CE 320-003: Fluid Mechanics

William Pennock

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Course Description (from the 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 natural channels.

Co-requisite or Pre-requisite:

MECH 236 with a grade of C or better. Prerequisite: MECH 235 with a grade of C or better, MATH 112 and PHYS 111/111A

Canvas: CE320003-Fluid Mechanics

Lectures: Mondays and Wednesdays, 11:30 AM – 1:00 PM EDT/EST

Instructor: Dr. William Pennock

Office: Colton 268

Office Hours: Tuesdays 1:30-3:00 PM, Thursdays 3:00-4:30 PM, or by appointment (scheduled through Canvas)

Email: whp3@njit.edu


Students must purchase access to Pearson’s MasteringEngineering learning environment, which is available through the NJIT Bookstore. Access to the e-text is included with the access card (ISBN: 9780134628776), so it is not necessary to purchase the physical textbook to get access unless having a physical copy (ISBN: 9780134676616) is desired. Homework will be assigned through MasteringEngineering, so it is critical that you have access to MasteringEngineering. Because MasteringEngineering is integrated with our Canvas site, please register for MasteringEngineering through the course Canvas site by clicking on the “MyLab and Mastering” link in the navigation menu. For best results, please read the assigned reading (including example problems) before it is covered in class. For readings labeled “skim”, they tend to focus on more theoretical and specialized applications. It is good to be familiar with the existence of these topics, but you are not expected to learn them through this class.

Course Section: 003
**Communication:**

All communication by the Instructor will be done through Canvas. It is your responsibility to check e-mail, and the course page on Canvas regularly.

**Items Required for this Course:**

1. MasteringEngineering access
2. Computer with microphone and webcam
3. Calculator

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction and Fluid Properties</td>
<td>1.1-1.10</td>
<td>Assigned through MasteringEngineering.</td>
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<tr>
<td>2 &amp; 3</td>
<td>Fluid Statics</td>
<td>2.1-2.8,2.11,2.12 (2.9-2.10, 2.13 skim)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Kinematics</td>
<td>3.1-3.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.5 skim)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Conservation of Mass</td>
<td>4.1-4.4</td>
<td></td>
</tr>
<tr>
<td>6 &amp; 7</td>
<td>Work and Energy</td>
<td>5.1-5.5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Midterm Exam (October 8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Fluid Momentum</td>
<td>6.1,6.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(6.3-6.5, 14.1-14.9 skim)</td>
<td></td>
</tr>
<tr>
<td>10 &amp; 11</td>
<td>Analysis &amp; Design of Pipe Flow</td>
<td>10.1-10.5</td>
<td></td>
</tr>
<tr>
<td>12 &amp; 13</td>
<td>Open Channel Flow</td>
<td>12.1-12.9</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Dimensional Analysis &amp; Similitude</td>
<td>8.1-8.5</td>
<td></td>
</tr>
<tr>
<td>Exam Period</td>
<td>Final Exam</td>
<td></td>
<td>See NJIT website for date</td>
</tr>
</tbody>
</table>

**Grading Policy:**

- **Homework:** 20%
- **Quizzes:** 25%
  - The lowest quiz grade will be dropped.
- **Midterm Exam:** 25%
- **Final Exam:** 30%
- **Attendance/Participation:** Students within 2% of a letter grade can be promoted up to the next highest grade level or demoted to the next lowest grade level based on their attendance and participation in class (both during lectures and in online discussions).

**Grading Scale:**

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A: 100-90  
B+: 89-85  
B: 84-80  
C+: 79-75  
C: 74-70  
D: 69-60  
F: Below 60

**Attendance and Participation:**

Due to the synchronous online nature of this course and the semester, attendance is especially important to remain engaged with your courses and your learning community. Please do your best to be fully present during lectures and avoid distractions for yourself and for fellow students. As noted above, attendance and participation is a non-negligible component of your grade. If a student must miss a class or an exam, please contact the professor to discuss the issue at least **24 hours prior to** the class or exam. Students will not be allowed to makeup exams or quizzes if the professor is not contacted prior to the class. If a student had a serious medical issue, death in the family, or other excusable emergency absence, the student is required to obtain an excused absence from the Dean of Students prior to asking for a make-up.

**Assignment Policy:**

All assignments are due by 11:59:59 PM on Wednesdays, unless otherwise specified. Late assignments will automatically be deducted 10% per day they are late and will not be accepted after 48 hours.

**Students with Disabilities:**

NJIT is committed to providing students with documented disabilities equal access to programs and activities. If you have, or believe that you may have, a physical, medical, psychological, or learning disability that may require accommodations, please contact the [Office of Accessibility Resources and Services](#).

**Additional Support:**

Even without the uncertainty this year has brought, college studies provide many new challenges and opportunities, and many students experience some form of distress as a result. If you feel overwhelmed or would like to talk with someone about your mental or emotional state, please reach out to C-CAPS or the Dean of Students.

**Withdrawals:**

In order to insure consistency and fairness in application of the NJIT policy on withdrawals, student requests for withdrawals after the deadline will not be permitted unless extenuating circumstances (e.g., major family emergency or substantial medical difficulty) are documented. The course Professors and the Dean of Students are the principal points of contact for students considering withdrawals.

**Exam Policy:**
Exams will be proctored through Webex (mobile device) and administered through the Lockdown Browser and Monitor (computer). Both the midterm and the final exam are cumulative. Quizzes will be given on a weekly basis at the end of Monday classes in Canvas.

NJIT policy requires that all midterm and final exams must be proctored, regardless of delivery mode, in order to increase academic integrity. Note that this does not apply to essay or authentic based assessments. Effective beginning Fall semester 2019, students registered for a fully online course section (e.g., online or Hyflex mode) must be given the option to take their exam in a completely online format, with appropriate proctoring.

In this course you will be required to use the following proctoring method to ensure academic integrity for exams. Please see NJIT’s response to questions about online proctoring [here](https://njit.edu/). See below for more information about how exams will be proctored in this course.

**Respondus LockDown Browser and Monitor**

Respondus LockDown Browser is a locked browser for taking assessments or quizzes in Canvas. It prevents students from printing, copying, going to another URL, or accessing other applications during a quiz. If a Canvas quiz requires that LockDown Browser be used, students will not be able to take the assessment or quiz with a standard web browser. Students may be required to use LockDown Browser with a webcam (Respondus Monitor), which will record students during an online exam.

The webcam can be built into your computer or can be the type that plugs in with a USB cable. Watch this [short video](https://njit.edu/) to get a basic understanding of LockDown Browser and the webcam feature. A student [Quick Start Guide (PDF)](https://njit.edu/) is also available.

Respondus Lockdown Browser and Monitor does not work with Linux and Chromebooks at this time. Please visit the [Respondus Knowledge Base article on computer requirements](https://njit.edu/) for additional information.

**For “New” Quizzes in Canvas (used in this course):**

If a New Quizzes assessment requires the use of LockDown Browser, it will automatically launch from the student’s regular browser session. At the end of the quiz, LockDown Browser will close, allowing the student to continue with their standard browser. To be clear, the LockDown Browser application must first be installed to the computer or device. But once installed, it will automatically launch (and close) as needed with New Quizzes.

1. Download and install LockDown Browser from this link: [http://www.respondus.com/lockdown/download.php?id=264548414](http://www.respondus.com/lockdown/download.php?id=264548414) (Links to an external site.)
2. Once your download and installation has finished, log into Canvas using your standard browser.
3. From your Dashboard or under “Courses”, click on the course in which you have to take the exam that requires LockDown Browser.
4. After you enter the course, find the exam and click on it.
5. A new tab will open with a message stating “Assessment Loading”. You will also see a pop-up window asking you to open Lockdown Browser. Click “Open Lockdown Browser”.

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6. Lockdown Browser will automatically launch and your quiz will be loaded into Lockdown Browser. Click “Begin” to take the quiz. Once a quiz has been started with LockDown Browser, you cannot exit until the “Submit Quiz” button is clicked.

7. If you are required to use a webcam (Respondus Monitor), you will be prompted to complete a Webcam Check and other Startup Sequence steps.

**Students:** If information is not posted about whether quizzes will be created using “Classic” or “New” quizzes, contact your instructor.

**Webex**

Webex can be used to allow instructors to proctor exams themselves. Your instructor will schedule a Webex exam session and share the meeting information with you ahead of time. The exam in Canvas will be password-protected. You can connect to the Webex session with either your phone or computer. You can find links to download the mobile app from the App Store or Google Play Store at the bottom of njit.webex.com (Links to an external site.).

When your instructor is ready to start the exam, they will provide the exam password in the meeting so all students can begin the Canvas quiz. Your instructor will then watch you, via the web camera, as you take the exam. Students are expected to remain connected to the Webex session until their exam is submitted. The session may also be recorded by your instructor.

In order to use Webex for proctored exams, you will need the following:

- High-speed internet connection
- Webcam (internal or external) and/or smartphone with camera (instructor’s preference)
- The process for connecting to Webex will be the same as when you connect for a class.

Tips for ensuring a smooth experience while using Webex:

- Connect to your Webex session before class starts.
- Log into Canvas before connecting to Webex.

Questions or problems can be submitted via web form by going to: https://servicedesk.njit.edu (Links to an external site.) and clicking on the "Report your issue online" link. You may also call the IST Service Desk with any questions at 973-596-2900.

**Academic Integrity:**

“Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu”

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**Syllabus Information:**

The dates and topics of the syllabus are subject to change; however, students will be consulted with and must agree to any modifications or deviations from the syllabus throughout the course of the semester.

**Copyright:**

All course content (including this syllabus, lecture materials, homework assignments, and exams) is protected content. Students should not make copies of any course materials or distribute these materials in the public domain, including sites such as Chegg, CourseHero, etc.

### Outcomes Course Matrix

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

**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 Weekly homework, quizzes, and exams

Provide design principles for sanitary and storm sewer design along with drainage analysis. 2 1 Weekly homework, quizzes, and exams

Introduce the varied flow principles and their application. Discuss the use of software-based solutions such as HEC-2 2, 7 1, 2 Weekly homework, quizzes, 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 safe, practical, 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 technical and interpersonal skills through professional growth and development activities such a 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