated in the industry sector.

Required courses: Calc II and fluid mechanics.

Text

Textbook is: "Fundamental of hydraulic engineering systems, 5th edition" By Houghtalen, Akan, and Hwan, Editor is Pearson.

Additional textbooks

"Hydrologic Analysis and Design", Third Edition, by Richard McCuen.
"Hydraulique generale et appliquee", by Carlier, Editor is Eyrolle, 1972.

Classes

Held weekly in Room King Building (CKB) 207 on Monday 6:00 PM-9:00-PM. Attendance is expected. Students may leave after 15 minutes if the instructor or a substitute has not arrived by that time.

Instructor

Michel C. Boufadel, PhD, PE, P.Hydro., F.ASCE
boufadel@njit.edu ;
Office hours for the course: Monday 2:00-5:00 PM or by appointment.

Grading

Weekly quizzes	10%
Mid term exams	40%
Final exam	35%
Homework	10%
Class Participation	5%

90-100=A
80-90=B+
75-80=B
70-75=B-
65-70=C+

Homework Instructions

- ! Homeworks should be turned in at the beginning of the class on the due date. Late homeworks will receive a zero grade.
- ! The questions sheets should be provided in the beginning of the homework solution.
- ! Only one side of a 8.5x11 sheet must be used.
- ! Include the information that is given and clearly state any assumption. To receive credit for a problem, you must show your work.
- ! No credit will be given if you only write the answer.
- ! If you think that your answer is not correct (i.e., it does not make sense to you) but you don't know what else to do, say so.
- ! Homeworks should be written as technical reports. The text should be reported first followed by tables and then figures. The text should present the question and the solution, and point to the figures and tables. All tables should be numbered, and all figures should be numbered. Tables should have titles but no captions. Figures should have captions but no titles.
- ! All axes in graphs should have titles displaying the name of the variable and the units that are being used in the graph.
- ! Straight lines should be used to connect between data points in graphs. Use of smooth lines from a spreadsheet software, such as Excell, will be penalized.
- ! Printout of columns of numbers from a spreadsheet will be penalized.
- ! Discussing the problems with your colleagues is permitted but copying is not.
- ! Documents should be stapled only on the top left.

Exams Instructions

- Quizzes might be given at the beginning of any lecture.
- Bring a **non-programmable calculator** with you to the class, you might need it for a pop quiz.
- Make-up examinations will only be offered with advance permission from the instructor and only under the most extreme circumstances. A typed request and explanation must be provided. But regardless, expect make-up exams to be more difficult.
- To receive credit for a problem, you must show your work. No credit will be given if you only write the answer. If you think that your answer is not correct (i.e., it does not make sense to you) but you don't know what else to do, say so.

PROPOSED TOPICS in chronological order

Topic 1	Energy and mass principles
Topic 2	Major losses in pipes.
Topic 3	Minor losses. Water hammer.
Topic 4	Pumps and air reservoirs.
Topic 5	Pipelines: Branched and looped.
Topic 6	Open channel flow: Manning's equation.
Topic 7	Open channel flow: HEC-RAS.
Topic 8	Open channel flow. Energy considerations and hydraulic jump.
Topic 9	Backwater curves.
Topic 10	Weir and culverts.
Topic 11	Sizing reservoirs.
Topic 12	Design of stormwater systems.

Accessibility

Any student who has a need for accommodation based on the impact of a disability should contact the

Instructor privately to discuss the specific situation as soon as possible. Contact Disability Resources and Services to coordinate reasonable accommodations for students with documented disabilities. The NJIT web site below provides additional information: http://www.njit.edu/counseling/services/disabilities.php

Academic Honesty

Student's expected to abide by the NJIT's Academic Honesty Policy. Any work submitted by a student for academic credit will be the student's own work. You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

Course Objectives Matrix – CE 322 Hydraulics

Strategies and Actions	**Student Learning Outcomes**	**Outcomes (a-k)**	**Prog. Object.**	**Assessment Methods/Metrics**
Course Objective 1: Provide students with the knowledge necessary to perform design work in various hydraulic engineering areas including pipe systems, pumping stations, sanitary and storm sewers, and open channel flow.				
Review basic fluid mechanics principles.	Understand the most important aspects of fluid mechanics.	a	1	Quizzes and homework.
Discuss principles for water distribution system design.	Ability to design a water distribution network.	c	1	Design project.
Illustrate principles of pumping station design.	Understand the need for and design of pump for stations water distribution and sewer sanitary systems.	c, j	1	Design project.
Discuss principles of open channel flow and flood control.	Ability to analyze and design storm water systems.		1	Design project.
Discuss principles of sanitary and storm piping design.	Ability to design sanitary and storm sewers		1	Design project.
Course Objective 2: Incorporate State-of-the-art Software design tools.				

Introduce the software design tools available for distribution system design, open channel flow and reservoir routing.	Ability to apply software design tools to real world problems.	e, j	1, 2	Design project.

CEE Mission, Program Objectives and Program 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 scholarship among our faculty and students
- to promote service to the engineering profession and society

Our program objectives are reflected in the achievements of our recent alumni.

1 – Engineering Practice: Recent alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.

2 – Professional Growth: Recent alumni will advance their skills through professional growth and development activities such as graduate study in engineering, professional registration, and continuing education; some graduates will transition into other professional fields such as business and law through further education.

3 – Service: Recent alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, civic organizations, and humanitarian endeavors.

Our program outcomes are what students are expected to know and be able to do by the time of their graduation:
(a) ability to apply knowledge of math, science, and engineering
(b) ability to design and conduct experiments, as well as interpret data
(c) ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of ethical and professional responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) ability to use techniques, skills and modern engineering tools necessary for engineering practice

Revised 8/28/13