Spring 2022

CE 320-002: Fluid Mechanics

Thomas Olenik

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

NJIT New Jersey Institute of Technology

CE 320 – Fluid Mechanics

Spring 2022

Text: (Electronic Version) Hibbeler, Fluid Mechanics, 2nd Edition, Pearson-Students must purchase the master engineering access codes from the NJIT bookstore or at www.masteringengineering.com, No other sources are acceptable, (you cannot stay in the course if you do not have the access code) The access codes for the Spring 2022 semester are: olenik77993 for the day section(002) and olenik63421 for the evening section(104).

Instructor: Prof. Thomas Olenik P.E. 227 Colton Hall, 973-596-5895 e-mail: olenik@njit.edu Office hours: Every day from 9am to 9pm(except when in class). Email for an appointment using Webex(Access code 927 738 446)

Prerequisites: See course catalog 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 open channels/gravity flow. Design applications are included in this course

Week	Topic	Reading Assignment	Problems
1	Introduction (Chapter 1)	3-43 Front & rear inside covers, Appendix A	See masteringengineering assignments (All Weeks)
2& 3	Fluid Statics (Chapter 2)	44-74 & 85-90	
4 & 5	Fluid Flow Concepts (Chapter.3) Conservation of Mass (Chapter 4)	136-147	
6 & 7	Analyzation of Moving Fluids (Chapter 5)	214-257	
8	MID Term Exam (March 10)		
9	Fluid Momentum (Chapter 6)	284-297	
10 & 11	Analysis and Design of Pipe Flow (Chapter 10)(Chapter 14*)	505-543	
12 & 13	Open Channel/gravity Flow (Chapter 12)	638-681	
14	Modeling/Similitude (Chapter 8) (including Chapter Review)	418-446	
FINAL EXAM	Date to be determined		

GRADING

Mid-Term (100 points)
Assigned Homework (70 points)
Final Exam (100 points)

The final grade will be based upon the following percentages utilizing the total points achieved by the students.

A =	90 to 100%
B+ =	85 to 89%
B =	80 to 84%
C+ =	70 to 79%
C =	60 to 69%
D =	50 to 59%
F =	Below 50%

*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).

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: **(Hybrid)**
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 exams.
Discuss the design of structures impacted by fluids.	1	1, 2	Weekly homework and exams.

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 exams.
Provide distinct and detailed examples of how these equations are utilized in design.	**1, 2**	**1, 2**	Weekly homework and exams.
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 exams.
Provide design principles for sanitary and storm sewer design along with drainage analysis.	2	1	Homework and exams.
Introduce the varied flow principles and their application. Discuss the use of software-based solutions such as HEC-RAS	2, 7	1, 2	Homework and exams.

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 August 9, 2021