NEW JERSEY INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

CE 320 – Fluid Mechanics	Fall 2016
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 Prooperties	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, 15.3,18.1,22.1,22.1,14.2,26.1 27.2,28.2,287.7,111,115
10	Open Channel Flow	407-481	3.2,3.4,3.5,3.7,6.2,7.1,7.2 10.1,11.2,17.6,18.1,3,33
7	Similitude and Dimension Analysis	232-251	
11	Fluid Measurements	491-541	

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.

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 reviewed in class and not collected. 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 cap program embedded in the Civil 3D software. This project is required and will count as an additional 20 points for each student.

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.
*Students will be consulted with by the instructor and must agree to any modifications or deviations from the syllabus throughout the course of the semester.

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

Department of Civil and Environmental Engineering

CE 320 – Fluid Mechanics

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, 10^{th} 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 **Date:** Sept. 2011

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: Recent 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: 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, educational institutions, civil organizations, and humanitarian endeavors.

Our student outcomes are what students are expected to know and be able to do by the time of their graduation:

(a) an ability to apply knowledge of math, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an 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 on 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,
(i) a recognition, of need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use techniques, skills and modern engineering tools necessary for engineering practice

Rev. 8/28/13

Course Objectives Matrix – CE 320 Fluid Mechanics

Strategies and Actions	Student Learning Objectives	Student Outcomes (a-k)	Program Educational Objectives	Assessment Methods/Metrics
Course Objective 1: Provide the student with a basic knowledge in fluid properties and statics utilizing the principles developed in previous mechanics courses.				
Illustrate basic fluid properties and fluid statics	Understand basic principles.	a	1	Weekly homework and quizzes.
Discuss the design of structures impacted by fluids	Learn the importance of design principles.	c, e	1, 2	Weekly homework and quizzes.
Course Objective 2: Develop the principles and equations for pressure flow and momentum analysis				
Develop the continuity and Bernoulli equations and friction loss equations	Learn the importance of these equations in both fluid mechanics and hydraulics.	a	1	Weekly homework and quizzes.
Provide distinct and detailed examples of how these equations are utilized in design.	Appreciate the difference between theory and practice.	c,e,j,i	1, 2	Weekly homework and quizzes.
Course Objective 3: Provide the students with the analysis and design principles for water distribution and pressure flow systems design (pressure flow, pumps and network analysis).				

Provide design solutions and examples for pumping and network analysis Introduce actual engineering design problems.	Ability to apply the principles and equations to design problems. Learn what to look for in professional design practices	c, e, j e, h, I, j, k	1 1, 2	Review of design problems. Review of design problems.
Course Objective 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.	Learn the basics of open channel flow	a, c, e	1	Review of homework and quizzes.
Provide design principles for sanitary and storm sewer design along with drainage analysis.	Ability to apply principles to design problems.	e	1	
Introduce the varied flow principles and their application. Discuss the use of software-based solutions such as HEC-2	Familiarization with modern design analysis.	j, k	1, 2	Review of homework and quizzes.