Fluid Mechanics

[Jump to Today](#)

Objectives: To develop a fundamental understanding of the science and engineering of fluid mechanics, through rigorous theoretical discussions, analytical examples, practical applications, and computational projects.

Textbook: Munson, et al., *Fundamentals of Fluid Mechanics* (http://www.wiley.com/WileyCDA/WileyTitle/productCd-EHEP002022.html) **(Required).** Reading will be assigned from 7 Edition, however you should be able to use an earlier edition with minimal difficulty. You can purchase either electronic or hardcopy format as you prefer. We will mostly cover Chapters 1-7, and sample some of the rest.

Instructor:

> **Shawn Shadden**
> Email: shadden@berkeley.edu (mailto:shadden@berkeley.edu) (please see email policy below)
> Office hours: Wednesdays 12:00-1:30PM
> Location: 5126 Etcheverry

GSI:

> **Siavash Ameli**
> Email: sameli@berkeley.edu (mailto:sameli@berkeley.edu) (please see email policy below)
> Office hours: Thursdays 2:45-4:45PM
> Location: 136 Hesse

> **Spencer Frank**
> Email: spencerfrank@berkeley.edu (mailto:spencerfrank@berkeley.edu) (please see email policy below)
> Office hours: Fridays 1:00pm-3:00PM
> Location: 136 Hesse

Grader:

> **Shuk Han Chan**
> Email: shukhan@berkeley.edu (mailto:shukhan@berkeley.edu) (please see email policy below)
> Location:

Email Policy: For email to instructor, GSI, and grader: Please send email from a berkeley.edu account. Attempt will be made to respond to emails in a timely manner. Please allow 24 hours for response. If no response is received within 24 hours, please send a **friendly** reminder. Urgent or complicated matters are best discussed in person.

Assessment: Course grade will be comprised of the following components: **15% Homework, 15% Projects, 15% x 3 ODK's, 25% Final Exam**

Getting help with homework: The best way to get help with homework is face to face discussion with peers, GSIs during office hours or instructor during office hours. You can also use Piazza for posting questions. Students should feel free to also *answer* homework questions on Piazza. I encourage transfer of knowledge (not solutions per se) among peers (use common sense here).

Turning in homework: Homework assignments must be submitted in person to the drop box on the 3rd floor of Etcheverry. Please do not email pictures of your homework–this is not manageable.

Discussions:

Wednesday 2-3pm 3109 ETCHEVERRY - Siavash Ameli

Wednesday 4-5pm 3113 ETCHEVERRY - Siavash Ameli

Thursday 4-5pm 103 GPB - Spencer Frank

Grading notes:

- While homework serves educational and evaluational roles, more emphasis is placed on education than evaluation. For homework, there is more latitude to make mistakes and grading is less nuanced. Nonetheless, grading of homework must assess some level of correctness.
- You can turn 1 homework in up to 3 (calendar) days late. If you do not have any late assignments, you receive a 10% bonus on your assignments at the end of the semester.
- Grade-focused conversations are welcome when they are proactive, realistic, and framed around concrete objectives for the course.
- Your grades are not what make you a worthy human being. Free yourself from this burden and enjoy learning.

Topic outline:

1. Fluid Statics
   1. Pressure variation in a fluid at rest
   2. Hydrostatic forces on plane and curved surfaces
   3. Buoyancy and flotation principles
2. Bernoulli Equation
   1. Derivation of streamline and normal components of the momentum equation

2. Static, dynamic and total pressures
3. Restrictions on the use of the Bernoulli equation
3. Fluid Kinematics
    1. Eulerian and Lagrangian descriptions
    2. Velocity and acceleration field
    3. Control volume and system representation
    4. Reynolds transport theorem
4. Integral control volume analysis
    1. Conservation of mass, momentum and energy for incompressible flow
5. Differential analysis of fluid flow
    1. Velocity and acceleration field
    2. Conservation of mass and momentum
    3. Euler's inviscid equations of motion
    4. Potential Flow
    5. Navier-Stokes Equations
6. Dimensional Analysis
    1. Buckingham Pi Theorem
    2. Modeling and similitude
7. Viscous Flow in Pipes
    1. Laminar and turbulent flow
    2. Entrance region and fully developed flow
8. External Flow
    1. Lift and drag concepts
    2. Boundary layer concepts

Honor Code: _As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others._ Please read information at: http://asuc.org/honorcode/resources/HC%20Guide%20for%20Syllabi.pdf   (http://asuc.org/honorcode/resources/HC%20Guide%20for%20Syllabi.pdf)

Collaboration: Collaboration on homework is permitted, but you must produce your own unique solutions.

DSP: Appropriate accommodations will be made for students with documented disabilities. Please inform the instructor if this applies to you. Further information can be found at: http://dsp.berkeley.edu/facresponsibilities.html (http://dsp.berkeley.edu/facresponsibilities.html)

Religious Creed: If you anticipate not being able to attend a quiz or exam due to a religious commitment, please inform the instructor at the start of the semester. Further information can be found at:

Date	Details	
Fri Aug 28, 2015	Reading Assignment 1 (https://bcourses.berkeley.edu/courses/1371798/assignments/6675836)	due by 11:59pm
Wed Sep 2, 2015	Reading Assignment 2 (https://bcourses.berkeley.edu/courses/1371798/assignments/6675876)	due by 11:59pm
Tue Sep 8, 2015	Homework Assignment 1 (https://bcourses.berkeley.edu/courses/1371798/assignments/6745440)	due by 5pm
Fri Sep 11, 2015	Reading Assignment 3 (https://bcourses.berkeley.edu/courses/1371798/assignments/6817955)	due by 11:59pm
Mon Sep 14, 2015	Homework Assignment 2 (https://bcourses.berkeley.edu/courses/1371798/assignments/6785095)	due by 4pm
Mon Sep 21, 2015	Reading Assignment 4 (https://bcourses.berkeley.edu/courses/1371798/assignments/6850710)	due by 11:59pm
Fri Sep 25, 2015	Homework Assignment 3 (https://bcourses.berkeley.edu/courses/1371798/assignments/6843754)	due by 5pm
Mon Sep 28, 2015	ODK (midterm) 1 (https://bcourses.berkeley.edu/calendar?event_id=1798608&include_contexts=course_1371798)	11am to 12pm
Fri Oct 2, 2015	Project 1 (https://bcourses.berkeley.edu/courses/1371798/assignments/6853174)	due by 11pm
Wed Oct 7, 2015	Reading Assignment 5 (https://bcourses.berkeley.edu/courses/1371798/assignments/6908948)	due by 11:59pm
Fri Oct 9, 2015	Homework Assignment 4 (https://bcourses.berkeley.edu/courses/1371798/assignments/6892403)	due by 5pm
Fri Oct 16, 2015	Homework Assignment 5 (https://bcourses.berkeley.edu/courses/1371798/assignments/6924158)	due by 5pm
	Reading Assignment 6 (https://bcourses.berkeley.edu/courses/1371798/assignments/6926399)	due by 11:59pm
Tue Oct 20, 2015	Homework Assignment 6 (https://bcourses.berkeley.edu/courses/1371798/assignments/6955838)	due by 11:59pm
Mon Oct 26, 2015	ODK (midterm) 2 (https://bcourses.berkeley.edu/calendar?event_id=1798610&include_contexts=course_1371798)	11am to 12pm
Wed Oct 28, 2015	Project 2 (https://bcourses.berkeley.edu/courses/1371798/assignments/6915954)	due by 11:59pm
Fri Oct 30, 2015	Homework Assignment 7 (https://bcourses.berkeley.edu/courses/1371798/assignments/6967904)	due by 5pm

Fri Nov 6, 2015	[Homework Assignment 8 (https://bcourses.berkeley.edu/courses/1371798/assignments/6983968)](https://bcourses.berkeley.edu/courses/1371798/assignments/6983968)	due by 5pm
Wed Nov 11, 2015	[Reading Assignment 7 (https://bcourses.berkeley.edu/courses/1371798/assignments/7001924)](https://bcourses.berkeley.edu/courses/1371798/assignments/7001924)	due by 11:59pm
Mon Nov 16, 2015	[Homework Assignment 9 (https://bcourses.berkeley.edu/courses/1371798/assignments/7010243)](https://bcourses.berkeley.edu/courses/1371798/assignments/7010243)	due by 5pm
Fri Nov 20, 2015	[Homework Assignment 10 (https://bcourses.berkeley.edu/courses/1371798/assignments/7033710)](https://bcourses.berkeley.edu/courses/1371798/assignments/7033710)	due by 5pm
Mon Nov 23, 2015	[ODK (midterm) 3 (https://bcourses.berkeley.edu/calendar? event_id=1798611&include_contexts=course_1371798)](https://bcourses.berkeley.edu/calendar?event_id=1798611&include_contexts=course_1371798)	11am to 12pm
Mon Dec 7, 2015	[Project 3 (https://bcourses.berkeley.edu/courses/1371798/assignments/7034053)](https://bcourses.berkeley.edu/courses/1371798/assignments/7034053)	due by 11:59pm
Mon Dec 14, 2015	[ME 106 Final Exam (https://bcourses.berkeley.edu/calendar? event_id=1798612&include_contexts=course_1371798)](https://bcourses.berkeley.edu/calendar?event_id=1798612&include_contexts=course_1371798)	11:30am to 2:30pm
	[ODK 1 (https://bcourses.berkeley.edu/courses/1371798/assignments/6930348)](https://bcourses.berkeley.edu/courses/1371798/assignments/6930348)	
	[ODK 2 (https://bcourses.berkeley.edu/courses/1371798/assignments/6985717)](https://bcourses.berkeley.edu/courses/1371798/assignments/6985717)	