

JOHN A. REIF, JR. DEPARTMENT OF
**CIVIL AND ENVIRONMENTAL
 ENGINEERING**



CE 320 – Fluid Mechanics - Spring 2018

Text: Franzini and Finnemore, Fluid Mechanics 10th Edition, McGraw-Hill, ISBN: 0-07-243202-0

Instructor: Prof. Thomas Olenik, 227 Colton Hall, 973-596-5895 e-mail: olenik@njit.edu

Prerequisites: Mech 235 with a grade of C or better. **Corequisite:** Mech 236. This course is designed to present the fundamental laws relating to the static and dynamic behavior of fluids. The emphasis is placed on applications dealing with the flow of water and other incompressible fluids. These include flow in pipe systems and natural channels.

Chapter	Topic	Pages	Problems
1	Introduction	1-12	5.6,5.7,5.8
2	Fluid Properties	13-44	3.5,3.6,3.7,11.1,11.4,11.8,22
3	Fluid Statics	45-92	2.3,2.4,3.1,3.2,4.1,4.3,4.4,5.4,5.7,5.10, 7.7,7.8,7.11,9.6,9.9,17
4	Fluid Flow	97-111	5.2,5.3,7.2
5	Steady Flow (Bernoulli's Equation)	127-171 (except section 5.7)	2.2,2.5,3.2,3.4,9.1,9.3, 10.4,13.2,13.6,34
6	Momentum Forces	185-198	4.2,4.5,5.1,5.5
8	Pressure Conduits	255-355	2.2,2.3,3.1,5.3,6.1,12.1,13.2, 15.3,18.1,22.1,22.1,24.2,26.1 27.2,28.2,28.7,111,*115*
10	Open Channel Flow	407-481	3.2,3.4,3.5,3.7,7.1,7.2 10.1,11.2,17.6,18.1,3,33
7	Similitude and Dimension Analysis	232-251	
11	Fluid Measurements	491-541	

*Hazen-Williams Equation Only

QUIZZES (Closed book & Notes): A 30 point quiz will be given every week. There will be no make-up quizzes. A missed quiz will be graded as a zero. The passing grade for each quiz will be 21 points. A student who fails and/or does not take four quizzes will fail the course.

Analytical Software: Watercad and HEC-RAS will be utilized for assigned problems, and/or class discussions.

HOMEWORK

A supplementary homework problem (s) will be distributed each week and collected at the following class. A poor submittal will result in a point deduction of up to 50 points (off of your final point total) per problem. The problems listed above for each chapter will be discussed in class and will be collected occasionally.

All submitted problems must be done on standard computation paper in pencil and be presented in an organized neat manner.

CLASS PROJECT

Each student will design a water distribution system using the water CAD program embedded in the Civil 3D software. This project is required and will count as an additional 20 points for each student. Projects that are poorly prepared etc. can cause the student to lose up to 20 points.

GRADING

Quizzes* 30 points each
Final Exam* 200 points

The final grade will be based upon the following percentages utilizing the total net points (after any HW grade deduction) achieved by the student.

A =	90 to 100%
B+ =	87 to 89%
B =	80 to 86%
C+ =	77 to 79%
C =	72 to 76%
D =	70 to 71%
F =	Below 70%

*Closed book & Notes

*The NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students.

The use of electronic devices (other than calculators) is strictly prohibited during class hours. (Severe Penalties May Result).

CE 320 – Fluid Mechanics Course

Description:

This course is designated to present the fundamental laws relating to the static and dynamic behavior of fluids. The emphasis is placed on applications dealing with the flow of water and other incompressible fluids. These include flow in pipe systems and natural channels.

Prerequisites: Mech 235 – Statics, Corequisite Mech 236 – Dynamics

Textbook (s)/Materials Required: Fluid Mechanics with Engineering Applications, McGraw Hill, Franzini and Finnermore, 10th Edition

Objectives:

Provide students with a basic knowledge in fluid properties and statics utilizing the principles developed in previous mechanics courses.

1. Develop the principles and equations for pressure flow and momentum analysis.
2. Provide the students with the analysis and design principles for water distribution and pressure flow system design (pressure flow, pumps and network analysis).
3. Illustrate and develop the equations and design principles for open channel flow, including sanitary and storm sewer design and flood control hydraulics.

Topics:

Fluid properties
 Fluid Statics
 Fluid Kinematics
 Flow of an incompressible ideal fluid
 Impulse-momentum principal
 Flow of a real fluid
 Fluid flow in a pipe
 Open channel flow
 Dimensional Analysis

Schedule: (4-0-4)
Professional Component: Engineering Topics
Program Objectives Addressed: 1, 2
Prepared By: Prof. Olenik

Outcomes Course Matrix – CE 320 - Fluid Mechanics

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
Student Learning Outcome 1: Define fluid properties and statics utilizing the principles developed in previous mechanics courses.			
Illustrate basic fluid properties and fluid statics.	1	1	Weekly homework and quizzes.
Discuss the design of structures impacted by fluids.	1	1, 2	Weekly homework and quizzes.
Student Learning Outcome 2: Develop the principles and equations for pressure flow and momentum analysis.			
Develop the continuity and Bernoulli equations and friction loss equations.	1	1	Weekly homework and quizzes.
Provide distinct and detailed examples of how these equations are utilized in design.	1, 2	1, 2	Weekly homework and quizzes.
Student Learning Outcome 3: Design water distribution and pressure flow systems (pressure flow, pumps and network analysis).			
Provide design solutions and examples for pumping and network analysis.	2	1	Design problems.
Introduce actual engineering design problems.	2	1, 2	Design problems.

Student Learning Outcome 4: Illustrate and develop the equations and design principles for open channel flow. Included in this objective is sanitary and storm sewer design and flood control hydraulics (varied flow).			
Develop the principles of open channel flow and introduce Manning's Equation.	1	1	Homework and quizzes.
Provide design principles for sanitary and storm sewer design along with drainage analysis.	2	1	Homework and quizzes.
Introduce the varied flow principles and their application. Discuss the use of software-based solutions such as HEC-2	2, 7	1, 2	Homework and quizzes.

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 scholarship among our faculty and students
- to promote service to the engineering profession and society

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

1 – Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward 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 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 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.

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 and inclusive 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 conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Revised: 2/13/18